

[54] **SHEET WRAPPING AND UNWRAPPING APPARATUS**

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[51] Int. Cl.² B65H 5/00

[58] Field of Search 346/138, 132, 125, 126,
346/127, 128; 101/415.1, 409, 410, 411,
412; 271/3, 277, 275, 82

[56] **References Cited**

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Primary Examiner—Evon C. Blunk

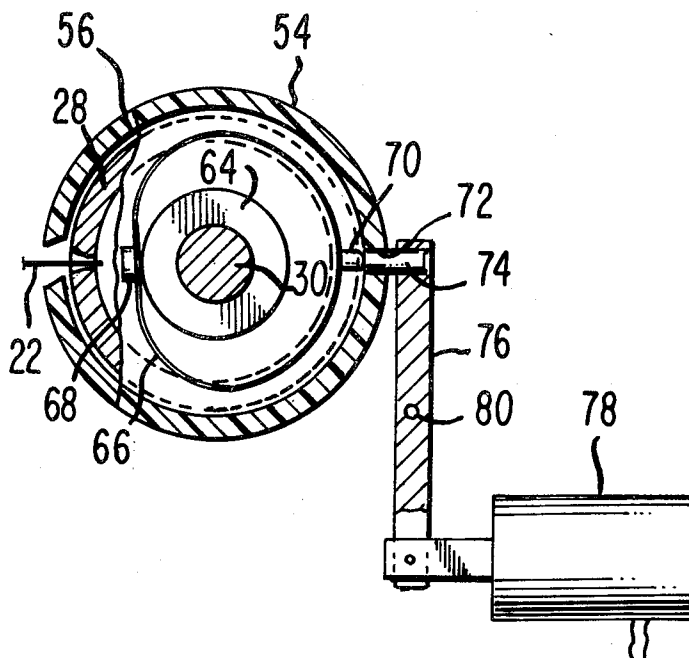
Assistant Examiner—Bruce H. Stoner, Jr.

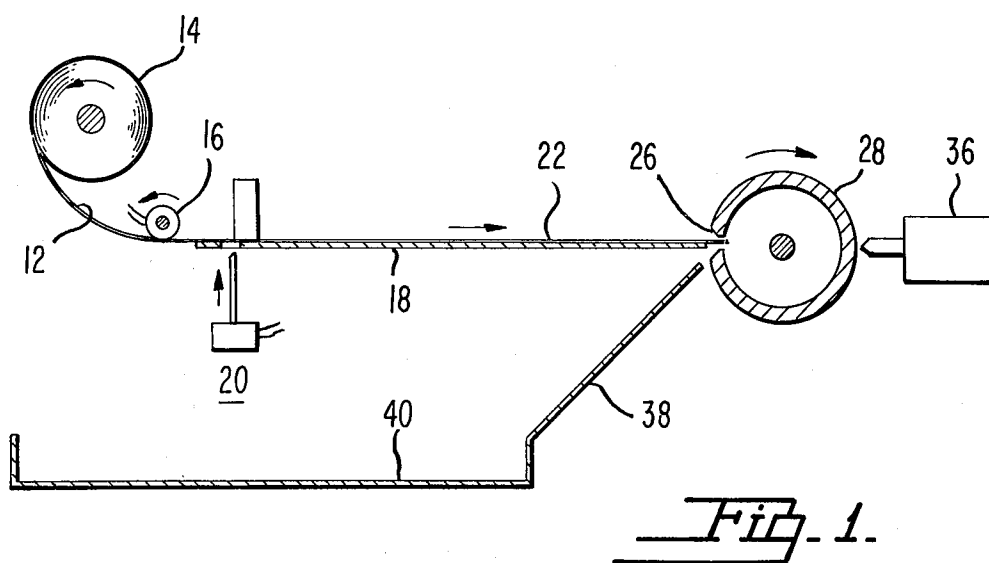
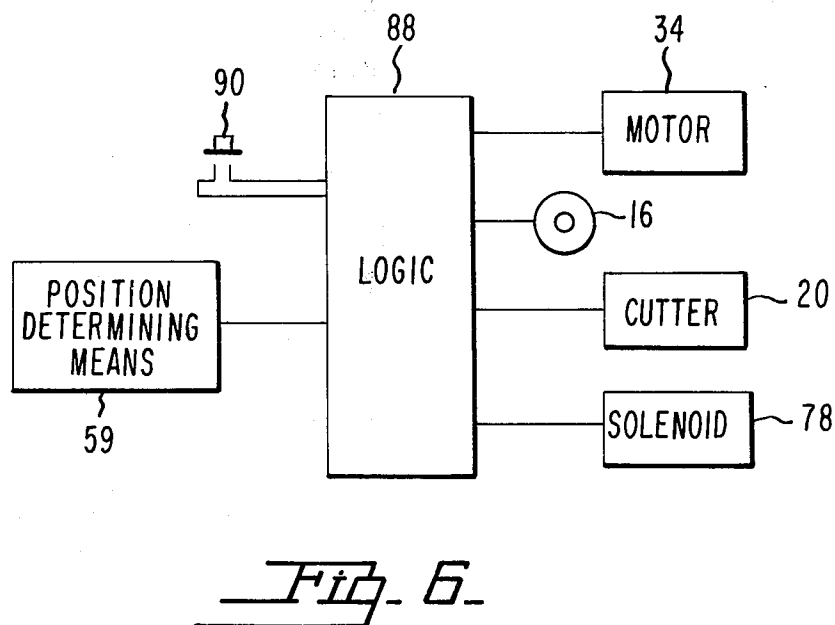
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[57] **ABSTRACT**

