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Brearley

[11] **3,811,547**

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[54] **CYCLICALLY ROTATABLE ECCENTRIC PIVOT FOR RIBBON REVERSE LEVER**

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[52] **U.S. Cl.** **197/165**

[51] **Int. Cl.** **B41j 33/44**

[58] **Field of Search** 197/151, 157, 160, 161, 197/162, 163, 164, 165; 101/336; 242/67.4

[56] **References Cited**

UNITED STATES PATENTS

1,275,755	8/1918	Roebuck	197/157
1,938,728	12/1933	Tompkins	197/165
2,902,136	9/1959	Whippo	197/165
3,171,530	3/1965	O'Daniel et al.	197/151
3,346,090	10/1967	Goff et al.	197/151 X

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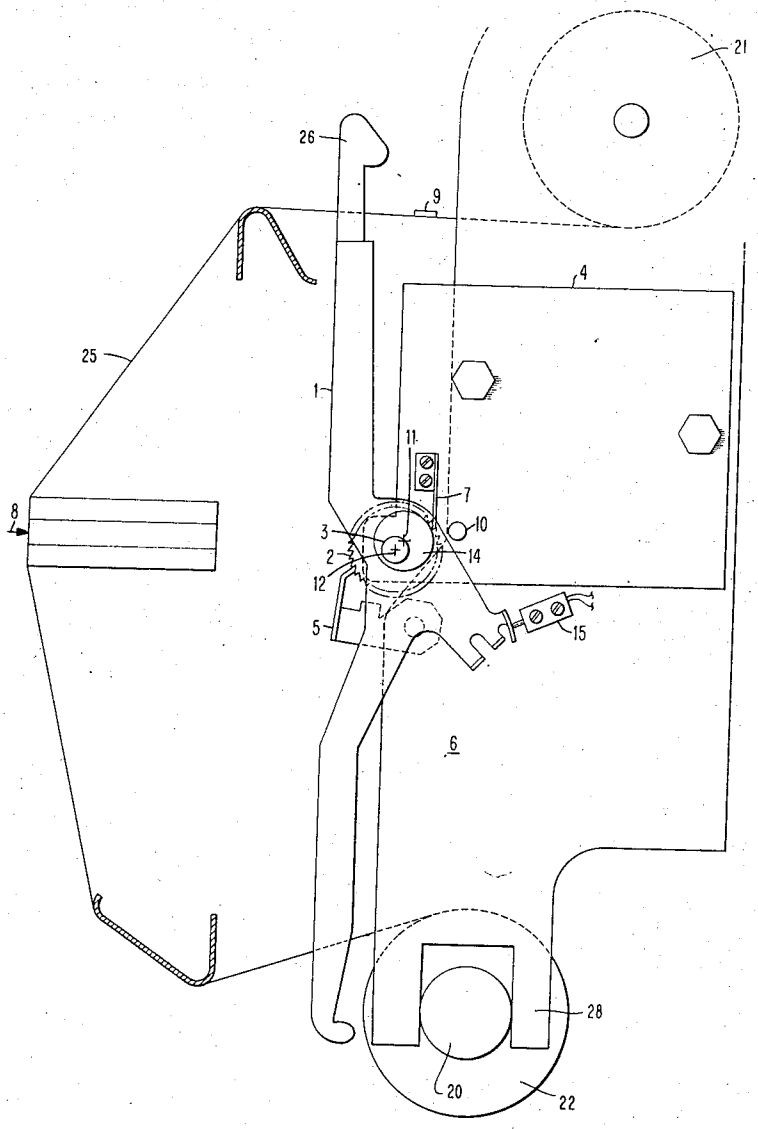
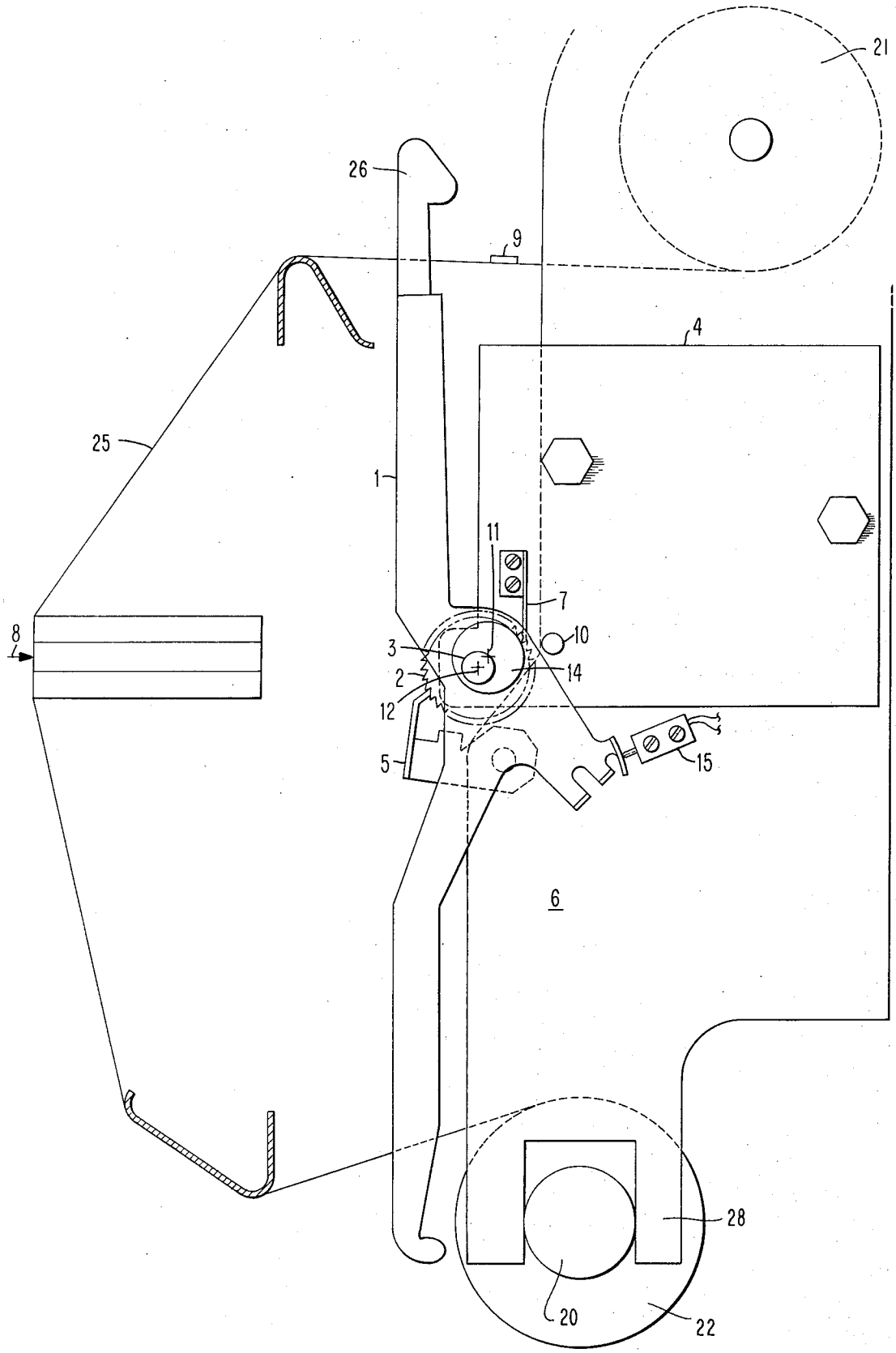
[57] **ABSTRACT**

