United States Patent

[11] **3,561,691**

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[45] Patented **Feb. 9, 1971**

[54] **TAPE UNWINDING MEANS**
10 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **242/55,** 234/128; 242/75.3
[51] **Int. Cl.** **B65h 75/02**
[50] **Field of Search** 242/55, 57, 75, 75.2, 75.3, 75.43, 147, 153, 154; 226/113, 114; 234/128

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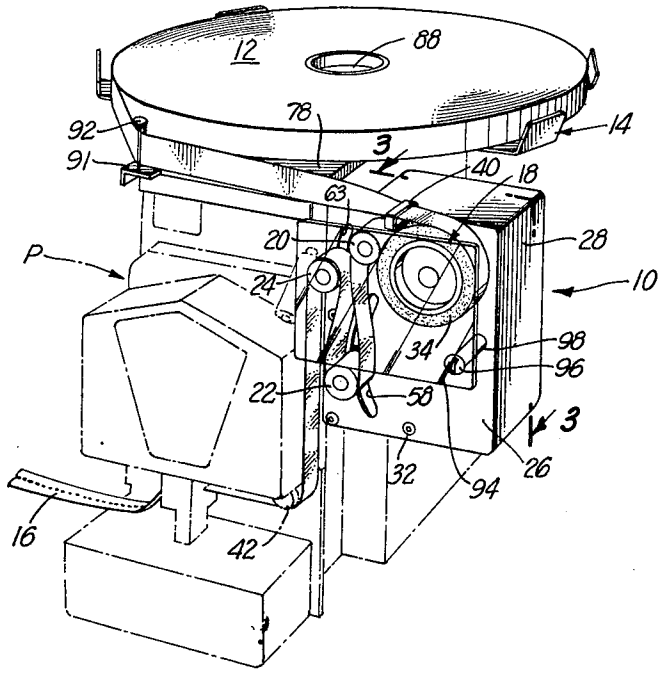
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ABSTRACT: A device for automatically unwinding paper tape from a roll and feeding it, under gentle tension, to the output tape punch of a tape justifying computer. The device has a drive wheel, for tractively propelling the tape, and three rollers, one of which is mounted on a pivot arm and rides in a loop formed in the tape between the other two. Power is supplied to the drive wheel by a gear head motor which is automatically controlled by a mercury switch connected in series therewith and mounted on the above-mentioned pivot arm. As the tape slackens, the pivot arm moves downwardly and causes the mercury switch to turn off the motor.



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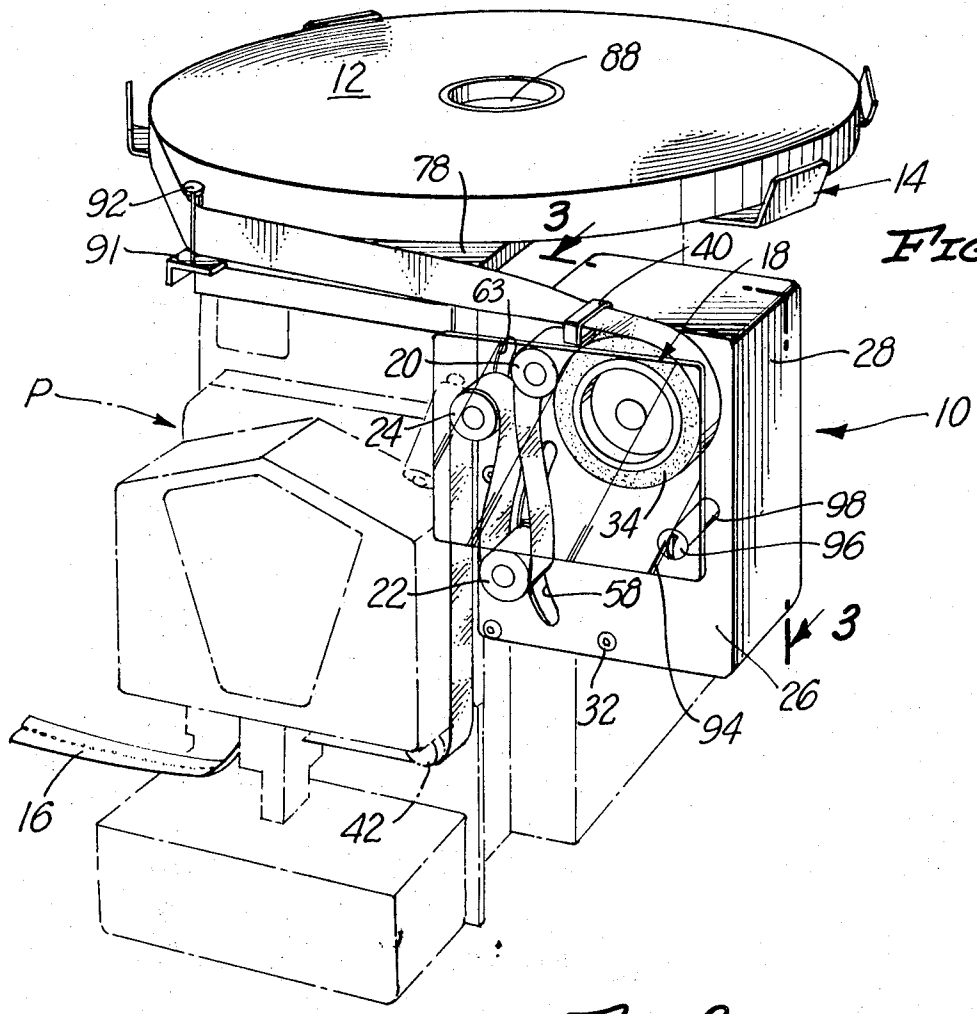
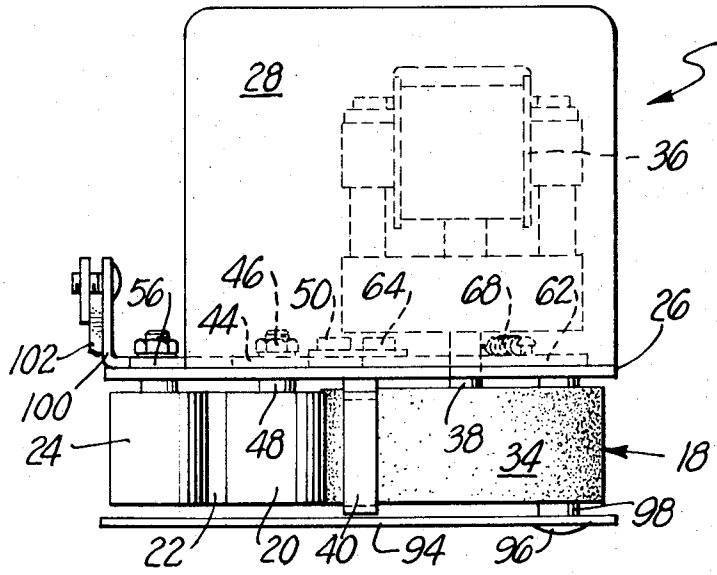