As a sheet material such as paper is wrapped onto an axially rotating cylinder, it is pulled through a slot in a member which surrounds a lengthwise portion of the cylinder. Relative motion between the cylinder and member is stopped before all of the sheet is passed through the slot. Then, the cylinder and member may be rotated together for any desired purpose, such as to allow writing on the sheet. The sheet is unwrapped by rotating the cylinder in the reverse direction, while holding the member stationary.

4 Claims, 6 Drawing Figures





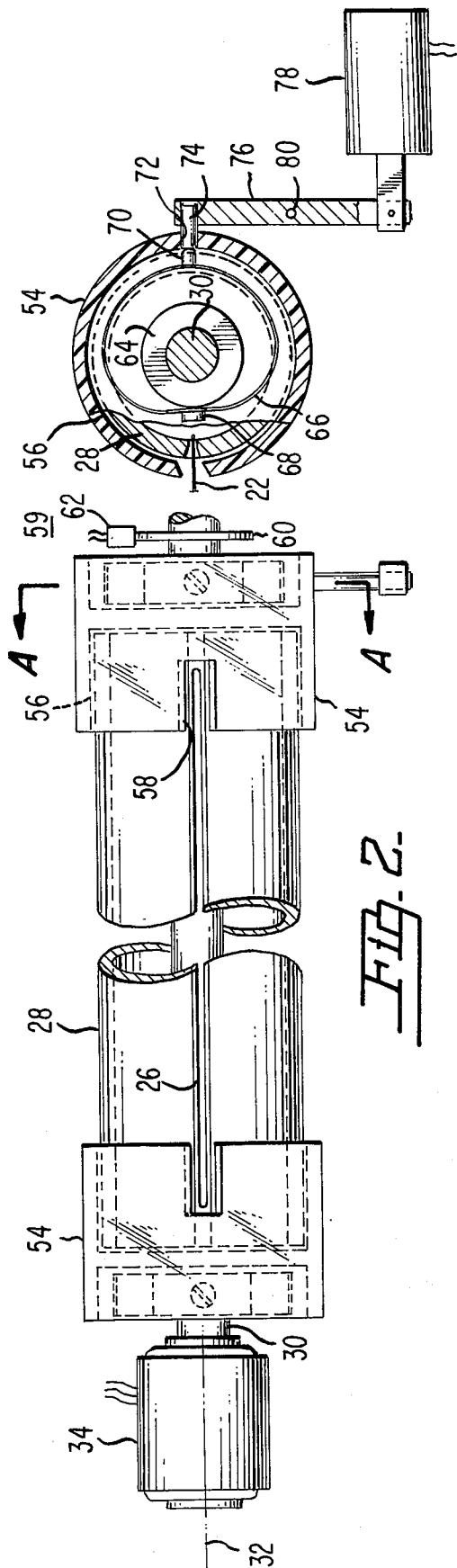


Fig. 3.

