WRAPPING ROTATING ROLLS OF SHEET MATERIAL

Assignee: Eddystone Machinery Company, Chester, Pa.
Filed: July 29, 1970
Appl. No.: 59,275

References Cited
UNITED STATES PATENTS
3,323,284 6/1967 Lagasse........................................156/506 X

ABSTRACT
To a roll of sheet material which is rotating on one or more drums of a cloth winder, a piece of paper is fed from below into the space between the roll of sheet material and a drum on which it is being wound, the roll being pressed against the drum. Overlapping the forward edge of the piece of paper is adhesive tape with the adhesive directed toward and bonding with a previous turn or wrap of the paper.

13 Claims, 8 Drawing Figures
Fig. 8.
WRAPPING ROTATING ROLLS OF SHEET MATERIAL

DISCLOSURE OF INVENTION

The present invention relates to wrapping a roll of sheet material such as cloth, plastic, foil, paper or web. The invention relates both to the mechanism and method. A purpose of the invention is to support and rotate a roll of sheet material on at least one horizontal rotating drum, to feed a piece of paper (including foil, plastic, cloth or the like) from below the drum into the space between the drum and the roll of sheet material, pressed down against the drum so that the piece of paper is progressing with the roll of sheet material at the same surface as that of the roll, to secure the forward edge of the piece of paper to the roll of sheet material preferably by adhesive tape overlapping the forward edge of the piece of paper and having its adhesive directed toward the roll of sheet material, to continuously wrap the piece of paper around the circumferential surface of the roll of sheet material as the roll continues to turn until the piece of paper begins to roll against itself, and thereafter to secure the rearmost edge of the piece of paper to the previous turn or wrap of the paper, preferably by adhesive tape overlapping the rearmost edge and having its adhesive directed toward the previous turn of the paper.

A further purpose is to cut-off a piece of paper from a continuous web of paper, preferably on one stroke of a reciprocating carriage, and then to apply adhesive tape to the rearmost edge of the piece of paper overlapping that edge and to the forward edge of the web of paper overlapping that edge preferably on a return stroke of the carriage. A further purpose is to provide means for storage of excess paper between the point of application of the adhesive tape and the location of the winding drum. A further purpose is to support a cutter on pivoted arms on a carriage and to raise and lower the cutter on the carriage. A further purpose is to drive a carriage in reciprocation by a sprocket engaging a chain both of whose ends are fastened to the carriage. A further purpose is to rotate the cutter by a sprocket which engages the carriage driving chain, as the carriage is moved by the chain. A further purpose is to move tape applicators to and from operative positions by supporting them on a carriage on pivoted arms and selectively raising and lowering the arms. A further purpose is to tension adhesive tape fed to applicator means by upper and lower sets of pivoted arms manipulated by tracks, the lower arms raising and lowering the applicator means, and the upper arms raising and lowering tension means for the tape. A further purpose is to resiliently bias the cutter toward the work against a stop on the carriage. A further purpose is to resiliently bias tape applicator means toward the piece of paper and against a stop. A further purpose is to extend the adhesive tapes over cutter blades on the carriage at the end of the stroke to cut off the ends of the adhesive tapes. Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which the invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation, and clear demonstration of the principles involved.

FIG. 1 is a diagrammatical central vertical longitudinal section of a wrapping machine of the invention.

FIG. 2 is a central vertical longitudinal section through the cutter and tape applying mechanism of FIG. 1.

FIG. 3 is a fragmentary transverse section through the cutter mechanism, the section being taken on the line 3-3 of FIG. 2.

FIG. 4 is a fragmentary bottom plan view of the cutter portion of the carriage as shown in FIG. 2.

FIG. 5 is a fragmentary transverse section through the tape transport mechanism, the section being taken on the line 5-5 of FIG. 2.

FIG. 6 is a fragmentary bottom plan view of the tape transport mechanism as shown in FIG. 2.

FIG. 7 is a section of the FIG. 1 on the line 7-7 showing the edge wrapping device.

FIG. 8 is an electrical circuit diagram.

In the prior art, cloth rolls have been wrapped in connection with winding machines by extending a piece of paper longitudinally across the axial length of the roll and wrapping the width of the paper around the circumference of the roll of sheet material. This procedure has proved to be cumbersome and costly.

In accordance with the present invention the rolling action of the drum or one of the drums on which the roll of sheet material is turning prior to doffing is used to secure a piece of paper to the circumference of the roll of sheet material, to wrap the piece of paper around the circumference, and to secure the rearward end of the piece of paper to an earlier turn or wrap of the piece of paper.

The piece of paper is supplied with a width which is as wide or greater than the axial length of the sheet material on the roll.

