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Eckerd et al.

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[54] **RIBBON FEED MECHANISM FOR FEEDING TYPE RIBBON ON TYPE RIBBON SPOOLS**

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[52] **U.S. Cl.** **242/67.4**

[51] **Int. Cl.²** **B65H 17/02**

[58] **Field of Search** 242/67.4, 201; 197/160

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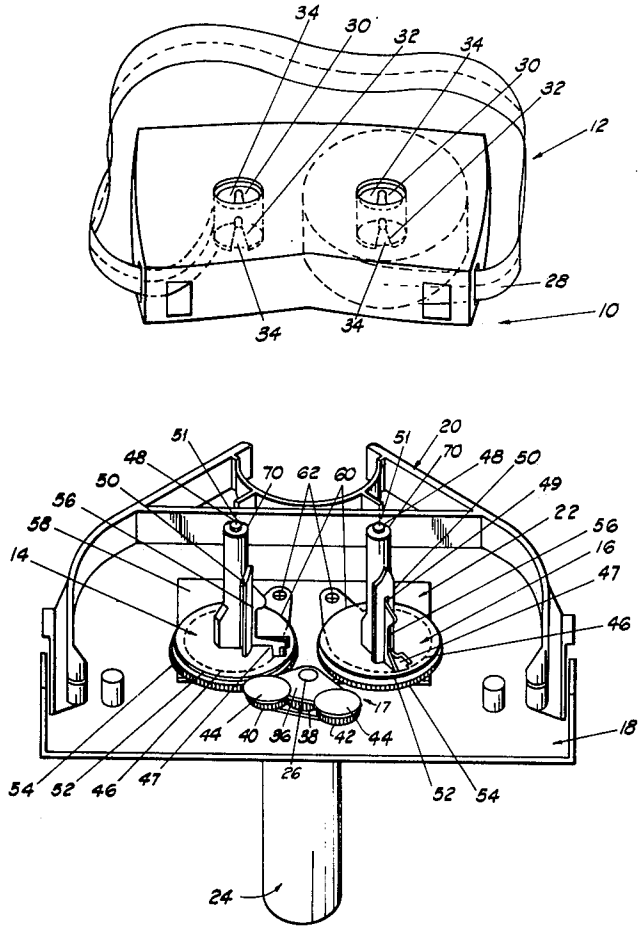
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[57] **ABSTRACT**

A printing apparatus having an electrically controlled carrier assembly for driving drive spools which engage type ribbon spools used for winding type ribbon from one type ribbon spool to another. The carrier assembly drives one of the drive spools in one direction winding ribbon on the ribbon spool. When the ribbon spool has been unwound from the opposite ribbon spool, the apparatus receives an electrical signal. The carrier assembly then disengages the drive spool, rotates and drives the other drive spool in an opposite direction. This operation is repeated continuously as the apparatus winds the ribbon from one ribbon spool to the other.