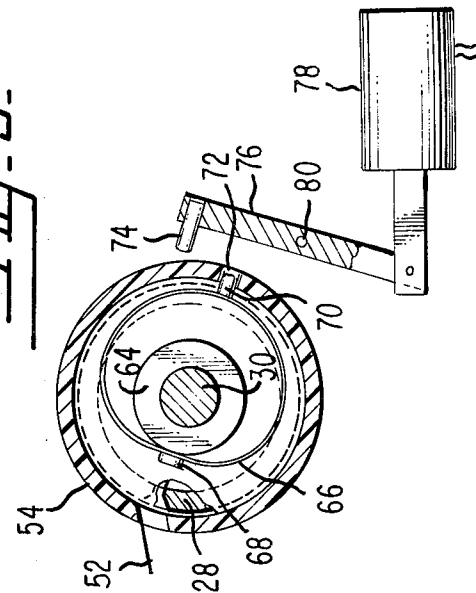
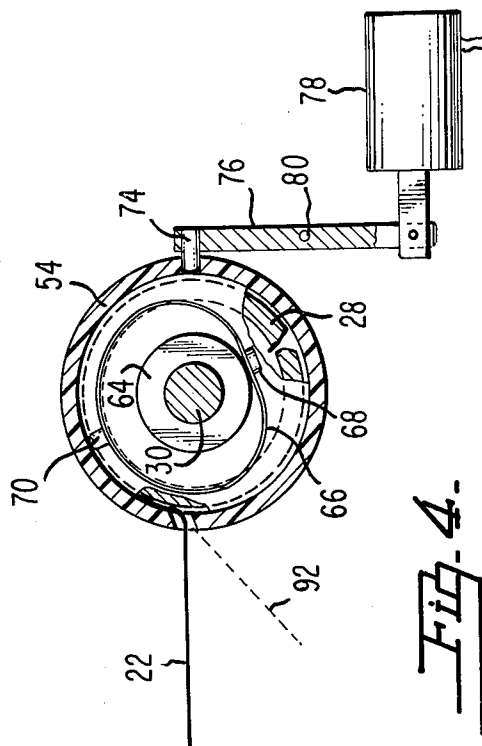


Fig. 5.



SHEET WRAPPING AND UNWRAPPING APPARATUS

BACKGROUND OF THE INVENTION

In commercial facsimile transceivers, for example, where both the original document sheet and the output message sheet must rotate in cylindrical fashion past reading and writing transducers, respectively, the problem of removably securing a sheet onto a cylinder exists.

Some existing transceivers utilize manually operated clamping bars to fasten the sheet to the cylinder. One transceiver uses an elastic belt to secure the sheet. Another transceiver clamps the leading edge of the sheet as it is pushed into the machine and the trailing edge is pulled around freely, contained by surrounding guide ribs. Yet another transceiver features a loading scheme in which the operator places the sheet on a pull-out tray, and upon pushing the tray back into the machine, the sheet becomes fastened to the cylinder by means of metal bands adhering to a magnetic strip in the cylinder. Each of these approaches is not without problems in an application involving automatically wrapping a sheet onto a cylinder and later unwrapping it from the cylinder.

SUMMARY OF THE INVENTION

Apparatus for wrapping a sheet onto and unwrapping it from a cylinder includes an axially rotatable cylinder having a means for accepting an edge of a sheet and a member coaxially located with the cylinder. The member has an intercylindrical surface, which coextends with at least a portion of the cylindrical edge of the member, and is rotatable thereabout. The member includes a slot opposite the cylindrical surface of cylinder permitting passage of a sheet therethrough. The apparatus also includes a means for axially rotating the cylinder, which has accepted an edge of a sheet, in a first direction relative to the member for pulling the sheet through the slot and wrapping it around the cylinder. Relative motion between the cylinder and member can be stopped before all of the sheet has passed through the slot. The means for creating relative motion between the cylinder and member includes a means to create relative motion in the opposite direction between cylinder and member for unwrapping the sheet from the cylinder.

A BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic diagram of a facsimile transceiver employing a preferred embodiment of the present invention;

FIG. 2 is a preferred embodiment of the present invention illustrating apparatus for wrapping and unwrapping a sheet from a cylinder;

FIG. 3 is a cross-section along lines A—A of FIG. 2, illustrating a sheet being received into the cylinder;

FIG. 4 is similar to FIG. 3, except that it shows a sheet in the process of being wrapped around or being unwrapped from a cylinder;

FIG. 5 is similar to FIG. 3, except that the cylinder is being rotated with the sheet in place; and

FIG. 6 is an electrical schematic of the interconnection among the various electrical devices in the facsimile transceiver.