An eccentric mounting for a ribbon reverse lever which provides a different portion of the ribbon at the print position each time the ribbon reverses its winding direction.

2 Claims, 9 Drawing Figures

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CYCLICALLY ROTATABLE ECCENTRIC PIVOT FOR RIBBON REVERSE LEVER

BACKGROUND OF THE INVENTION

This invention is an improvement to the ribbon feed device which is disclosed by Moneagle, et al., in U.S. Pat. No. 3,759,456, filed June 23, 1971 as Ser. No. 155,925 assigned to the instant assignee. The disclosure in the Moneagle, et al. patent is incorporated by reference into this application.

Poor ribbon durability is a problem encountered in most impact printing devices. The ribbon, which is a length of ink impregnated fabric, is passed back and forth between the type and the paper exposing successive portions to the impacting type face. Before the end of the ribbon is unwound from its spool, the direction of winding is reversed. This reversal of direction is usually initiated by rigid tabs attached to the edge of the ribbon fabric near each end. As the ribbon is withdrawn from its supply spool and wound onto a take-up spool, an end tab displaces a sensing lever, as the end of the fabric is reached. The lever displacement causes the spool driving means to change its direction of motion and the ribbon is rewound on the empty spool. A similar action occurs when the other end of the fabric is reached. A high rate of ribbon degradation occurs at the point on the fabric where movement in one direction stops, and movement in the opposite direction begins. During the dwell time between forward and reverse ribbon motion, a narrow band at the end of the ribbon undergoes a repetitive impacting by the type face. The repetitive impacting damages the fibers of the ribbon fabric so that they separate in the narrow band and the ribbon becomes unusable.