FIG. 1.

FIG. 2.



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FIG. 3.

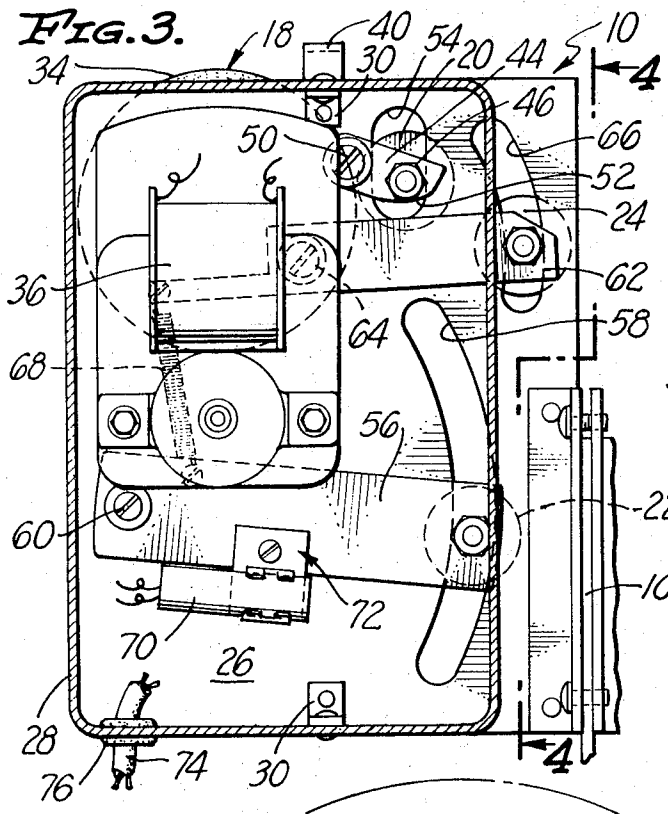


FIG. 4

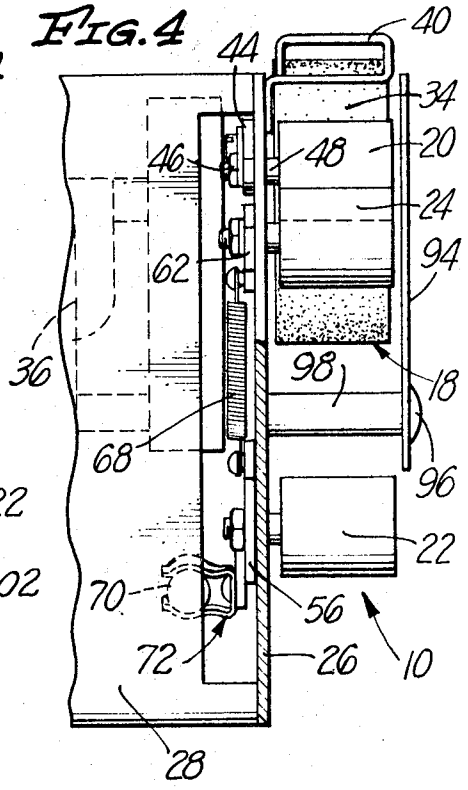
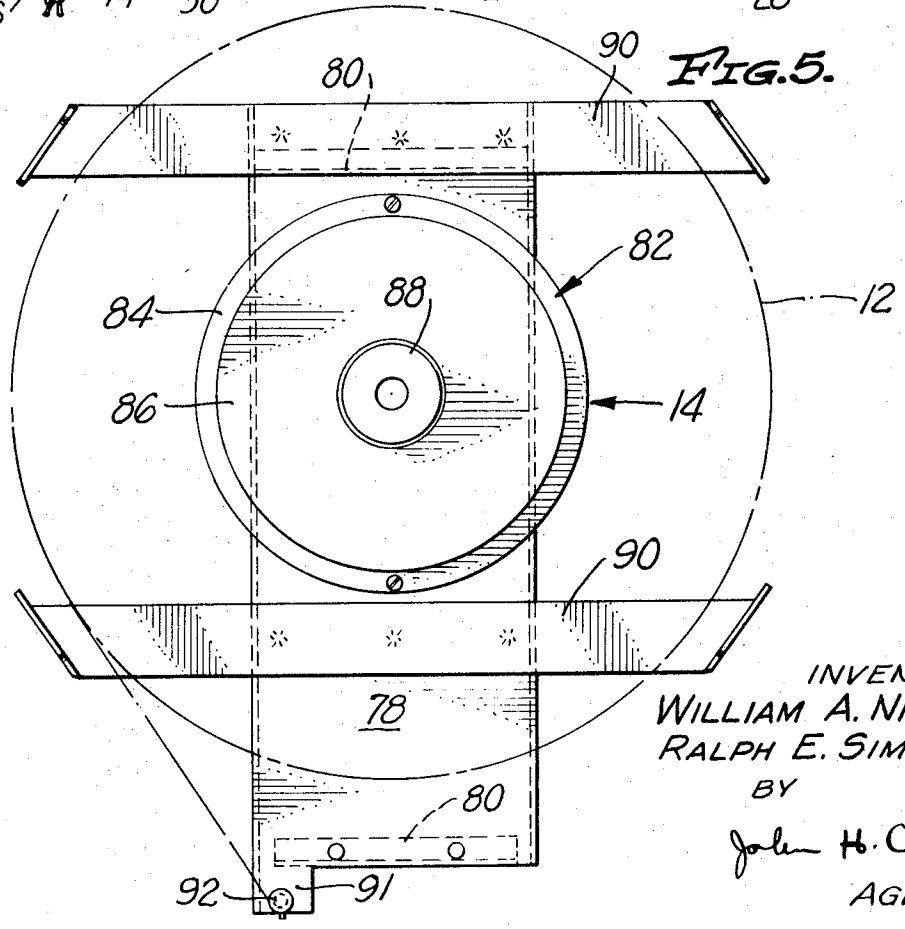


FIG. 5.