DETAILED DESCRIPTION

In FIG. 1, sheet material 12 from a continuous roll 14 passes between a powered capstan 16 and a guide plate 18 and through a cutter assembly 20. The free end of a cut sheet 22 resides in a sheet accepting means such as a slot 26 in cylinder 28. In a manner to be described, the cut sheet is wrapped on the cylinder 28, and then written onto or read from by a writing or reading transducer 36. After the reading or writing is completed, sheet guide 38 receives the completed sheet and guides it to collection bin 40.

Referring next to FIG. 2, cylinder 28, shown partially broken away, is secured to a shaft 30, which is adapted to be rotated about an axis 32 by a drive means 34. Drive means 34 may, for example, be either a 2-speed 2-direction motor, or two motors, one operating at high speed and one at low speed with clutch means determining which drives the cylinder. Alternately, the drive means may be a motor equivalent, such as a stepper motor, which is adapted to drive cylinder 28 in either direction and at a slow speed for loading and unloading sheets and at a high speed during reading or writing operations all under logic control. Cylinder 28 has, as previously mentioned, a means such as a slot 26 for accepting the free end of sheet 22, FIG. 1. Alternately, some type of clip may be utilized to receive a sheet 22. Slot 26 must, of course, be at least as long as sheet 22 is wide. Cylinder 28 will typically have an outer circumference of dimension slightly less than a sheet 22 is long (dimension from left to right, FIG. 1), so that the sheet wraps just once around the cylinder with a small portion of the sheet in slot 26, and a small free portion 52 on the opposite end (FIG. 5) for reasons which will be explained shortly.

Also, rotatably secured on shaft 30 on either end of cylinder 28 is a member 54 having cylindrical cavity portion 56 sized to fit over the cylinder 28. The clearance between the inner cylindrical surface of member 54 and the outer surface of cylinder 28 is sufficient to permit sheet 22 to pass therebetween. Member 54 also has a slot 58, which is initially positioned to line up with slot 26 in cylinder 28.

A shaft position determining means 59 may comprise, for example, a cam means 60 secured to shaft 30, switch means 62 and may be used with logic to provide necessary timing signals, as will be described.

Referring next to FIG. 3, which is a section substantially along lines A—A, FIG. 2, a collar 64 secured to shaft 30 prevents longitudinal motion of member 54, while permitting rotational motion. A generally oval shaped bias spring 66 is attached by securing means 68 to collar 64. A detent button 70 attached to the spring 66 is normally biased into an orifice 72 in member 54. See FIG. 5. However, as illustrated in FIG. 3, a projecting pin 74 on locking lever 76 may be caused to enter orifice 72, thereby driving out detent button 70. This occurs when, under logic control, solenoid 78 is energized, causing lever 76, to which it is coupled, to pivot counter-clockwise about pivot-point 80. With solenoid 78 thus energized, cylinder 28 may be rotated by motor 34 in either direction while member 54 is held stationary.

FIG. 6 illustrates schematically the electrical interconnection between a logic control assembly 88 and capstan 16, cutter 20, motor 34, and solenoid 78, as output devices, and position means 59 and starting

switch 90, as input devices. The logic interconnections in logic control assembly 88 are not shown nor described in detail, since the details thereof are provided according to the present state of the art and form no part of the present invention per se. It is sufficient to say that logic 88 may contain purely electronic elements or may contain a combination of mechanical and electrical elements.

In operation when it is desired to write upon a sheet 22, logic 88 (FIG. 6) may be activated by any suitable means, such as depressing switch button 90. Motor 34 (FIG. 2) is caused by logic 88 to rotate cylinder 28 and member 54 into the position shown in FIG. 3. Position means 59 may be utilized by logic 88 to determine the position of cylinder 28. Next, power capstan 16 (FIG. 1) is energized to propel sheet material 12 toward and into slot 26 in cylinder 28 (and therefore, through slot 58 in member 54, FIG. 2). Thereafter, cutter 20 controlled by logic assembly 88 cuts sheet material 12 producing a sheet 22. Then solenoid 78 is energized causing pin 74 on lock lever 76 to move detent button out of orifice 72. Next, motor 34 under logic control begins slowly to rotate cylinder 28 in the clockwise direction (as viewed in FIG. 3) while member 54 is held stationary by lock lever 76, thereby causing sheet 22 to be wrapped around cylinder 28. FIG. 4 shows the sheet and cylinder at an intermediate point in their travel.