Goff, Jr., et al., U.S. Pat. No. 3,346,090, in FIGS. 3-6 shows a ribbon feed mechanism wherein each successive printing operation contacts a different vertical position on the ribbon. Whippo, U.S. Pat. No. 2,902,136, shows another ribbon mechanism wherein the reversing of the ribbon takes place during the idle time between print strokes. Both of these prior art devices accomplish an object similar to this invention, but do so in a completely different manner and with completely different hardware.

A typical example of prior art for which this invention is an improvement, is shown in Tompkins, U.S. Pat. No. 1,938,728. In the reversable ribbon feeding mechanism disclosed therein, a control lever is rocked when the ribbon nears the end of a cycle, activating a control means to change the direction of the ribbon spools. In that device, the printing done in the interval between the actuation of the control lever and the commencement of reverse motion of the ribbon, takes place in one spot on the ribbon.

OBJECTS OF THE INVENTION

An object of the invention is to provide an improved reversing mechanism operating to eliminate excess ribbon wear as the ribbon feed direction is reversed.

Another object of the invention is to provide a reversing ribbon mechanism in which a different portion of the ribbon is presented at the print position each time the ribbon reverses.

These and other objects of the invention will become apparent to those skilled in the art from the more detailed description which follows.

SUMMARY OF THE INVENTION

The reversing point on the ribbon is automatically changed during the operation of the ribbon feed mechanism by means of rotating an eccentric hub on which the ribbon reversing lever is mounted. As the eccentric hub is driven, the relative position of the ribbon reversing lever and the ribbon spool is changed so that when the ribbon end reversing tab contacts the lever, the point which the ribbon motion stops in front of the printer hammers will be different from the corresponding point during the previous reversing cycle. Changing the ribbon motion stopping point lengthens the life of the ribbon.

DESCRIPTION OF THE DRAWING

The FIGURE shows a detailed drawing of the extended ribbon life device and a simplified drawing of the ribbon and feed mechanism.

DESCRIPTION OF THE INVENTION

Referring now to The FIGURE, the preferred embodiment of the ribbon feed and correction device embodying this invention will be described in more detail. The invention disclosed herein is an improvement of the ribbon feed and correction device disclosed by Moneagle, et al., in U.S. Pat. No. 3,759,456. As such, many of the elements shown in the FIGURE herein are the same as those disclosed in the Moneagle et al. patent. The overall structure and operation of the Moneagle, et al. ribbon feed and correction device is incorporated herein by reference. The following table of comparison will be of assistance in relating many of the elements shown in the FIGURE herein, to those disclosed in the Moneagle, et al. patent.

TABLE OF COMPARISON

Instant Disclosure Name	Instant Disclosure Number	Moneagle, et al. Patent number
Ribbon reverse lever	1	46
Stud	3	52
Fixed mounting plate	4	120
Support plate	6	8
Pivot point for support plate	10	10
Ribbon spool	21	2
Ribbon spool	22	4
Ribbon	25	16
Forked portion of support plate	28	34

The ribbon skew correction mechanism **20** shown in the FIGURE herein is comprised of the following plurality of elements shown in FIG. 3 of the Moneagle, et al. patent: the motor **110**, the shaft **36**, the web axial position detection means composed of the elements **20, 28, 60, 66,** and **72,** the intermittent clutch means composed of the elements **54, 86, 90, 94,** and **104,** and the rotary to reciprocating motion conversion means **32.**

The attachment of the ribbon reverse lever **1** (as shown and described in the Moneagle, et al. patent) is modified by placing a ratchet **2** over the stud **3** on the fixed mounting plate **4.** Mounted on ratchet **2** is lever hub **14** which is eccentrically offset relative to the stud **30** and the ratchet pivot axis **12.** A feed pawl **5** attached to the moveable support plate **6** engages the rachet teeth and uses the oscillating motion of the ribbon skew