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TAPE UNWINDING MEANS

BACKGROUND OF THE INVENTION

This invention relates generally to an automatic tape unwinding device, and more particularly to such a device capable of unwinding paper tape from a relatively large roll and feeding it, under light tension, to a high-speed tape punch of the type employed in newspaper composing rooms as the output punch for a justifying computer.

As those skilled in the art of newspaper composition are aware, linecasting machines (originally designed and built solely for manual operation) have in recent years been increasingly converted to automatic operation capability by the installation of a tape-controlled device known commercially as the Teletypesetter Operating Unit (hereinafter Operating Unit or simply Unit), a product of Fairchild Graphic Equipment Division of Fairchild Camera and Instrument Corp., Plainview, New York, which attaches directly to the keyboard of such a machine. A linecasting machine so equipped, can be converted from manual to automatic operation, or vice versa, by simply turning a tape feed control lever on the Operating Unit. The tape fed to the Operating Unit is of a specially prepared type having coded perforations, the function of the Unit being to read these combinations and translate them into mechanical actions which automatically operate the linecasting machine.

The perforated tape which controls the Operating Unit is prepared from blank paper tape of suitable type by means of a Teletypesetter Perforator, an instrument manufactured and sold by the same company that produces the Operating Unit. The Teletypesetter Perforator (hereinafter Perforator) is equipped with a fast keyboard and a mechanism cooperating therewith to punch code symbols, and center feed holes, in the tape.

While the automatic method of operating linecasting machines described above is a substantial improvement over the old manual operating method, it does require the use of at least one trained operator for Perforator keyboard work who must, as he works, make continuous type justification, hyphenation, etc., decisions of the sort necessary for the production of useable tape copy. These decision making burdens, of course, slow the operator down and result in a reduced rate of copy flow from his machine. In more recent years, the versatile computer has been drafted for performance of the Perforator operator's decision making chores, thus freeing him for the production of straight unjustified copy, which he can turn out at a much faster pace, and with far less strain, than he can justified copy. Specially designed computers have been made available for such tape processing work. These computers function by reading unjustified tape copy and transmitting commands to a high-speed tape punch mechanism, which then prepares new tape, in properly justified form, for feeding to the Operating Unit of a linecasting machine.

A typical example of a high-speed punch mechanism suitable for use in a justifying computer system such as described above is manufactured by Teletype Corporation of Skokie, Illinois, and sold under the name "High-Speed Tape Punch Set (BRPE)," referred to hereinafter as the BRPE Punch (or simply Punch). The BRPE Punch is designed to perforate information in paper tape at speeds of up to 110 characters per second, which is equivalent to 1100 words per minute. The information is received from external control circuits in the form of multiwire electrical pulses which are translated into mechanical motions that feed the tape and perforate feed and code holes therein. The tape-feeding operation is accomplished by means of a feed wheel with pins on its outer periphery which fit into the feed holes in the tape and advance the latter with each increment of rotation of the wheel. Different versions of the BRPE Punch are available to produce fully perforated, standard teletypewriter, paper tape of five, six, seven, or eight levels.

The BRPE Punch has a tape reel and brake mechanism mounted on one side of its base to provide support for a roll of feed tape, and guides and rollers strategically situated to provide a pathway for the tape from the roll to the punching mechanism (punch block) of the Punch unit. The largest tape roll that can be handled effectively on this tape reel is a roll of 8-inch diameter, although the Punch could be operated with much greater efficiency if a 14-inch roll (a standard-sized roll) could be employed in lieu of the smaller one, since it holds approximately three times as much tape as the latter.

While we have found those familiar with BRPE Punches to be well aware of the potential advantages of the 14-inch tape roll over the 8-inch one as a source of feed tape for such machines, no one has, to our knowledge, yet succeeded in adopting the Punch for accommodation of the larger roll. The principal obstacle to the use of such a 14-inch roll with presently existing Punches is the excessive weight of a roll of that size, which has the effect of causing the feed wheel of the Punch to tear or elongate the feed holes in the tape at Punch start up times. The relatively great weight of the 14-inch tape roll is also disadvantageous in that it causes undue wear on the tape-feeding mechanism of the Punch. In this connection, even the use of an 8-inch roll has been found to require the exertion of about 8 ounces of pressure on the punch block of a BRPE Punch to pull the tape off of the roll and through that machine. The pressure would obviously be substantially higher than this were a 14-inch roll of tape employed.

SUMMARY OF THE INVENTION

The tape unwinding device (hereinafter unwinder) of this invention is a relatively lightweight unit of fairly simple construction, and is in its preferred form as presently contemplated, designed for attachment to one of the punch unit mounting brackets of a BRPE Punch in a convenient location for feeding tape from a 14-inch roll to the Punch for tape-perforating purposes. The unwinder is powered to drive the tape toward the Punch, and deliver it thereto under sufficiently light tension to eliminate the above-mentioned problems of tape damage and excessive wear on the tape feeding mechanism of the Punch which would otherwise be present. In this connection, we have determined that only 1 ounce of pressure is required to pull the output tape of our unwinder through the punch block of a BRPE Punch, as compared to the 8 ounces of pressure exerted on the punch block during conventional usage of the Punch with a full 8-inch roll of tape as its feed source. We have provided, for use in conjunction with our new unwinder, a special roll holder for supporting a 14-inch roll of tape horizontally above a BRPE Punch. The design of the roll holder is such that the tape roll is induced by its own weight to remain firmly in place, in tape dispensing availability, therein during operation of the Punch. As will be seen, tape can be easily dispensed to the operating unwinder from a roll of tape so horizontally disposed.

