

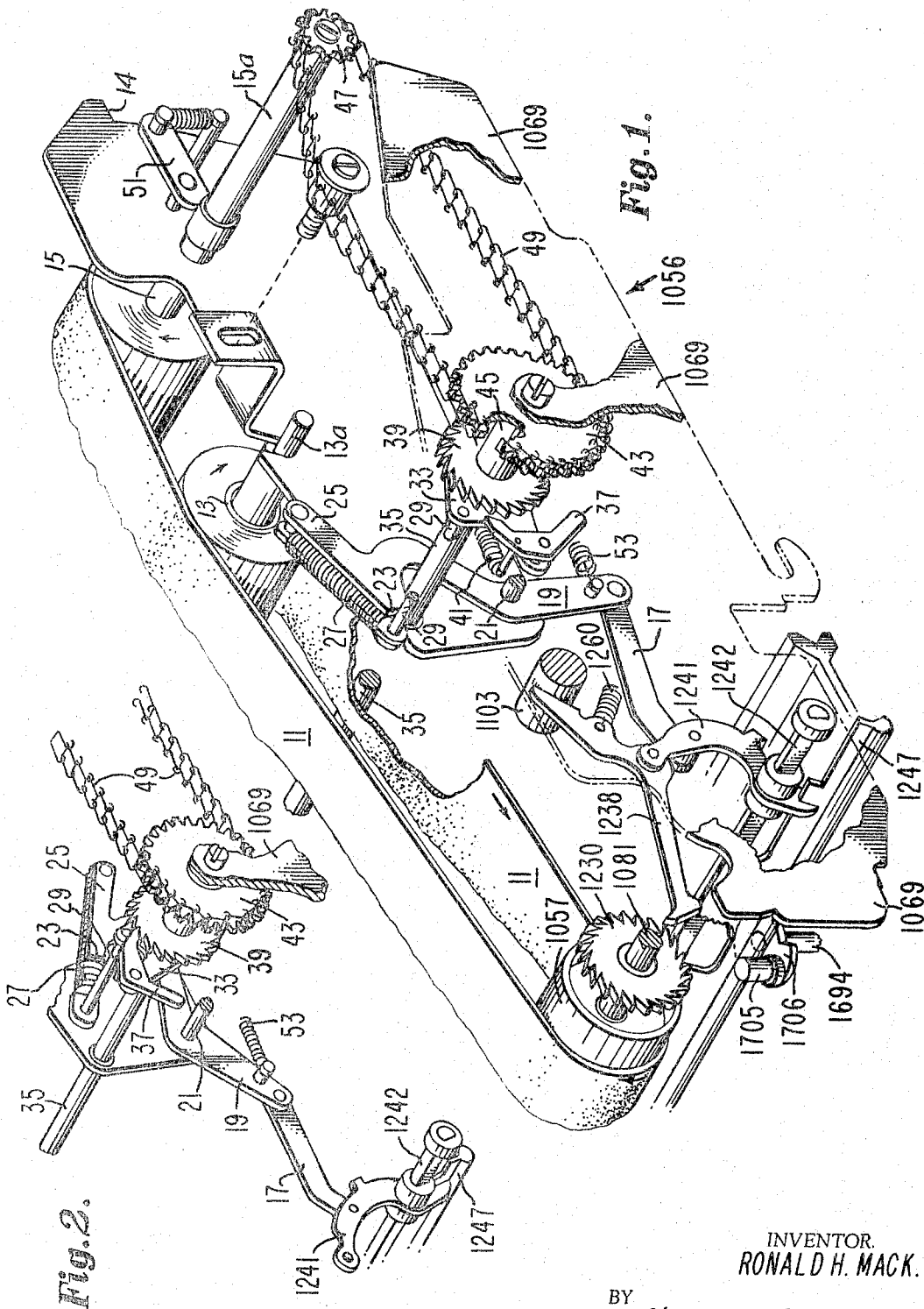
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## WEB TAKE-UP MECHANISM

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## WEB TAKE-UP MECHANISM

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This invention relates to web handling apparatus and, more particularly, to a web take-up mechanism which prevents the formation of undesirable slack in the portion of an incrementally advanceable web that lies between a platen and a take-up spool.