5 Claims, 2 Drawing Figures



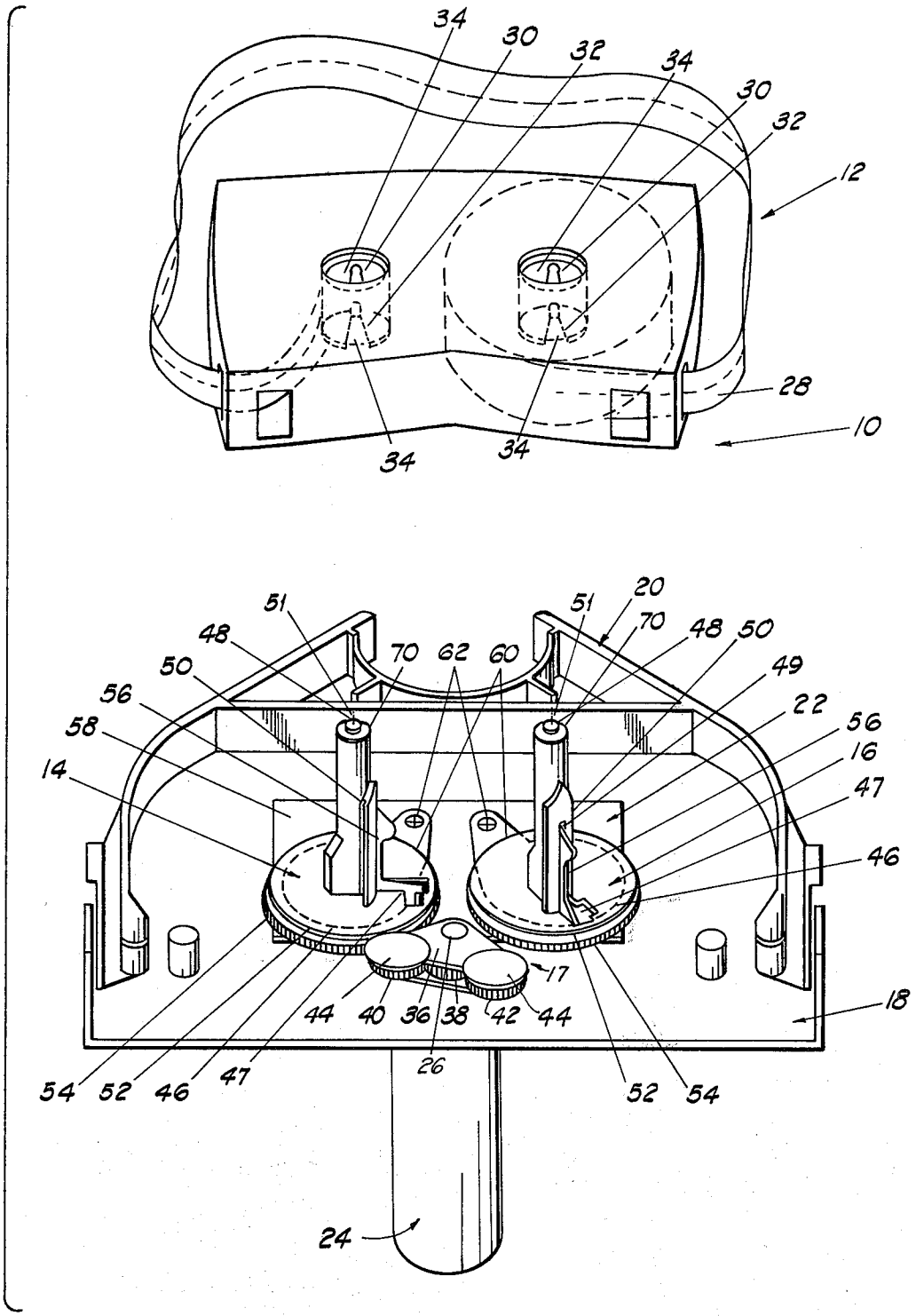

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FIG. 1

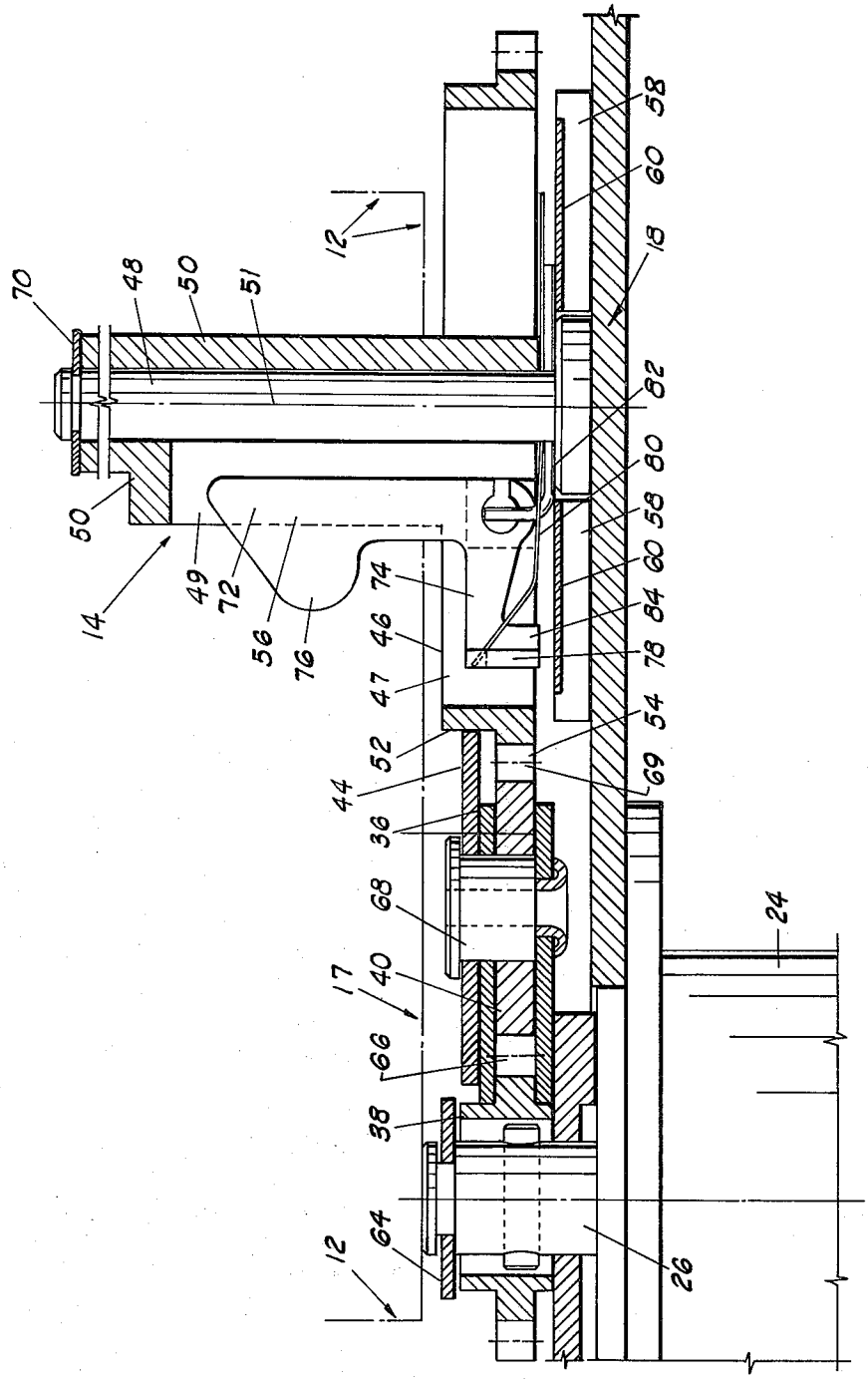

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FIG. 2

RIBBON FEED MECHANISM FOR FEEDING TYPE RIBBON ON TYPE RIBBON SPOOLS

BACKGROUND OF INVENTION

This invention relates generally to improvements in a printing apparatus and more particularly, but not by way of limitation, to a ribbon feed mechanism for electrically controlling a carrier assembly used in winding ribbon from one ribbon spool to another ribbon spool.

In a prior art printing apparatus, the ribbon feed mechanism uses an operation of advancing and reversing ribbon by using drive spools with ratchet teeth. An actuator arm is spring-biased against one drive spool and is moved back and forth by a solenoid. A stop is spring-biased against the ratchet teeth of the ribbon spool so that the spool rotates only on the forward stroke of the actuator arm. When the end of the ribbon is reached, a wiper drops from the undriven ribbon spool. The wiper rotates into the path of the moving actuator arm and acts as a fulcrum for the actuator arm to pivot about on the return stroke. The actuator arm then pivots against the opposite drive spool and begins driving it. The ribbon then advances in the opposite direction pulling the wiper back into the ribbon spool.

SUMMARY OF INVENTION

The present invention has no cams, slides, followers, overcenter mechanisms, or ratchet assemblies which are characteristic of the presently used ribbon feed mechanisms. The elimination of these characteristics, mechanical components and the substitution of electrical controls result in a more reliable ribbon feed mechanism which can be used in high speed printing apparatus.

The improved printing apparatus includes a base plate, a type ribbon wound on type ribbon spools, a first drive spool and a second drive spool engaging the ribbon spools for winding the ribbon from one ribbon spool to the other ribbon spool, a carrier assembly for engaging and rotatably driving the first drive spool, disengaging the drive spool and engaging and rotatably driving the second drive spool, an electric motor having a motor shaft rotatably driving said carrier assembly, and a contact board in contact with the first drive spool and the second drive spool for electrically signaling the motor when the ribbon on the ribbon spool is unwound so that the direction of rotation of the motor shaft is reversed, thereby reversing the direction of rotation of the carrier assembly.

Advantages and objects of the invention will be evident from the following detailed description when read in conjunction with the accompanying drawings which illustrate an embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the improved printing apparatus.