In its preferred form, as presently contemplated, our tape unwinder has a drive wheel with a tractive rim adapted to receive a length of tape in partial wrap therearound; a follower wheel mounted to move into and out of tractive rolling contact with the drive wheel; an end roller; and a traveling roller, mounted on a pivot arm in such a way as to rest in a loop in the tape between the follower and end rollers. A motor adapted to turn the drive wheel at a rim speed slightly faster than that corresponding to the rate of tape movement through the punch block of a BRPE Punch is operably connected with said drive wheel. Thus, when the unwinder is feeding such a Punch, its drive wheel moves tape from a feed roll fast enough to build sufficient slack in the tape ahead of the wheel to provide the aforesaid loop between the follower and end rollers for the traveling roller to ride in.

The pivot arm to which the traveling roller is attached has a tilt-sensitive switch, such as a mercury switch, affixed thereto in such a way as to exert on-off control of the aforesaid motor as the slack in the tape varies between predetermined limits.

Thus, if the tape suddenly slackens to an excessive degree, due to, for example, sudden cessation of operation of a BRPE Punch being serviced by the unwinder, the traveling roller drops and carries the pivot arm down to a point at which the tilt-sensitive switch cuts off current to the motor, and when the tape subsequently becomes taut, the switch on the pivot arm will, at a particular point of upswing of the pivot arm, turn the motor on again. When the unwinder is in operation, downward pressure on the tape from the traveling roller riding in the aforesaid loop pulls the follower roller to its position of closest proximity to the drive wheel, except when the tape becomes excessively slack, in which case the tape pull on the follower roller eases and the latter is induced, by means subsequently described, to move away from the drive wheel and permit the latter to coast to a stop without driving the tape along with it to cause excessive slack tape accumulation between the rollers of the unwinder.

In a particularly preferred embodiment of our invention, the aforesaid end roller is mounted on a pivot arm to permit swinging movement thereof, and there is spring contact between that pivot arm and the pivot arm to which the traveling roller is attached which permits the end roller to serve as a shock absorber for the tape if the latter is subjected to sudden pulling, jerking, or other, stresses during operation of the unwinder.

It is thus a principal object of this invention to provide means for permitting the automatic feeding of paper tape to an operating BRPE Punch from a 14-inch roll without risk of damage to the tape as a result of excessive pull thereon by the feed wheel mechanism of the Punch.

It is another object of the invention to provide such means resulting in substantially less wear on the feeding mechanism of the Punch than results from present methods of feeding the Punch from an 8-inch tape roll.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds.

DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of an unwinder in accordance with this invention attached to a BRPE Punch and feeding tape from a roll supported atop the cover of the Punch into the punch block of the latter, the outline of the Punch being shown in phantom lines for purposes of better illustrative effect.

FIG. 2 is an enlarged top view of the unwinder with its parts in the relative positions shown in FIG. 1, the tape being omitted and certain hidden parts of the unwinder being shown in dashed lines, for better illustrative effect, showing, also, a mounting bracket by means of which the unwinder is attached to the Punch.

FIG. 3 is a sectional view of the unwinder, and its mounting bracket, taken along line 3–3 of FIG. 1, a structural member of the Punch to which said bracket is attached being shown fragmentarily and certain wiring particulars being omitted for purposes of better clarity of illustration.

FIG. 4 is a fragmentary side view of the unwinder, partly in section taken along line 4–4 of FIG. 3.

FIG. 5 is a top view, slightly enlarged, of a roll holder for the tape roll shown in FIG. 1, the outer periphery of the roll and a short segment of tape leading therefrom being shown in phantom lines to indicate the manner in which the tape is held by, and dispensed from, the roll holder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Considering now the drawings in greater detail, with emphasis first on FIG. 1, there is shown generally at P a BRPE Punch (hereinafter Punch P) with a preferred embodiment of an unwinder in accordance with this invention **10** (hereinafter unwinder **10**) mounted thereon. There is also shown a roll of tape **12**, representative of a standard 14-inch diameter roll, mounted on a preferred embodiment of tape roll holder in accordance with this invention **14** (hereinafter roll holder **14**). FIG. **1** illustrates unwinder **10** in operation and feeding a strip of the tape from roll **12** into Punch P.

Unwinder **10** is essentially a tape driving mechanism having certain visible rotating members which pull the tape from roll **12** and move it, under relatively light tension, towards Punch P, and a system of cooperating inner parts and components, enclosed, for the most part, in a housing consisting of a front panel **26** and a back cover **28**. Back cover **28** has an open front which fits against front panel **26**, in the manner best illustrated in FIGS. **1** and **2**, to form the aforesaid housing, the back cover and panel being fastenable together in this manner by means of a pair of L-shaped brackets **30** fixedly secured to the inner surfaces of the top and bottom sides of the cover, with one leg of each extending towards the other, as shown in FIG. **3**, and a pair of cooperating screws **32**. The L-shaped brackets **30** are positioned so that their extended legs are close enough to the edges of the top and bottom sides of back cover **28** to receive screws **32** when the back corer and front panel are fitted together in the above-indicated manner. The extended legs of brackets **30** have tapped openings sized to receive said screws, and front panel **26** has a pair of openings large enough to freely admit the screw shafts, positioned to overlie the bracket openings and permit tightening of the screws in the latter when the front panel and back cover are brought together to form the aforesaid housing, one of the screws being shown so tightened in FIG. **1**.

The aforesaid rotatable members of unwinder **10** include a drive wheel **18**, a follower roller **20**, a traveling roller **22** and an end roller **24**. Drive wheel **18** is of relatively large diameter, by comparison with any of the follower, traveling and end rollers, which latter are all of equal size. The drive wheel is of light metal construction, except for an encircling tire **34** of a mediumly soft rubbery material having a transversely flat tread surface adapted to contact the tape with sufficient traction to move it similarly to the way a drive pulley moves a belt conveyor when the tape is held tautly thereagainst during operation of the unwinder. Tire **34** can be made of any rubbery material suitable for the purpose, a preferred example of which, we have found, is a homogenous mixture of about 65 percent neoprene and 35 percent rubber.