One object of this invention is to provide an improved mechanism for maintaining a web taut as it is being incrementally rewound.

Another object of this invention is to provide a web rewind mechanism operable in unison with the feeding operation of a platen to maintain the web therebetween taut during the feeding of the web.

Another object of this invention is to provide a pre-loadable rewind mechanism which, prior to the feeding of the web, removes residual slack.

A further object of this invention is to provide web rewinding drive means for applying torque to the take-up end of the web in a greater degree than that necessary to remove slack generated by the feeding operation.

Other objects of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a spread perspective of a web handling apparatus embodying the features of the invention; and

FIG. 2 is a similar view of only a portion of the apparatus showing the elements of the invention in a driven position, the elements of FIG. 2 being shown in a different position than in FIG. 1.

The subject web take-up mechanism is illustrated and described in the environment of an accounting machine of the type disclosed in United States Patent 2,629,549 assigned by Thomas M. Butler to the assignee of the present invention. The following portions of the Butler patent are particularly directed to a suitable adjacent environment for this invention: Line spacing means—column 122, FIGS. 102 and 103 on sheet 51; line spacing power drive—column 152, FIG. 150 on sheet 72. Those elements of the accounting machine which are disclosed hereinafter as well as the Butler patent are identified by reference numerals over 1000, as in the Butler patent; whereas, new elements disclosed herein are designated by reference numerals below 100.

The subject invention may be employed for rewinding a web 11, such as a conventional roll of journal paper. The web 11 is initially wound upon a rimless supply spool 13 which is freely rotatable on rod 13a the reduced ends of which are received in laterally spaced guide plates as 14 within a paper carriage 1056 of the accounting machine. The web is guided from the supply spool around an incrementally rotatable platen 1057, and thereupon around a take-up or rewind spindle or spool 15 that is coupled to and is positively driven from drive shaft 15a. In a manner described in detail in the Butler patent, the platen is driven and draws the web away from the supply spool. As a result of such web feeding, the used portion of the web would accumulate and lie slack between the platen and the rewind spool were it not for the subject take-up mechanism.

Stated briefly, to advance the web 11 a predetermined distance, power is applied to a shaft 1694 which causes the rotation of a cam disc 1706 as well as a stud 1705 secured thereto. The stud 1705 impinge upon a bail 1247 and drives it rearwardly. A curved arm 1241 has its lower end connected to the bail 1247 and is pivoted about

a shaft 1242 which passes proximate thereto, such that the rearward motion of the bail 1247 causes the curved arm 1241 to turn counterclockwise about the shaft 1242. FIGS. 1 and 2 illustrate the change of position of these elements.

A pawl 1238 is pivotally mounted near its midpoint to the other end of the curved arm 1241. The rearmost end of the pawl normally rests upon the top surface of a bushing 1103 which is secured to one of a pair of carriage end plates 1069. As the curved arm turns counterclockwise, the pawl is shifted forward and at the same time urged clockwise by a tension spring 1260 attached near its rearward end. However, the pawl is not free to pivot clockwise and into mesh with the teeth of a ratchet wheel 1230 until the forward shifting of the pawl causes its rearward end to ride down the surface of the bushing 1103. Thus, there is provided a delay between the initiation of the power stroke, via the curved arm 1241, and the onset of the driving of the ratchet wheel 1230.

The ratchet wheel 1230 and the platen 1057 are fixed about a common shaft 1081. As the web 11 passes around the platen, it is held in frictional engagement therewith by biased rollers, not shown. Accordingly, incremental actuation of the pawl 1238 positively advances or feeds the web a determinable distance toward the rewind spool 15.

