United States Patent [19]

Peters

[11] **3,921,879**

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[54] **WEB ADVANCE MECHANISM**

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[52] **U.S. Cl.** **226/148;** 226/156; 226/187

[51] **Int. Cl.²** **B65H 17/22**

[58] **Field of Search** 226/187, 148, 156, 157

[56] **References Cited**

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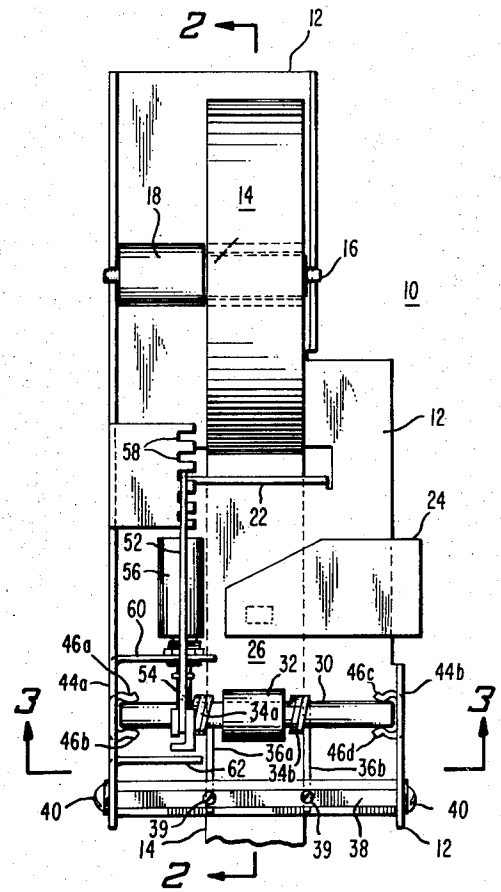
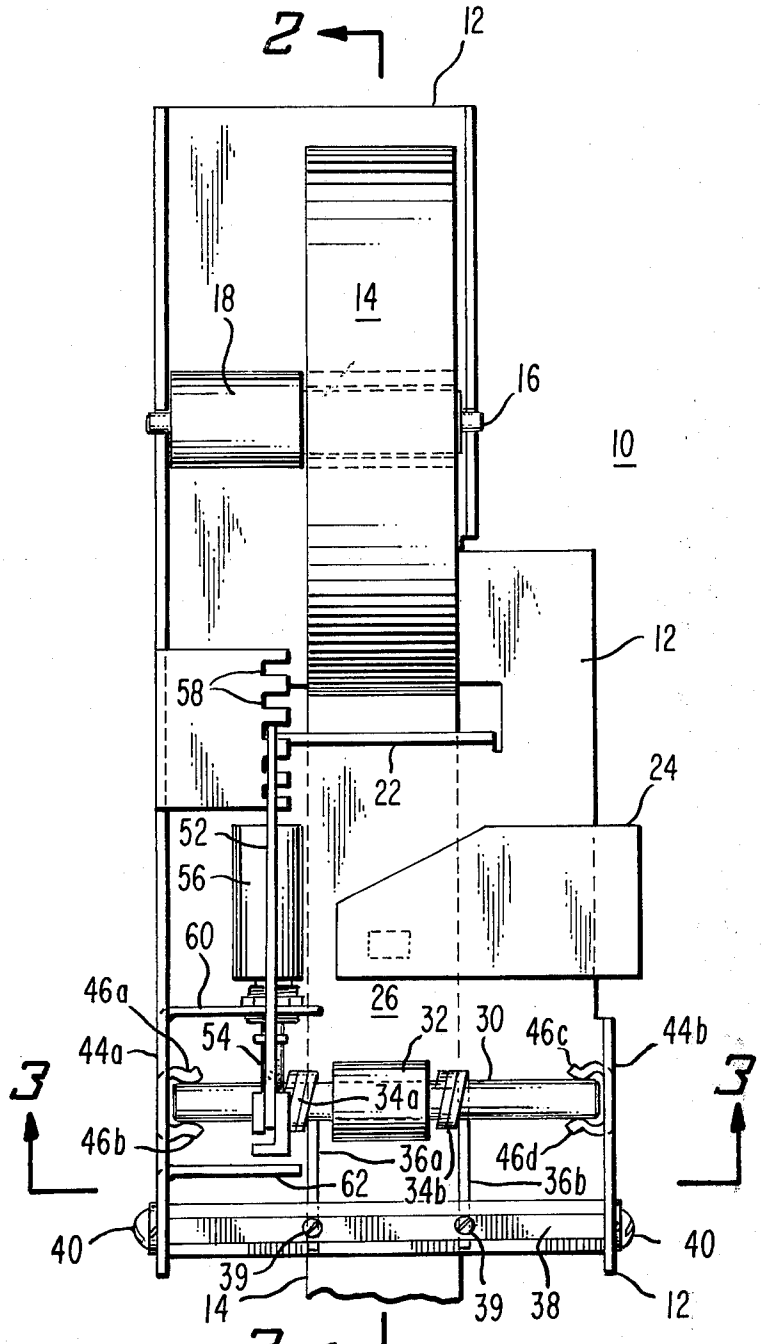
[57] **ABSTRACT**