Drive wheel **18**, as its name implies, furnishes the necessary power to move tape from roll **12** through the unwinder, and is connected, for that purpose, to the spindle **38** of a gear head motor **36**, which latter is disposed behind front panel **26**. There is an opening through panel **26** properly sized and positioned to permit motor spindle **38** to pass without binding so that the drive wheel can be attached to its outer end for the above-indicated purpose. The drive wheel has a hub opening adapted to snugly receive the outer end of spindle **38**, and is detachably secured thereto by means of an Allen setscrew housed in the body of the wheel so as to work radially into and out of contact with the spindle for wheel installation and removal purposes. Access can be had to the setscrew by means of a radial bore extending through tire **34** and into the metal body of the wheel, of sufficient size to freely admit an Allen wrench for screw loosening and tightening purposes. The end segment of spindle **38** has a flat side to receive the setscrew in conventional fashion. This method of wheel attachment to an axle is well known to those skilled in the mechanical arts and, accordingly, has not been illustrated in the drawings.

Each of the follower, traveling and end rollers is of lightweight metal, preferably aluminum, construction, and has an axle which extends rearwardly through an appropriately sized and located opening in front panel **26** to anchored support on a movable pivot arm behind that panel, hereinafter to be described. The roller pivot arms are so mounted as to permit each roller a range of movement consistent with its particular function in unwinder **10**. Thus, follower roller **20** is attached to a pivot arm which permits it to move into and out of contact with drive wheel **18**, for reasons hereinafter made clear. The drawings show the follower roller in its position of closest proximity to the drive wheel. The roller assumes this

position during normal operation of the unwinder and moves away from the drive wheel, under a biasing force presently to be identified, when the unwinder stops running. Traveling roller **22** is mounted to permit its up and down movement, through a predetermined distance, and end roller **24** to permit the same kind of movement, except at a higher elevation (and for a shorter distance) than the traveling roller, all for reasons hereinafter appearing.

To prepare unwinder **10** for operation, a length of tape from roll **12** is threaded through a tape guide **40**, positioned as shown in FIG. **1**, around approximately three-fourths of the periphery of drive wheel **18**, then up and over follower roller **20**, down and under traveling roller **22**, up and over end roller **24** and then down and around a guide roller **42** on Punch P, from whence it is threaded into the punching and feeding mechanism of the latter. FIG. **1** shows such a length of tape so threaded through unwinder **10** and Punch P, and (at **16**) emerging from the latter in perforated condition. While only the feed holes are shown on the perforated tape, it will be appreciated by those skilled in the art that such tape ordinarily has coded perforations, as well as feed holes, therein.

As previously indicated, gear head motor **36** has a shaft speed calculated to drive the tape at a slightly faster rate of movement than the rate of movement of the tape through Punch P, to assure a certain amount of slack between the drive wheel and Punch, therein, for a purpose hereinafter appearing. In a working model of the unwinder designed and built substantially along the lines of unwinder **10**, we have found a 120 volt, 60 cycle AC, self-contained gear head motor, geared down from 3400 to 90 r.p.m., to be optimumly suitable as the driving means for its drive wheel corresponding to drive wheel **18**.

The follower, traveling and end rollers of unwinder **10**, and their mounting means, are positionally arranged to permit the traveling roller to rest in a downwardly extending loop of tape between the follower and end rollers. The weight of the traveling roller thus cradled, pulls downwardly on the tape to a sufficient extent to maintain the follower roller in close proximity to drive wheel **18**, during operation of the unwinder. By this means, frictional drive force is imparted to the tape, which is, as FIG. **1** illustrates, squeezed between the drive wheel and follower roller, when they are forced together in the indicated fashion. When excessive slack develops in the tape passing through the unwinder during operation of Punch P, as, for example, when the Punch suddenly ceases to operate, traveling roller **22** drops with the bottom of the loop of tape between the follower and end rollers (as the loop lengthens with the extra tape slack) and, at a certain point on its descent, cause motor **36** to shut off through cooperating mercury switch means soon to be described. After the tape loop reaches a predetermined point of elongation, the traveling roller no longer rides downwardly with it to exert pulling force, through the tape, on follower roller **20** and urge the latter toward the drive wheel. When this pulling force on the follower roller is thus released, the roller is automatically biased away from the drive wheel to loosen the grip of the latter on the tape and permit it to coast to a stop without dragging the tape along with it. The manner in which the parts of the unwinder function to achieve these results will shortly be explained in greater detail.

When the excess slack is subsequently removed from the tape in the unwinder, the tape loop between the follower and end rollers tightens and pulls traveling roller **22** upwardly, At a predetermined point of its upward travel, motor **36** is automatically turned on again and the unwinder resumes operation with the tape pulling downwardly on follower roller **20** to urge it toward drive wheel **18**, and into pressing contact with the tape thus caught between it and the drive wheel periphery.

Tape guide **40** has a downwardly extending tab at its rear end, as viewed in FIG. **1**, with an opening sized to loosely admit one of the screws **32**. It is fastened in place with the tab sandwiched between front panel **26** and the L-shaped bracket **30** at the top of back cover **28** of the unwinder housing so that the screw **32** connecting those members passes through the aforesaid opening therein. There is a suitably sized and appropriately located recess in the front edge of the top of back corer **28** to accommodate the aforesaid tab and permit unhindered assembly of the unwinder housing in the manner taught herein. Tape guide **40** does not form a critically necessary part of unwinder **10** and can be dispensed with completely, if desired, within the scope of the present invention.

Gear head motor **36** is secured to front panel **26** of the unwinder housing by means of screws which pass through appropriately located openings in the panel and are screwed into tapped openings in integral bosses extending forwardly from the gearbox housing of the motor assembly. The body of the motor assembly is thus held in properly spaced d relationship with front panel **26** to permit the installation of moving parts, hereinafter to be described, between the motor and panel. To avoid a confusing proliferation of structural detail therein, not necessary to an understanding of our invention by those to whom these teachings are directed, the above-noted motor support particulars have not been illustrated in the drawings.