FIG. 2 is a cross-section of a side view of the carrier assembly and drive spool.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 the printing apparatus is designated by a general reference character **10.** Apparatus **10** includes a type ribbon cartridge **12** which is seated on a first drive spool **14** and a second drive spool **16,** a carrier assembly **17** for driving the first drive spool **14** and the second drive spool **16,** a base plate **18,** a ribbon guide **20** pivotally attached to the base plate **18,** a switch assembly **22** attached to the base plate **18** and electrically connected to a motor **24.** The motor **24** has a motor shaft **26** attached to the carrier assembly **17.**

The type ribbon cartridge **12** includes a type ribbon **28** attached to type ribbon spools **30.** The spools **30** have centering notches **32** at the bottom portion thereof. The cartridge **12** also includes apertures **34** into which the first drive spool **14** and the second drive spool **16** are inserted. Centering notches **32** serve to properly align the type ribbon spools **30** on the first drive spool **14** and the second drive spool **16.**

The carrier assembly **17** includes a carrier housing **36** containing a pinion gear **38** which is attached to the motor shaft **26.** The pinion gear **38** drives a first planet gear **40** and a second planet gear **42.** Secured to the top of the planet gears are thrust washers **44.**

The first drive spool **14** and the second drive spool **16** include annular base **46** with a cylindrical housing **48** attached to a center portion thereof. The annular base **46** includes an aperture **47,** a notched shoulder **52** around the circumference of the base **46,** and gear teeth **54** adjacent to the shoulder **52.** The housing **48** is rotatably mounted on a post **51** which is secured to the base plate **18.** The housing **48** includes a slot **49** therein, and a centering ramp **50** which engages the centering notches **32** of the ribbon spools **30** when the ribbon cartridge **12** is attached thereto. A spring-biased wiper **56** positioned inside aperture **47** and slot **49** is pivotally secured to post **51.**

The switch assembly **22** includes a contact board **58** secured to the base plate **18** and positioned between the plate **18** and the drive spools. The board **58** includes pear shaped electrical contact pads **60** which are preferably gold plated copper conductors. The pads **60** are positioned underneath the apertures **47** and around the circumference of the drive spools so that when wiper **56** drops through the aperture **47** it will contact the pad **60.** At the neck of the pear shaped pads **60** are soldering posts **62** for connecting electrical circuitry used to signal the motor **24.** The electrical circuitry is not shown in this figure.

FIG. **2** is a more detailed drawing of a cross-section of the carrier assembly **17** engaging the first drive spool **14.** The bottom line of the ribbon cartridge **12** is shown in its proper position when seated on the drive spool, but the ribbon **28** and the ribbon spools **30** are not shown.

Motor shaft **26,** of the motor **24,** is shown secured to the pinion gear **38** which is held in place by a retaining ring **64.** The pinion gear **38** is shown meshing with the first planet gear **40** at a position **66.** The first planet gear **40** is held in the carrier housing **36** by planet pin **68** and engages the gear teeth **54** of the first drive spool **14** at a position **69.**

The drive spool **14** is shown secured to the post **51** by retaining ring **70.** The wiper **56** is positioned inside the slot **49** of the housing **48** and inside aperture **47** of the base **46.** The wiper **56** includes a vertical arm **72** and a horizontal arm **74.** The vertical arm has a finger **76** which extends outwardly from the slot **49.** The horizontal arm **74** includes an end portion **78** which is bent at right angles to the arm **74.** One end of a wiper spring **80** is positioned parallel to the arm **74,** rests on the end portion **78** and biases the arm **74** downward toward the contact pad **60.** The wiper **56** is pivotally attached to

the post 51 by a wiper pivot pin 82. A bottom portion 84 of the arm 74 is used to contact the pads 60. The contact pads 60 are shown as part of the top of the contact board 58.

Operation

In operation, the electrically controlled ribbon feed mechanism works as follows.

The ribbon cartridge 12 is seated on the first drive spool 14 and the second drive spool 16. The housings 48 are inserted into the ribbon spools 30 aided by the centering ramps 50 and the centering notches 32. As the cartridge 12 is inserted, the ribbon 28 being wrapped around the ribbon spools 30 comes into contact with the finger 76 of the wiper 56. The wiper 56 being pivotally mounted and positioned inside the aperture 47 and slot 49 is forced further back into the slot 49 as the ribbon 28 bares against the finger 76. When the cartridge 12 is seated on top of the drive spools and the ribbon 28 is properly positioned on the ribbon guide 20, the printing apparatus 10 is then ready to be used.

Using the illustration in FIG. 1, it can be seen that if the ribbon cartridge 12 is seated on the drive spools, the ribbon spool 30 attached to the first drive spool 14 has been unwound. The wiper 56 being spring-biased has dropped through aperture 47 and is in contact with the contact pad 60, sending an electrical signal to the electrical circuitry to tell the motor 24 to rotate the carrier assembly 17.