In connection with the invention, a web of paper is cut transversely and tapes are applied so that one tape is eventually present extending longitudinally of and overlapping the forward edge of the paper and a second tape extends longitudinally and overlaps the rear edge of the piece of paper. At the time this piece of paper comes in contact with the roll of sheet material, the leading adhesive attaches the paper to the roll of sheet material. For convenience in applying the adhesive tape, one piece is preferably applied simultaneously when the paper is cut from a web of paper to the rearmost edge of the piece of paper and one piece to the forward edge of the web of paper.

In the preferred machine of the invention a carriage moves transversely and on one stroke a cutter is manipulated by tracks to cut the paper, the cutter preferably being supported on arms which are on pivots fixed on the carriage, and on the reverse stroke tape applicator means is manipulated to engage the paper, preferably by moving one set or two sets of arms which are on fixed pivots on the carriage, one set of arms manipulating tape applicator means and the other set of arms manipulating tape tension means under the control of tracks. It will thus be evident that the application of the tape to the piece of paper, and the cutting off of the piece of paper from the web, and the wrapping of the paper around the roll of sheet material and the affixing of the adhesive tape to the roll of sheet material at one edge under the pressure exerted by the roll of sheet material (usually primarily due to its weight against the drum on which it is supported partially or wholly, or which is weighted with which it is turning), are all accomplished automatically. By the invention, it is possible to wrap a piece of paper around a roll of sheet material which is being wound on a winding machine, while the roll is turning on the winding machine. A strip of paper having a width as long or longer than the length of the sheet material is fed from a paper roll, cut-off to length, and provided with adhesive tape overlapping both the forward and the rearward edges of the advancing cut sheet of paper. Then the paper, with the adhesive side of the tape toward the roll of sheet material, is fed along one of the drums of the winding machine, so that it advances through the interface between the roll of sheet material and the winding drum, and the forward tape adheres to the outside of the roll of sheet material under the weight of said roll. As the roll of sheet material turns on the winding machine drum or drums, the paper advances around the circumference of the roll of sheet material, until it surrounds the roll of sheet material and the tape on the rear edge of the piece of paper adheres to the piece of paper to complete the circumferential covering. The ends of the paper, extending beyond the roll of sheet material, may be folded over as desired and secured manually by a tape or otherwise.

FIG. 1 shows the middle drum 20 and the lift-off or take-off drum 21 of a three drum cloth winder, which may be of the type shown in Aulen U.S. Pat. No. 3,045,940, granted July 24,
When it is time to wrap the piece of paper around the roll of sheet material 24, clutch 51 engages and the belts advance to move the piece of paper between lift-off drum 21 and belts 61 around pulley 64, then into the bite between lift-off drum 21 and the roll 24, and then past the space where the roll 24 has previously contacted the surface of lift-off drum 21 at 71.

As the forward end 67 of the piece of paper 38 and its tape strip enter the bite between drum 21 and the outside of roll 24, the pressure due to the weight of roll 24 makes the free adhesive portion of adhesive tape strip engage and adhere to the outer circumference of the roll of sheet material 24. As the roll 24 turns, the piece of paper advances through the bite 70 to make a smooth wrap around the circumference of roll 24, until finally the rear end 66 of the piece of paper 38 and its strip of adhesive tape encounter the piece of paper 38 toward the forward end, and the adhesive on the tape strip 73 bonds to the paper and completes the wrapping around the circumference.

Referring now to FIGS. 2 to 6 inclusive, a carriage 80 reciprocates back and forth on spaced parallel guides 81 supported at the ends, which guides are engaged at the top and bottom by rollers 82 supported by axles 83 on the carriage. As best seen in FIGS. 2, 3, and 4, stationary rails 84 extend laterally and are supported at the ends. These rails as shown in FIGS. 2, 3, and 4 have a track 85 which receives and guides followers 86 over the top of track 85. Followers 86 travel along track 85 and are guided by roller 88 and a driving sprocket 90. The shaft 87 is journaled in bearings 91 mounted in arms 92 which are pivoted on a fixed pivot shaft 93 by bearings 94.

The track 85 has a forward and cutting lower track portion 96 in which the shaft 87 proceeds in the direction of the arrow 97, an upwardly diagonally disposed sloping portion 98 in which the shaft 87 follows the arrow 100 and an upper track portion 101 in which the shaft 87 follows the arrow 102, the cutter is inoperative and the sprocket 90 disengages from its driving chain. At the end of track 84 near the left of FIG. 3, latches 103 pivoted at 104 have surfaces 105 in the way of the forward motion of shaft 87 and the latches are forced out of the way as the shaft moves forward but they are biased, to return to the position shown, by helical tension springs 106 acting between spring abutments 107 on the latches and spring abutments 108 on the rails. On the retracting stork, shaft 87 is forced by latch surface 110 to take upper track 101.