Considering now those internal parts of unwinder **10** which control and direct the movements of its follower, traveling and end rollers, and focusing first on FIG. **3**, follower roller **20** is, as there shown, fixedly secured to a relatively short pivot arm **44** in such a way as to extend perpendicularly forwardly therefrom. The inner end of the follower roller axle is threaded for such purpose, and passes through an appropriately located opening in pivot arm **44** to receive a locknut washer, not shown, and a nut **46** which serve to secure the axle to the pivot arm. To assure proper spacing between pivot arm **44** and the body of follower roller **20**, a spacer sleeve **48** is positioned about the roller axle between the pivot arm and roller body, sufficient looseness between the involved parts of the roller mount assembly being, of course, provided to permit the use of unwinder **10** with minimal frictional resistance between those parts.

Pivot arm **44** is pivotally fastened to the back of front panel **26** of the unwinder housing, as shown at **50**, in such fashion as to permit its unhindered swinging movement in close, but nonbinding, proximity to the panel. A portion of the lower edge of pivot arm **44**, as viewed in FIG. **3**, is curved in camlike fashion, as shown at **52**, for a purpose hereinafter appearing. The axle of follower roller **20** passes through an opening **54** in from panel **26**, sized to permit swinging movement of that roller through a limited range of movement into and out of contact with drive wheel **18**. The position of the follower roller is the same in FIG. **3** as in FIG. **1**, that is, its position of closest proximity to the drive wheel. Swiveling movement of pivot arm **44** in the counterclockwise direction, as seen in FIG. **3**, moves the follower roller away from drive wheel **18**, as will be apparent from the drawings, particularly FIG. **3**.

Traveling roller **22** is fastened to the right end of a pivot arm **56**, as viewed in FIG. **3**, in substantially the same manner that follower roller **20** is secured to pivot arm **44**. Pivot arm **56** is substantially longer than pivot arm **44** and pivotally fastened at **60** to front panel **26** of the unwinder housing, near its left side, again as viewed in FIG. **3**, by means substantially the same as employed for the fastening of pivot arm **44** to that panel. There is an arcuate slot **58** in front panel **26** sized to admit the axle of traveling roller **22** and permit swinging movement of the latter through a fairly wide range, yet prevent it from dropping below a certain point. Consequently, traveling roller **22** ceases to exert downward pressure on the tape loop between the follower and end rollers when the tape slack exceeds an amount corresponding to this point of its travel.

End roller **24** is supported at the right end of still another pivot arm **62**, as seen in FIG. **3**, in the same way in which the follower and traveling rollers are secured to their respective pivot arms. Pivot arm **62** is pivotally fastened to front panel **26** at **64**, to permit its pivotal movement in close proximity to the panel similarly to the way in which pivot arms **44** and **56** move, by means essentially the same as the corresponding means for pivotally securing the latter pivot arms to panel **26**.

Pivot arm 62, however, has a pivot point intermediate its ends, rather than having its relatively close to the end opposite that to which its cooperating roller is attached, as does each of pivot arms 44 and 56. An arcuate slot 66 in front panel 26 of the unwinder housing permits swinging movement of end roller 24 similar to that permitted traveling roller 22, but within a more limited range.

Fastened between a point at the left end of pivot arm 62, as seen in FIG. 3, and a point somewhat inboard, in the axial direction, of the pivot point of pivot arm 56, so as to connect pivot arms 62 and 56, is a spiral tension spring 68. When the unwinder is in a state of rest in the upright position illustrated in FIG. 1, and there is no tape pressure on any of its rotating members, the weight of traveling roller 22 carries that member downwardly to the bottom of arcuate slot 58. The position of spiral tension spring 68 is such that when this movement of the traveling roller occurs, force exerted by the spring pulls downwardly on the left end of pivot arm 62, as viewed in FIG. 3, thereby causing the right end of that pivot arm, and end roller 24, to move upwardly. Pivot arm 62 operates in the same plane of movement as pivot arm 44, and as the former moves upwardly, under the urging of spring 68, its upper edge comes into contact with the arcuate lower edge 52 of the latter. Continued upward movement of pivot arm 62 forces the arcuate edge of pivot arm 44 to move in camlike fashion in contact therewith, thereby inducing upward movement of the follower roller 20 to a position out of contact with drive wheel 18. This (that is, the force of spiral tension spring 68, acting through pivot arm 62, on pivot arm 44), is the biasing influence, referred to earlier, which holds follower roller 20 out of contact with drive wheel 18 when the unwinder is at rest.

It will now be apparent that the threading of tape from roll 12 through unwinder 10 and Punch P in the manner illustrated in FIG. 1, causes traveling roller 22 to bear downwardly on the resultant loop of tape between the follower and end rollers, which in turn causes the tape to pull downwardly on the follower roller and urge it to a position of close proximity to drive wheel 18. The pull on follower roller 20 is, of course, against the force of spiral spring 68, acting through pivot arm 62, which means that the spring urges the right end of that pivot arm, as viewed in FIG. 3, upwardly against the camlike lower edge of pivot arm 44. This upward urging of the right end of pivot arm 62, by spiral spring 68, imparts a cushioning and shock absorbing function to end roller 24. Thus, during normal operation of the unwinder, the tape will pull sufficiently hard against the force of spring 68 on the end roller to urge pivot arm 62 out of contact with pivot arm 44, as best illustrated in FIG. 3, and thereby give the tape a spring-cushioned ride over that roller. Furthermore, any sudden pull or jerk on the tape, while the unwinder is in operation, serves to pull the end roller still harder against the yielding resistance of spring 68, so that the latter tends to absorb the resulting shock and prevent damage to the tape and/or equipment.

Attached to pivot arm 56, by means of a holding clip and retaining screw 72, is a mercury switch 70. The mercury switch can be angularly adjusted, relative to the pivot arm, by swiveling its holding clip about the aforesaid retaining screw. The switch is connected in series with gear head motor 36, current for which is supplied from an outside source of 115-volt AC current by means of a conductor cord 74, threaded through a grommeted opening 76 in the bottom wall of back cover 28 of the unwinder housing, all as illustrated in FIG. 3. The exact wiring details of the motor and mercury switch are omitted from the drawings, since such minutiae are well known to those skilled in the art and their inclusion would serve merely to obscure more important internal details of unwinder 10 residing at the heart of the invention.