The motor shaft 26 rotates the carrier assembly 17 toward the first drive spool 14. The first planet gear 40 engages the first drive spool 14 and begins driving it. At this time, thrust washer 44 engages the notched shoulder 52 of the drive spool 14, maintaining the gear teeth alignment along the pitchline. As the spool 14 turns, the ribbon 28 begins to wind around the ribbon spool 30. The ribbon contacts the finger 76 and forces the wiper 56 back into the slot 49 thus pivoting the horizontal arm 74 upward and away from the contact pad 60 and into the aperture 47.

The drive spool 14 continues to wind the ribbon 28 on the ribbon spool 30 until the ribbon 28 is unwound from the opposite spool 30. The wiper 56 in the unwound spool 30, now drops through the aperture 47 of the second drive spool 16 and contact is made with the contact pad 60, transmitting the electric signal to the circuitry which controls motor 24. When the motor 24 receives a reversing signal, the motor shaft 26 disengages the carrier assembly 17 from the first drive spool 14 and rotates the carrier assembly 17 toward the second drive spool 16. The second planet gear 42 now engages the second drive spool 16 and begins driving it in the opposite direction. As the spool 16 turns, the ribbon begins to wind onto the ribbon spool 30 and the finger 76 of the wiper 56 is forced back into the slot 49. The drive spool 16 continues to wind the ribbon 28 on the ribbon spool 32 until the ribbon is unwound from the other spool 32. The operation then repeats itself.

Changes may be made in the construction and arrangement of parts or elements of the various embodiments as disclosed herein without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. In a printing apparatus having a base plate, a type ribbon wound on type ribbon spools, a first drive spool and a second drive spool engaging the ribbon spools for winding the ribbon from one ribbon spool to the other ribbon spool, the improvement comprising:

drive means for engaging and rotatably driving the first drive spool, disengaging the first drive spool, engaging and rotatably driving the second drive spool;

an electric motor having a motor shaft rotatably driving said drive means; and

an electrical contact board disposed between the base plate and the first and second drive spools, and electrically connected to said motor, said electrical contact board in contact with the first drive spool and the second drive spool for producing an electrical signal when the ribbon on the ribbon spool is unwound so that the direction of rotation of the motor shaft is reversed, thereby reversing the direction of rotation of said drive means.

2. The apparatus as defined in claim 1 wherein said drive means is a carrier assembly comprising:

a carrier housing;

a pinion gear attached to said housing and rotatably driven by said motor shaft;

a first planet gear attached to said housing and rotatably driven by said pinion gear; and

a second planet gear attached to said housing and rotatably driven by said pinion gear.

3. The apparatus as defined in claim 2 wherein rotation of the motor shaft in one direction pivots said first planet gear on said carrier assembly into driving engagement with said first drive spool, whereas rotation of the motor shaft in the other direction pivots said second planet gear on said carrier assembly into driving engagement with said second drive spool.

4. The apparatus as defined in claim 3 wherein said first planet gear and second planet gear include thrust washers secured thereto, said washers having a greater diameter than said first and second planet gears so that when said first and second planet gears mesh with said first and second drive spools, said thrust washers engage said drive spools aligning the meshing gear teeth along the proper pitchline.

5. In a printing apparatus having a base plate, a type ribbon wound on type ribbon spools, a first drive spool and a second drive spool engaging the ribbon spools for winding the ribbon from one ribbon spool to the other ribbon spool, the drive spools housing spring-biased wipers which are held in place by the ribbon as it is wrapped around the ribbon spools, the improvement comprising:

a carrier assembly for engaging and rotating the first drive spool, disengaging the first drive spool, engaging and rotating the second drive spool, the assembly comprising:

a carrier housing;

a pinion gear attached to said housing;

a first planet gear attached to said housing and rotatably driven by said pinion gear, said first planet gear engaging and rotatably driving the first drive spool;

a second planet gear attached to said housing and rotatably driven by said pinion gear, said second planet gear engaging and rotatably driving the second drive spool;

an electric motor having a motor shaft rotatably driving said pinion gear; and

an electrical contact board disposed between the base plate and the first and second drive spools, the wiper contacting said board when the ribbon on the ribbon spool is unwound to electrically signal said motor so that the direction of rotation of said motor shaft is reversed thereby reversing the direction of rotation of said carrier assembly.

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