Also secured to the curved arm 1241 is one end of a link 17 which, through that arm, is pulled forward during each power stroke. The link 17 and the following elements combine to drive the rewind spool 15 to prevent the formation of web slack as the web is being positively advanced. The rearward end of the link 17 is pinned to the lower end of a rewind drive arm 19. The rewind drive arm 19 is pivotable about a stud 21 which is secured between the ends of the drive arm and one of the carriage end plates 1069. The upper end of the rewind drive arm is somewhat T shaped, has a leading edge 23, and a rearward extending portion 25. A coil spring 27 is secured parallel to the portion 25 between its rearmost terminus and one end of a laterally extending stud 29, which passes in front of the leading edge 23. In the normal position, as shown in FIG. 1, the leading edge 23 of the rewind drive arm 19 is held against the stud 29 by the coil spring 27 which is then under slight tension.

The other end of the stud 29 is secured to a rewind feed pawl mounting blank 33 that is pivotally mounted upon a tie rod 35 which is secured between the carriage end plates 1069. A rewind feed pawl 37 is rockably pinned to the mounting blank 33 in close proximity to a rewind ratchet wheel 39 and is biased against the periphery of the ratchet wheel by a tension spring 41 extending between the pawl and the mounting blank. The rewind ratchet wheel 39 and a drive sprocket 43 are axially mounted upon a sleeve 45 which is freely rotatable about the tie rod 35.

The rewind spool 15 carries a driven sprocket 47 which is coupled to the drive sprocket 43 through a link chain 49. A spring biased brake arm 51 is positioned proximate the periphery of the driver shaft 15a for the rewind spool 15 and has a leading edge which impinges thereagainst. A restoring spring 53 is secured between the lower end of the drive arm 19 and the adjacent guide plate 14. In the driven position, shown in FIG. 2, this spring is under considerable tension.

The following operation of this web take-up mechanism is with reference to both FIGS. 1 and 2. As previously stated, the curved arm 1241 is rotated counterclockwise during each power stroke and simultaneously shifts forwardly both the platen feed pawl 1238 and the link 17. The motion of the link 17 imparts a clockwise movement to the drive arm 19 about its pivot 21 which displaces the portion 25 of that arm rearwardly and ap-

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plies a distending force to the spring 27. The spring 27 has considerable resilience and under certain operating conditions to be detailed hereinafter, in lieu of distending, pulls the stud 29 rearwardly in an arcuate path about the tie rod 35.

The arcuate translation of the stud 29 drives the pawl mounting blank 33 and the biased pawl 37 clockwise and advances the ratchet wheel 39 in that direction. The rotational energy imparted to the ratchet wheel is directly coupled to the drive sprocket 43 and thereupon is transferred via the chain 49 to the driven sprocket 47. In this manner the rewind spool 15 is incrementally advanced to take-up or rewind that portion of the web that is being fed past the platen. Upon completion of the power stroke, the spring 53 restores the platen feeding and take-up elements to their normal position, as shown in FIG. 1. During restoration and prior to the next subsequent web feeding and take-up operation, the brake arm 51 restricts counterclockwise unwinding of the spool 15 and thereby the formation of slack from the take-up end of the web.

The operational description assumes that the spring 27 does not distend and therefore merely transmits motion to the stud 29 as if the stud were fused to the edge 23 of the drive arm. Under proper working conditions, however, the following factors alter the above overly simplified mode of operation and enable the spring 27 to be part of a broken or disconnecting linkage which elicits a mechanical coaction that removes any pre-existing web slack, rewinds the web in unison with the advancing of the web from the platen, and maintains adequate web tension during its feeding to prevent the formation of web slack.