As will now be apparent, mercury switch 70 provides the automatic control means, previously referred to, serving to shut off current to gear motor 36 when excessive slack occurs in the tape, and to turn the motor back on again when this slack is subsequently taken up. The mercury switch can be easily calibrated, through adjustment of its angular position on pivot arm 56 in the above-indicated manner, to provide for motor 36 shutdown at any suitable point along the path of up and down movement of traveling roller 22. It will be evident from the foregoing, that the shutoff of current to motor 36 by mercury switch 70 is followed immediately by an increase of slack in the tape loop between the follower and end rollers as the momentum in drive wheel 18 causes the latter to continue rotating and driving the tape over follower roller 20, and hence into said loop. As a result, traveling roller 22, riding in the enlarging tape loop, continues to drop until it reaches the bottom of arcuate slot 58 in front panel 26 of the unwinder housing, after which it can go no lower and ceases to bear down on the bottom of the tape loop as the latter continues to increase in size under the coasting influence of drive wheel 18. The instant the tape is relieved of the weight of traveling roller 22 in this fashion, the tape ceases to hold follower roller 20 close to the drive wheel, with the result that traction between the tape and drive wheel is lost and the still coasting wheel slows to a halt without adding more slack to the tape in the unwinder.

Should the point of motor shutoff occur exactly when pivot arm 56 brings traveling roller 22 to the bottom of arcuate slot 58 in front panel 26, continued tape slackening as a result of drive wheel coasting would not take place. Such exact coincidence of motor shutoff and tape tension release is unnecessary for good unwinder operation, however, and mercury switch 70 is preferably calibrated to stop and start the motor when traveling roller 22 is between ¾ and 1 inch from its lowest position of permissible travel.

Tape roll holder 14 comprises a metal plate 78 of generally rectangular shape with downturned side edges and having a pair of angle sections 80 fixedly secured, in transverse relationship, across its underside, between its downturned side edges. The angle sections are secured to plate 78 with a web of each depending downwardly therefrom and spaced to flank the front and rear walls of the cover of Punch P when the plate is positioned on the Punch as shown in FIG. 1. Two strips of resilient material, not shown, are glued transversely across the undersurface of metal plate 78, near, and inboard of, angle sections 80, to provide a cushioned bottom for roll holder 14, and that area enclosed by the two downturned side edges of plate 78 and the downturned webs of the two angle sections 80 is such as to snugly, but nonbindingly, admit the top of the cover of Punch P so that roll holder 14 can be fitted atop the Punch, and maintained in that position without serious danger of migration, during coactive operation of the Punch and unwinder 10.

Fastened to the top of metal plate 78, symmetrical about its longitudinal axis but closer to one end than the other, is a stationary tape deck 82. Tape deck 82 has a flat outer, annular segment 84, fastened flush against metal plate 78, a raised inboard segment 86, adapted to support a roll of tape in horizontal position, and an upstanding cylindrical core 88, sized to fit snuggly into the center hole of the tape roll.

A pair of lateral support members 90 are fixedly secured across the upper surface of plate 78, either side of tape deck 82, to provide support for the outer portions of a tape roll positioned on the roll holder should the roll tend to sag around its periphery. The outer ends of support members 90 are bent sharply upwardly, as best shown in FIG. 1, to provide a measure of safety against the migration of a tape roll from roll holder 14 should the roll somehow become dislodged from core 88 of tape deck 82. FIG. 5 shows the relative lengths of lateral support members 90, by comparison with the diameter of a roll of tape of approximately the maximum size roll holder 14 is designed to handle. Projecting upwardly from a forwardly extending segment 91 of metal plate 78, seen to the left in FIGS. 1 and 5, is a tape guide 92, positioned to guide the tape smoothly and tautly between roll 12 and unwinder 10.

Situated in front of the upper portion of front panel 26 of the unwinder housing is a plexiglass shield 94. This shield is held in planarly parallel relationship with front panel 26, and

spaced outwardly therefrom a sufficient distance to clear the drive wheel and roller structure between it and panel **26** (see FIG. 1), by means of a nut and bolt fastener **96** and a sleeve spacer **98** designed to fit around the bolt shank in the space between the shield and panel **26**. The head of the bolt member of the nut and bolt fastener **96** can be drawn pretty tightly against shield **94**, and still permit swiveling movement of the latter around the bolt shank to expose drive wheel **18** and the upper of the screws **32** holding front panel **26** to back cover **28** of the unwinder housing, for unwinder disassembly purposes. This easy swiveling advantage of the illustrated shield holding means makes the latter a preferred way of mounting the shield in place. It is not a critical feature of our unwinder, however, and can be modified, or even eliminated completely (along with the shield), within the scope of our invention.

It will now be evident that unwinder **10**, by virtue of its unique combination of cooperating parts serves to automatically unwind tape from a relatively large roll, such as, for example, a 14-inch roll, of paper tape, and feed it to a BRPE Punch under relatively light tension. In this connection, the tape stretching actions of the various tape handling rollers of unwinder **10** serve to keep the tape free of slack and under a minimum of tension so that the feeding mechanism of the Punch can work it into the punch block of the latter with even less force than is required to pull the tape from an 8-inch roll on the conventional, side-mounted reel and brake mechanism of the BRPE Punch referred to above. It is thus clear that the above-noted objects of our invention can be achieved with unparalleled excellence through the use of unwinder **10**.

Unwinder **10** is fastened to BRPE Punch P by means of a mounting bracket **100** which is, in turn, mounted on one of the punch unit mounting brackets of the Punch, shown at **102**, in a manner obvious to those skilled in the art in the light of this disclosure and FIGS. **2** and **3** of the drawings. The approximate size of unwinder **10**, which is, as indicated above, exemplary of an actual working model of an unwinder that we have used with complete success in a newspaper composing room, can be easily estimated from the drawings by those skilled in the art in view of their ready familiarity with the size of the BRPE Punch there shown (in, of course, the same scale as the unwinder). A further clue to the size of unwinder **10** can be found in the fact that the drive wheel of the aforesaid working model of our unwinder corresponding to drive wheel **18** of unwinder **10** was of 2½inch diameter and had a tread width of about 1-1/16 inch. An unwinder of the size dictated by these drive wheel dimensions is capable of handling five, six, seven or eight level tape.