Web advancing mechanism suitable for use in, for example, a low cost strip printer. A pair of torsion springs surround a cylindrical capstan. A free end of each spring is attached to a member which applies torque to the springs to urge the capstan into contact with the web. An advance mechanism causes the capstan to be incrementally rotated in one direction to advance the web, but also, while resetting, urges the capstan in the opposite direction. The torsion springs decrease in effective diameter when the capstan is urged in the opposite direction, the friction created thereby providing braking action to prevent movement of the cylinder in the opposite direction.

6 Claims, 3 Drawing Figures




2
12
18
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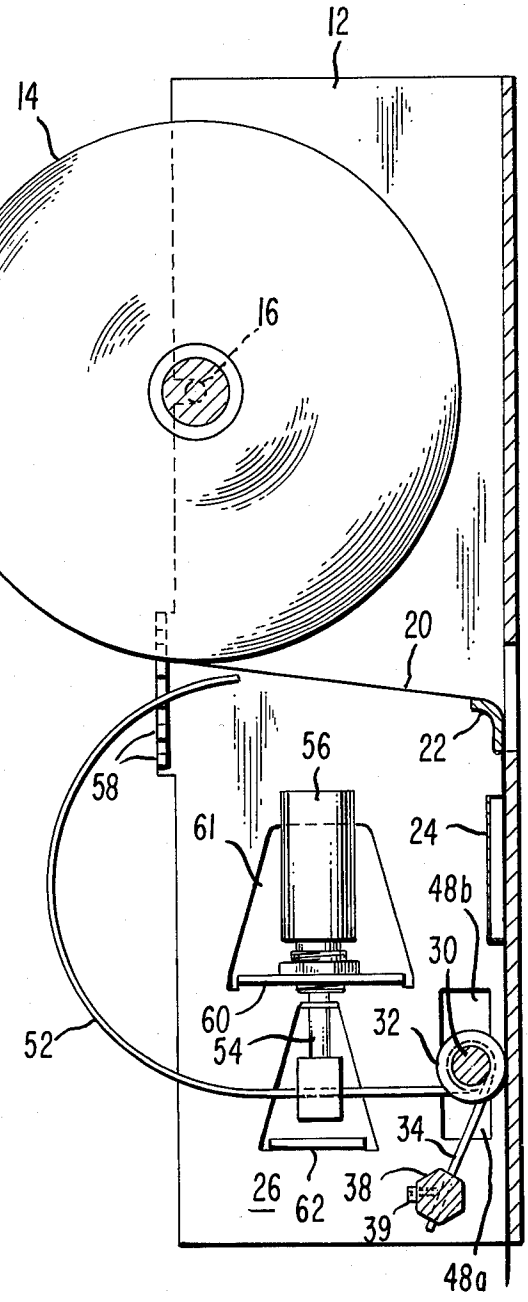
16
10
12
58
22
24
52
56
60
26
46a
32
30
46c
44b
54
44a
3
34a
3
46b
36a
46d
62
34b
36b
40
40
39
39
38
14
12
2

Fig. 1.


12
14
16
20
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56
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24
48b
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60
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32
52
34
26
62
38
39
48a

Fig. 2.