As shown in FIG. 1, and from the description of the relative positions and operation of the platen pawl 1238 and its associated ratchet wheel 1230 as well as the feed pawl 37 and its associated rewind ratchet wheel 39, it should be apparent that the curved arm 1241 need be pivoted only a small amount to impel the feed pawl 37 into the rewind ratchet wheel 39 and thereby drive the rewind spool 15. However, a much greater displacement of the curved arm is required before the pawl 1238 is induced to actuate the ratchet wheel 1230 and advance the web past the platen 1057. For this reason, the sprocket 43, via the chain 49 and sprocket 47, imparts an advancing torque or pre-loading bias to the rewind spool 15 prior to the feeding of the web past the platen. This advancing or augmenting torque is sufficient to rotate the spool 15 and take up any slack that might have formed subsequent to the prior web feeding sequence. Although the web take-up mechanism is designed to prevent the formation of slack due to web feeding, external conditions between power strokes could generate some slack intermediate the platen and the rewind spool. It is this slack which is removed by the pre-loading of the web take-up mechanism. Not only is the removal of any pre-existing slack completed prior to the initial advance of the web via the pawl 1238, but necessarily, the pre-loading must be sufficient to take-up more slack than normally might be expected. Accordingly, the take-up linkage coacts such that the drive arm 19 attempts to drive the pawl 37 and the ratchet wheel 39 through an arc which, via the rewind sprocket 47, could place sufficient strain upon the web to cause it to rupture. To obviate the latter condition without reducing the efficiency of the mechanism, the coil spring 27 provides the disconnecting linkage action once the tension on the web approaches an unsafe limit. This web tension creates a reverse torque which is applied from the rewind spool 15 to the sprocket 47, through the chain 49, and thereupon to the sprocket 43 and the ratchet wheel 39, to thereby hold immobile the feed pawl 37. The immobility of the feed pawl fixes the position of the mounting blank 33, the stud 29, and therefore the forward end of the coil spring 27. With the forward end of that spring fixedly

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positioned and its opposite end being carried rearwardly by the rearward portion 25 of the pivoting drive arm 19, the coil spring 27 distends, as shown in FIG. 2. In this manner, the drive arm 19 is temporarily decoupled from the stud 29 and the remainder of the linkage leading to the rewind spool 15. Hence, the rewind spool is not over driven, the web is not ruptured, yet there remains sufficient tension on the web to prevent the recurrence of slack. It is to be recalled that to this point in time the pawl 1238 has not yet meshed with the ratchet wheel 1230.

The next step in the operation is for the platen 1057 to be incrementally advanced by its pawl and ratchet wheel and thereby for the web to be fed toward the rewind spool 15. As soon as the web begins to be fed, there is a reduction of the reverse torque upon the spool 15 and the linkage leading back to the feed pawl 37. The reduction of the reverse torque returns mobility to the feed pawl, the mounting blank 33, and the stud 29. The latter is then pulled rearwardly by the distended spring 27 and by the operational train previously described, causes the rewind spool to be driven until the reverse torque on the web becomes sufficient to again immobilize the feed pawl. Thus, the coil spring 27 remains partially distended during the entire time the web is being fed, prevents the formation of web slack, and at the same time protects the web from rupture. Upon completion of the power stroke the elements are restored to their initial positions by the spring 53.

Although not necessarily obvious from the figures, the pawls, ratchet wheels, sprockets, and shafts of the take-up and the platen feed mechanisms are designed such that the distance the web is advanced during each power stroke is always less than the peripheral rotational distance of the rewind spool 15. Accordingly, as the diameter of the rolled up web increases about the rewind spool, the coil spring 27 is forced into greater distention during both the pre-loading and the feeding sequences. This cooperation of elements further insures the obviation of web slack between the platen and the rewind spool.

Though the detailed description of this take-up mechanism has been set in the environment of a particular accounting machine, it will be understood that this environment is not to be considered a limitation and also that variations may be made in the take-up mechanism without departing from the spirit and scope of the invention.

I claim:

1. Drive means for controlling the amount of slack in the portion of a web lying between a web feeding station and a web rewind station comprising:
  - power means coupled to the web feeding and rewind stations and actuating the rewind station in unison with the feeding of the web from the feeding station,
  - rewind station pre-starting means coupling the power means to the rewind station prior to the feeding of the web from the feeding station,
  - differential feed means coupling the power means to the rewind station and urging that station to rewind more of the web than is being fed, and
  - disconnecting linkage means intercoupling the power means, the pre-starting means, the differential feed means and the rewind station and interrupting the power transmission from the power means to the rewind station whenever the slack is reduced beyond a safe limit.
2. A drive means according to claim 1 wherein:
  - said rewind station includes an incrementally driveable rewind spool, and
  - said pre-starting means includes a closely coupled pawl and ratchet wheel rotatably linked to the rewind spool.
3. A drive means according to claim 2 wherein:
  - said disconnecting linkage means includes an elongated

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tension member having one end connected to the power means and the other end connected to the pawl.