The present invention has been described in considerable detail in order to comply with legal requirements for a full public disclosure of at least one of its embodiments. Such detailed disclosure is not, however, intended to unduly limit the scope of the patent monopolicy sought to be granted. Accordingly, while our novel tape unwinder and tape roll holder have been illustrated and described in what are considered to be preferred embodiments, it is emphasized that departures may be made therefrom within the scope of our invention. Certain of these departures have already been mentioned, and others will occur to those skilled in the art in the light of present teachings. Exemplary of the latter are noncritical variations of the shapes of various parts, or features, of the unwinder (and/or tape roll holder); refinements of the shapes of various parts or features of the unwinder or roll holder; etc. More specific examples of such variations include the substitution of a stationary end roller for moveable end roller **24** and elimination of spiral tension spring **68**, coupled with the substitution of a counterweighted pivot arm for camlike pivot arm **44** to bias follower roller **20** away from drive wheel **18** when the unwinder is at rest; etc. Other examples of unwinder modification within the scope of our invention could be enumerated, but the foregoing one believed adequately illustrative for the purpose.

While the above description has strongly emphasized the BRPE Punch feeding applicability of our invention, we wish to emphasize that our tape unwinder has broader use potential than this and can be employed for whatever service its unique capability suits it. It is emphasized, in final summary, that the scope of the present invention includes all variant forms thereof encompassed by the language of the following claims.

We claim:

1. Unwinding means for automatically unwinding tape from a rotatably mounted roll and delivering the unwound tape to tape processing means under relatively low tension upon demand of the latter, comprising, in combination:

a plurality of rotatable members including a drive wheel, a follower roller, a traveling roller and an end roller relatively mounted for threading thereabout a portion of unwound tape extending between the roll and the tape-processing means so that the tape passes around the drive wheel and up over the follower roller, then down and under the traveling roller and up over the end roller to provide a depending tape loop in which the traveling roller rides;

said drive wheel having a tractive rim surface engageable with the tape and driven at a speed slightly faster than the speed at which the tape is demanded by the tape-processing means;

said follower roller being mounted for swinging movement relative to the drive wheel and adapted to press the tape thereagainst so that when the drive wheel is rotating the tape is urged up and over the follower roller, thereby building up slack in the tape loop, which slack is reduced by the demand for tape by the tape-processing means;

said traveling roller being mounted on a pivot arm for vertical movement for bearing down on the bottom of the tape loop to take up slack and hold the tape under relatively low tension;

a motor mounted to drive the drive wheel; and

motor control means responsive to the disposition of the pivot arm for turning the motor on and off, whereby during operation of the tape-processing means tape is delivered thereto upon demand under relatively low tension and when such demand ceases excess slack builds up in the tape loop, permitting the traveling roller to move down and dispose the pivot arm to turn the motor off, resumption of demand causing the excess slack to be taken up, lifting the traveling roller to dispose the pivot arm for turning on the motor.

2. Unwinding means in accordance with claim **1**, in which said follower roller is mounted on a relatively short pivot arm with a camlike lower edge and said end roller is mounted on a second pivot arm to permit its movement up and down through an arcuate path;

a. said rotatable members are positioned in front of a panel and the pivot arms on which the follower, traveling and end rollers are mounted are positioned behind the panel;

b. said rollers have axles which project rearwardly to connect with their cooperating pivot arms; said panel has appropriately sized and located openings to accommodate the rearwardly projecting axles of said rollers and permit movement of each through a limited range of travel;

c. said pivot arm on which said traveling roller is mounted and said second pivot arm are connected by a spiral tension spring in such fashion that the spring urges said second pivot arm in the direction of upward movement of said end roller;

d. said relatively short pivot arm and said second pivot arm are so relatively positioned that the latter urges the former to its position corresponding to the extreme position of said follower roller away from said drive wheel and said former moves the latter downwardly, through rocking contact between its camlike lower edge and the upper edge of said latter, when said follower roller is pulled adjacent said drive wheel by the tape under tension during operation of said unwinding means; and

e. said end roller, when at its highest possible point with said follower roller as closely adjacent to said drive wheel as

possible during operation of said unwinding means, is movable to a still lower position against the tension of said spiral tension spring acting on said second pivot arm, whereby said end roller serves in a shock absorbing capacity to ease shock on said tape when it is subjected to undue stresses during operation of said unwinding means.

3. Unwinding means in accordance with claim 2 in which said drive wheel has a tire made of a mediumly soft rubbery material characterized by a tread surface adapted to assure good tractive contact between said wheel and said tape during operation of said unwinding means.

4. Unwinding means in accordance with claim 3 in which said mediumly soft rubbery material comprises a homogeneous mixture of about 65 percent neoprene and about 35 percent rubber.

5. Unwinding means in accordance with claim 1 in which said motor control means includes a tilt-sensitive switch secured to said pivot arm.

6. Unwinding means in accordance with claim 5 in which

said tilt-sensitive switch is a mercury switch.

7. Unwinding means in accordance with claim 2 having a back cover adapted to cooperate with said panel and substantially enclose those parts of said unwinding means behind said panel.

8. Unwinding means in accordance with claim 7 adapted for mounting on the frame of the high-speed output punch of a justifying computer adapted to convert perforated tape containing no justification codes into tape suitable for the automatic operation of line casting machines, for purposes of feeding blank paper tape from a roll of same to said punch.

9. Unwinding means in accordance with claim 8 in combination with a tape roll holder adapted to hold a 14-inch roll of said paper tape on top of said high-speed output punch and dispense said tape to said unwinding means.

10. Unwinding means in accordance with claim 1 in which said roll is mounted for rotation about an axis extending transversely of the axes of rotation of said rollers and drive wheel.