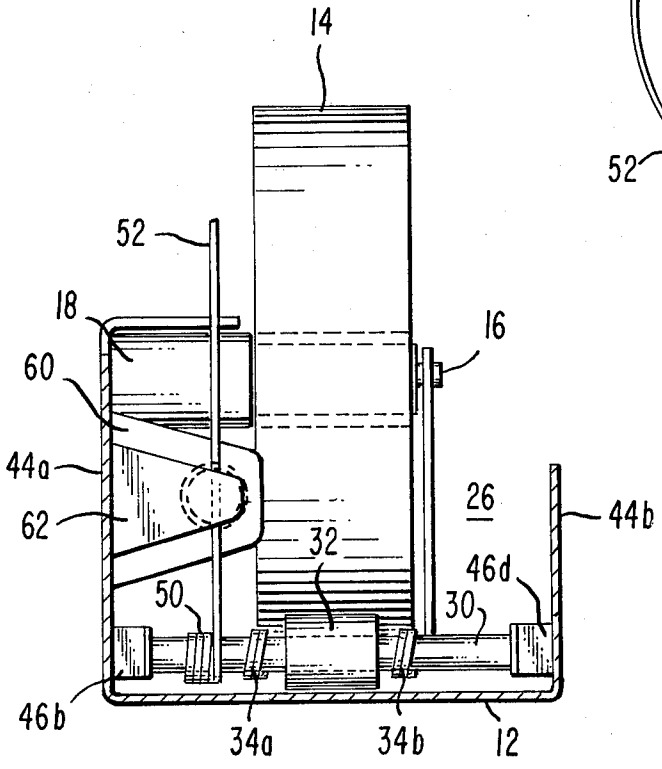
14
52
18
16
60
44a
62
26
44b
32
46d
50
30
46b
34a
34b
12

Fig. 3.

WEB ADVANCE MECHANISM

SUMMARY OF THE INVENTION

A mechanism for advancing a web includes a cylindrical means having a friction surface and a means for rotating the cylindrical means about its axis. The cylindrical means is passed through spring means wound in cylindrical fashion. A tail portion of the spring means extends generally normal to the cylindrical means axis, and is attached to a means applying torque for urging the friction surface of the cylindrical means into contact with the web, whereby when the cylindrical means is rotated by the rotational means, the web is advanced.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a printing apparatus including a preferred embodiment of the present invention;

FIG. 2 is a side elevation cross-section of the printer of FIG. 1, substantially along lines 2—2; and

FIG. 3 is a front elevation cross-section of the printer of FIG. 1, substantially along lines 3—3.

DETAILED DESCRIPTION

Referring to FIG. 1, a low cost strip printer **10** includes a generally U-shaped frame **12**, to which the various members of the printer are attached. A roll of web material, such as thermal print paper **14**, is rotationally supported by a shaft **16**, which is coupled to frame **12** in a manner to permit removal therefrom. A spacer portion **18** of shaft **16** laterally positions the roll **14**.

Referring for a moment to FIG. 2, strip of paper **20** extending from roll **14** passes under guide plate **22**, under a thermal print head assembly **24** and under capstan assembly **26** then out of the printer. Print head assembly **24** is a comercially available device that contains electrically activated bar or dot segments in contact with paper **20**. When electric signals from a signal source (not shown) such as a computer are applied selectively to the bars or dots, they heat up causing the paper to discolor, thereby forming a desired pattern such as letters, numbers and symbols.

Capstan assembly **26**, as seen in FIG. 1, comprises a cylindrical means or shaft **30** on a portion of which is a friction surface such as a rubber roller **32**. Roller **32** is positioned to frictionally engage paper **20**. Spring means comprising two identical torsion springs **34**a and **34**b, are positioned on shaft **30** on either side of roller **32**. The inside of each spring is substantially the same as the diameter of shaft **30**. The springs are wound about the shaft in a counterclockwise manner (as illustrated in FIG. 2). Therefore, when shaft **30** is rotating clockwise (as illustrated in FIG. 2), by means to be described to advance paper **20**, springs **34** tend to unwind and therefore increase in diameter allowing shaft **30** to rotate freely. When an attempt is made to rotate shaft **30** counterclockwise (as illustrated in FIG. 2), the spring tends to wind up, therefore decreasing in effective diameter. This decrease in diameter causes a very large friction force to be applied to shaft **30**, essentially eliminating counterclockwise motion of the shaft and therefore backwards motion of paper **20**.

Each spring **34** has a tang **36** (lengended **36***a* and **36***b* respectively), which extends substantially at right angles to shaft **30**. The tangs are attached to a member **38**, which is rotationally mounted at each end to frame **12**. A set screw **39** secures each spring to member **38**.

By rotating member **38**, torque is applied to shaft **30** to bias roller **32** against paper **20**. When the proper adjustment has been made, fastening means, such as screws **40**, are tightened to prevent rotation of the torque applying member **38**. Thus, springs **34** act as an anti-backlash mechanism and as a bias means for biasing roller **32** against paper **20**. The springs serve yet a third purpose, namely as journal bearings for shaft **30**.