At any position of the cylinder 28 other than that shown in FIG. 3, solenoid 78 may be de-energized. Lock lever 76 will still occupy the position shown in FIG. 4. Lock lever 76 remains positioned as illustrated in FIG. 4 for two reasons. First, there is no bias means urging pin 74 out of orifice 72. Second, the friction between pin 74 and the walls on member 54 surrounding orifice 72 so long as cylinder 28 continues to rotate, keeps the projection in the orifice.

After cylinder 28 has made one complete revolution, pin 74 is driven out of orifice 72 by detent button 70 (since solenoid 78 is no longer energized). Then, as illustrated in FIG. 5, cylinder 28 and member 54 can be caused to rotate together at high speed by motor 34 in the clockwise direction. Note particularly in FIG. 5 that a small tail part 52 projects through slots 58 in member 54. This tail portion may merely be pushed down against cylinder 28 by a deflector means (not shown) immediately preceding transducer 36. Writing onto sheet 22 by transducer 36 (FIG. 1) occurs under control of logic assembly 88.

When writing is complete, logic assembly 88 directs motor 34 to rotate in the counter-clockwise direction (as illustrated in FIG. 3) at slow speed until the cylinder and member 54 are as shown in FIG. 3. Meanwhile, solenoid 78 is energized so that when the cylinder and member 54 are as shown in FIG. 3, pin 74 will enter orifice 72. Motor 34 continues to drive cylinder 28 in the counter-clockwise direction, causing sheet 22 to be unwrapped from cylinder 28, thereby passing through slot 58 in member 54 and along guide 38 into bin 40 (FIG. 1). FIG. 4 shows the mechanism during the unwrapping operation. Dashed line 92 shows the path followed by sheet 22 while being unwrapped.

By means of the mechanism just described, automatic wrapping and unwrapping of a sheet to and from a cylinder is possible. The operation has been described in terms of sheets being created from a roll of sheet material. If precut sheets are to be utilized, such as in con-

nection with reading existing documents, the cutter 20 is not employed and some means may be substituted for capstan 16 to take a document from a stack and insert it into the slot 26. Otherwise, the operation is the same as has been described.

What is claimed is:

1. Apparatus for wrapping as sheet onto and unwrapping it from a cylinder comprising, in combination:
a cylinder having means for accepting an edge of said sheet;
a member coaxially located with said cylinder, having an inner cylindrical surface which coextends with at least a portion of the cylindrical surface of said cylinder, said member including a slot opposite the cylindrical surface of said cylinder permitting passage of said sheet therethrough;
means by which in a first mode axial relative motion is created in one direction between said cylinder, which has accepted said edge of said sheet, and said member for pulling said sheet through said slot and wrapping it around said cylinder and by which in a second mode axial relative motion is created in the opposite direction between said cylinder and member for unwrapping said sheet from said cylinder through said slot; and
means by which in a third mode said member is caused to rotate with said cylinder after said sheet has been wrapped around said cylinder and before said sheet has been unwrapped.

2. The combination as set forth in claim 1 wherein said cylinder has a circumference less than the length of said sheet to be wrapped therearound, said means by which said cylinder rotates with said member including means for causing said member to rotate with said cylinder after said cylinder has made no more than one revolution relative to said member.

3. Apparatus for wrapping a sheet onto and unwrapping it from a cylinder comprising in combination:
a cylinder axially rotatable having a slot for receiving an end of said sheet;
a member coaxially located with said cylinder, having an inner cylindrical surface which coextends with at least a portion of the cylindrical surface of said cylinder, said member including a slot opposite said cylindrical surface of said cylinder permitting passage of said sheet therethrough;
means normally causing said cylinder and member to rotate together, but which may be disabled;
means for disabling said disableable means and for holding said member stationary;
means for rotating said cylinder axially in one direction, a free end of a sheet having been first inserted through said slot in said member and through said slot in said cylinder, thereby to wrap said sheet onto said cylinder between said cylinder and member while said member is being held stationary by said disabling means and for rotating said cylinder and said member together in said one direction when said disabling means ceases to function.

4. The combination as set forth in claim 3, wherein said last-mentioned means is operable to cause said cylinder to be rotated in the opposite direction while said member is being held stationary by said disabling means to thereby cause said sheet to be unwrapped from said cylinder.

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