4. A web winding mechanism comprising:

a platen coupled for rotation to an incrementally actuable ratchet wheel and pawl, peripheral contact of the web about the platen enabling the incremental advance of the web during rotation of the platen, intermittent power means having a finite power stroke coupled to the pawl,

pawl restraining means delaying the engagement of the pawl with its associated ratchet wheel, and thereby the advancing of the web past the platen, until an intermediate point in the power stroke,

a web receiving spool,

web winding power transmission linkage connected to the power means,

said power transmission linkage including a pivotable drive arm, a wind pawl coupled to said pivotable drive arm, and a ratchet member normally delivering winding torque from the onset of the power stroke through the ratchet member to the web via the receiving spool,

said transmission linkage receiving reverse torque from the web via the receiving spool whenever the winding torque places an excessive amount of strain upon the web, and resilient disconnecting linkage means intermediate the drive arm and the wind pawl actuated by the reverse torque and thereupon decoupling the drive arm from the wind pawl.

5. A web winding mechanism according to claim 4 further comprising:

torque augmenting means interconnecting the wind pawl to the receiving spool throughout the power stroke and coacting with the disconnecting linkage means.

6. In a system which requires the incremental feeding of a web from a passive source, around a platen in frictional engagement therewith, and then upon an intermittently driven web receiver, the portion of the web lying between the platen and the web receiver being taken up by the receiver until a predetermined tautness is obtained, a web take-up mechanism comprising:

an arcuately advanceable drive arm, an incrementally rotatable element positively coupled to the web receiver, and

an elongated, resilient member connected between the drive arm and the rotatable member and coupling the motion of the drive arm to the web receiver through the rotation of the rotatable member for actuating the web receiver to take up the web until the predetermined tautness is obtained,

the web receiver being coupled back to the resilient member whenever the web becomes too taut, forcing a distention of the resilient member and thereby decoupling the motion of the drive arm from the web receiver.

7. In a system according to claim 6:

platen advancing means, and power stroke means common to the platen advancing means and the drive arm, the platen advancing means including delay means in-

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termediate the power stroke means and the platen for delaying the application of the power stroke to the platen until after the web receiver takes up the web and forces the distention of the resilient member.

8. In a system according to claim 7:

drive motion augmenting linkage coupling the rotatable element to the web receiver and over driving the web receiver with respect to the feeding of the web by the platen advancing means and forcing the distention of the resilient member during the application of the power stroke to the platen.

9. Means for controlling the amount of slack in a web passing through an accounting machine comprising:

a freely rotatable web supply spool;

an intermittently driven rewind spool;

an incrementally advanceable platen intermediate the path of the web from the supply spool to the rewind spool, the advancing of the platen drawing the web from the supply spool and tending to create slack in the web proximate to the rewind spool;

intermittent drive means common to the platen and the rewind spool actuating them in unison and obviating the formation of web slack proximate to the rewind spool;

rewind spool pre-loading means coupled between the drive means and the rewind spool, applying driving torque thereto prior to the incremental advancing of the platen, and placing the web under tension;

driving torque augmenting means including differential feed means coupling the drive means to the rewind spool and placing the web under increased tension; and

web tension responsive drive coupling and decoupling means connected between the drive means and the rewind spool; the web tension responsive means including an elongated, pretensioned, distendable member, the distention of which is controlled by the tension of the web proximate the rewind spool, excessive tension transmitted through the rewind spool forcing the distention of the member and the decoupling of the rewind spool from the drive means.

10. Slack control means according to claim 9 wherein the intermittent drive means and the pre-loading means include:

first and second pairs of pawls and ratchet wheels, reciprocating linkage simultaneously applying drive power to both said pawls, and

pawl detaining means inhibiting the first pawl from coacting with its ratchet wheel until the second pawl has transmitted a portion of the drive power to its associated ratchet wheel.

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