Side motion of the shaft is prevented by side walls **44***a* and **44***b* of frame **12** if desired tabs **46***a*, *b*, *c*, *d*, may be formed from frame **12** to further guide shaft **30**. These tabs create openings **48***a* and **48***b* in side wall **44***a* (see FIG. 2). Similar openings (not shown) are created in side wall **44***b*. Tabs **46** further stabilize shaft **30** in the horizontal direction (as illustrated in FIG. 2). They allow it to move vertically only. Tangs **36** of springs **34** may require help of tabs **46** to stabilize shaft **30**. Alternately, the tangs **36** may be sufficiently strong so that tabs will not be required.

Another torsion spring **50**, essentially identical to springs **34**, also surrounds shaft **30**. (See FIG. 3.) Spring **50** has a longer tang **52** than do the other springs. (See FIG. 2.) The tang **52** extends through plunger **54** of a solenoid **56** and into one of a plurality of slots **58** in frame **12**. Solenoid **56** is attached to a tab **60**, which is bent inward from side plate **54***a*, creating aperture **61**. A tab **62** acts as a stop for plunger **54**.

In operation, signals are applied to print head **24** to apply a desired pattern to paper **20**. Then solenoid **56** is energized pulling plunger **54** upward (FIG. 2). Because spring **50** tends to tighten on shaft **30**, the shaft is rotated clockwise (FIG. 2) journaled in springs **34**. Because roller **32** has been biased by member **38** and springs **34** downward against paper **20**, the paper is advanced. As the shaft is rotated clockwise, springs **34** tend to unwind, allowing the shaft to turn. When power is released, tang **52** of spring **50** applies a force to plunger **54** to move it away from the solenoid into stop **62**. The amount of force applied to plunger **54** is a function of the slot **58** in which tang **52** is placed, an adjustment which may be made to adjust for proper operation. As plunger **54** is moved downward, it causes spring **50** to unwind, thereby releasing pressure on shaft **30**. However, except for the presence of springs **34**, it is likely that shaft **30** would be caused to rotate counterclockwise (FIG. 2). As explained previously, any tendency toward counterclockwise motion of shaft **30** is prevented by the presence of springs **34**, which tend to tighten.

What is claimed is:

1. Mechanism for advancing a web comprising, in combination:

a shaft having a friction surface;

means for rotating said shaft about its axis;

spring means wound in cylindrical fashion through which said shaft passes, said spring means having a tail portion extending substantially normal to the axis of said shaft; and

means for applying torque to said tail portion for urging said friction surface of said rotating shaft into contact with said web far advancing the same.

2. Mechanism for advancing a web comprising, in combination:

a rotatable shaft having a friction surface;

means for rotating said shaft in one axial direction and also capable of normally rotating said shaft in the opposite direction;

spring means wound in cylindrical fashion through which said shaft passes and which is in contact therewith over at least a major portion of a circumferential region of said shaft, said spring being wound such that as said shaft is rotated in said one direction, said spring means tends to unwind thereby increasing in effective diameter allowing said shaft to rotate freely and when said shaft is attempted to be rotated in said opposite direction said spring means tends to decrease in effective diameter creating sufficient friction with said shaft to prevent said rotation, said spring means including a tail portion extending from the wound portion of said spring in a direction substantially normal to the axis of said shaft; and

means for applying torque to said tail portion for urging said friction surface of said shaft into contact with said web whereby when said shaft is rotated in said one direction by said rotational means, said web is advanced.

3. The combination as set forth in claim **2,** wherein said rotational means comprises motion creating means and an additional spring means, also through which said shaft passes, substantially similar to said first named spring means, the tail portion of said additional spring means being coupled to said motion creating means, said motion creating means creating motion in a first direction causing said additional spring means to rotate around said shaft in such a direction to decrease in effective diameter causing said shaft to rotate in said one direction, said motion creating means being thereafter caused to create motion in a second direction which would normally cause said shaft to move in said opposite direction.

4. The combination as set forth in claim **3,** wherein said motion creating means is a solenoid which creates motion is said first direction, and wherein said tail portion of said additional spring means creates bias on said solenoid to cause movement in said second direction.

5. The combination as set forth in claim **2,** wherein said spring means includes bearing means for permitting rotational movement of said shaft while preventing lateral movement of the same.

6. The combination as set forth in claim **2,** wherein the central portion of said shaft contains said friction surface and wherein said spring means comprise two torsion springs, one on either side of said friction surface portion.

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