correction mechanism to advance the ratchet one tooth for every two correction cycles (forward and back). The ribbon skew correction mechanism **20** includes the drive means for the ribbon spool **22.** Support plate **6** is pivoted at pivot point **10.** The ratchet **2** is held in the forward position by detent **7.** The reverse lever **1** is positioned to pivot freely about the lever pivot axis **11** on the ratchet hub **14.** When reversing tab **9** contacts reversing lever **1,** the motor reversing switch **15** is actuated, causing the ribbon winding direction to change. As the ratchet **2** is advanced by successive oscillations of support plate **6** pivoting at pivot point **10** the lever pivot axis **11** follows the locus of the eccentrically rotating lever hub **14.** This change in the location of the reverse lever pivot axis **11** alters the distance from printing position **8** to the operating end **26** of the lever **1** at the point of contact with the reversing tab **9** in the ribbon **25.** By providing a greater number of teeth in the ratchet **2** than the maximum number of correction cycles expected to occur in the length of the ribbon **25,** it is reasonably certain that the turnaround of the ribbon **25** will not happen at exactly the same spot on the ribbon **25** in successive reversals at either end. The ribbon must be fed twice its length before reversal will again be initiated at the same end. The number of correction cycles generated by the ribbon skew correction mechanism **20,** during this time is a function of the many variables which effect proper tracking of the ribbon **25.** Thus, the position of the lever **1** at reversal time is essentially random which spreads the impact of repetitive printing over a wider area of the ribbon **25** with a resulting increase in ribbon life.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that changes in form and details may be made without departing from the spirit and scope of this invention. For example, eccentric linkages can be substituted for the ratchet **2** and pawl **5** mechanism in order to obtain a similar mechanical movement of the ribbon reverse lever **1.** Furthermore, while the preferred embodiment has a ratchet **2** with a greater number of teeth than maximum correction cycles, this is not absolutely necessary. Since the number of correction cycles is, itself, random, it is improbable that the same spot on the ribbon would be repeatedly impacted by the type face, even if the number of teeth were the same or less than the maximum number of correction cycles. However, a greater number of teeth over maximum correction cycles assures a different reversal point for the ribbon **25** even if the number of correction cycles is the same twice in a row. Finally, the invention can be employed independently of the ribbon skew correction mechanism **20.** In such usage, the ratchet **2** may be driven through a reduction gear, by the spool drive motor. Alternately, the ratchet **2** can be driven by an independent motor having a rate of rotation which is not an integral submultiple of the rate of rotation of the spool drive motor.

I claim:

1. In combination with a ribbon feed device for an impact printer of the type wherein a printing ribbon is repeatedly wound and unwound between two spools mounted on said ribbon feed device with said ribbon passing over an impact printing position, and where the ribbon bears a ribbon reversing tab at each end which engages a winding spool reversing lever pivotally mounted on said ribbon feed device, wherein the improvement comprises:

an eccentric rotatably mounted on said ribbon feed device and serving as the pivot for said winding spool reversing lever,

means for rotatably driving said eccentric so as to displace said pivot of said winding spool reversing lever with respect to said ribbon feed device, thereby changing the position with respect to said ribbon feed device, at which said winding spool reversing lever engages said ribbon reversing tab and induces reversal of the spool winding motion,

whereby the position along said ribbon is changed where sustained impact printing occurs when the reversal of ribbon motion takes place, thereby reducing ribbon wear.

2. In a ribbon feed and correction device of the type wherein two winding spools alternately wind a printing ribbon mounted therebetween, said ribbon having a ribbon reversing tab at a longitudinal end thereof to operatively engage an operating end of a reversing lever to reverse the direction of rotation of said winding spools when said ribbon is unwound to said longitudinal end, said winding spools rotatably mounted on a ribbon spool rupport plate which is pivotally mounted to a fixed mounting plate, said ribbon spool support plate undergoing a pivotal displacement with respect to said fixed mounting plate when said versing lever reverses the direction of rotation of said winding spools, said ribbon passing over a printing position fixed with respect to said fixed mounting plate, the improvement made to extend the useful life of said ribbon, by reducing the duration of printing impact during said reversal of winding spool rotation, comprising:

a ratchet wheel rotatably mounted on said fixed mounting plate, to rotate about a first axis,

a detent means mounted on said fixed mounting plate, for operatively engaging said ratchet wheel and preventing rotation thereof opposite to a preferred direction;

a pawl means mounted on said ribbon spool support plate, for operatively engaging said ratchet wheel and rotatably advancing said ratchet wheel in said preferred direction when said ribbon spool support plate undergoes said pivotal displacement with respect to said fixed mounting plate;

a cylindrical hub rigidly mounted on said ratchet wheel with a second cylindrical axis parallel to but displaced from said first axis, to undergo eccentric motion when said ratchet wheel rotates about said first axis;

said reversing lever rotatably mounted on said cylindrical hub so that while maintaining substantially the same general orientation with respect to said fixed mounting plate, said reversing lever undergoes a circular oscillatory motion with respect to said fixed mounting plate, induced by the eccentric motion of said cylindrical hub as said ratchet wheel rotates;

whereby the distance between said printing position and said operating end of said reversing lever which operatively engages said ribbon reversing tab, changes as said winding spools change their winding direction, thereby changing the portion of the ribbon undergoing printing impact at said printing position, when the direction of ribbon winding is reversed.

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