Brackets 111 are mounted by screws 112 on either side of pivot 93 for cutter arms 92 and the brackets support spring abutments 113 which engage one end of helical tension springs 114, the other ends of which are anchored to spring abutments 115 on the cutter arms 92 so as to urge the cutter 88 toward the paper.

Near the right of the track in FIG. 3 shaft 87 moves to lower track 85 due to sloping track surfaces 116 and the pull of springs 114 toward the paper.

Chain 117 is anchored to the carriage 80 at one end at 118, and reverses direction around driving sprocket 120 on driving shaft 121 driven by a suitable motor and turning in suitable bearings 122 (FIG. 4). At the other end chain 117 reverses direction around idling sprocket 123 turning on stub shaft 124 on suitable bearings 125. The other end of the chain 117 is anchored at 126 to yokc 127 pivoted on the carriage on pivots 128 having bearings 130. The yoke 127 is resiliently urged to tension the chain 117 by screw 131 threaded into pivot 93 and passing through opening 132 in the yoke, to receive tension from helical compression spring 133 by nuts 134. The chain 117 engages sprocket 90 and as the carriage reciprocates on the cutting stoke turns the cutter 88.

As shown in FIGS. 2, 5 and 6, the carriage 80 supports two rolls of adhesive tape 140 and 141 wound on a double hub 142, each roll supported on its own hub, pivoted on centers mounted on the carriage. Tape strips 144 are paid off from the rolls 140 and 144 around a fixed pivot and guide roll 145 rotatable in the space of arms 146 and having the upper arms 147 journaled thereon on bearings 148. At the ends, the upper arms 147 journal a tape guide roll 150 in bearings 151.

3

1962 for Three-Drum Winder. The invention is also applicable to two drum winders, as shown in Aulen U.S. Pat. Nos. 2,619,299, granted Nov. 25, 1952, for Web Winder and 2,676,719, granted Apr. 27, 1954, for Web Winder.

Drum 20 is driven on horizontal shaft 22 and drum 21 is driven on spaced parallel horizontal shaft 23, both drums turning clockwise as shown in FIG. 1. After transfer from an entering drum (not shown), a roll of sheet material 24 has begun winding around a suitable shell or mandrel 25 on the middle drum 20 and the lift-off drum 21, increasing in size to form roll 24 and finally completed roll 24 which is cut-off from the continuous roll of material now winding on the entering drum (not shown) and is ready for doffing.

A roll of paper 26 is supported rotatably on a horizontal hub 27 below and forward of the lift-off drum 23. The width of the paper in some cases is suitable slightly greater than the width of the sheet material so that the paper wrapper can be folded over at the ends. Two or more pieces of paper can be spliced laterally if desired, by adhesive tape 28 paid off by roll 30 on hub 31 overlapping a joint between webs of paper. The paper web 32 from roll 26 is fed around motor driven horizontal feed roll 33 under paper guide 34 and beneath pressure and measuring roll 35 which also affixes tape 28.

The paper web 32 then is fed through guide passage 36 and past cutter 37 in inoperative position until sufficient paper has been wound that cutter 37 is long enough to more than wrap around the circumference of the roll of sheet material 24. At this point the forward feed stops and the cutter 37 is operated to cut-off a piece of paper 38 whose forward end has passed under tape transport mechanism 40 in inoperative position and through paper guides 41.

At intervals along the width of the machine (say every 18 inches), an endless storage belt 42 turns as shown by the arrows around pulleys 43, 44, 45 and 46, driven by sprocket 47 on lift-off drum shaft 23 by chain 48 to sprocket 50 which drives storage belt pulley 46 through electromagnetic clutch 51 so that the storage belt 42 turns at the same surface speed as the lift-off drum. A pressure belt 52 cooperates with each storage belt and idles around pulleys 53 and 54 to feed the piece of paper down to encounter feed plate 55 which causes the piece of paper to turn around pulley 44. The paper then encounters a pressure belt 56 idling over pulleys 57 and 58 and cooperating with each storage belt until the forward end of the paper encounters guide plate 60 to turn around pulleys 45.

The forward end of the piece of paper then is carried upward by storage belts each engaged by a pressure belt 61 idling around pulleys 62, 63 and 64 (to conform to the contour of lift-off drum 21). After cutting, the cut piece of paper 38 is advanced by storage belt 42 until rear edge sensing device 65 encounters the rear edge 66 of the piece of paper 38 and causes the storage belt to stop. This places the rear edge 66 of the piece of paper 38 in line to receive a piece of tape from the tape transport mechanism 40. In the meantime the web of paper 32 has advanced by the feed roll 33 until the far edge 67 of the web is opposite edge sensing mechanism 68, at which point the forward feed of the web 32 stops. The forward edge 67 of the web is then in position to receive tape from the tape transport mechanism 40.

The tape transport mechanism is then operated to apply tape overlapping the rear edge 66 of the piece of paper 38 and also to apply tape overlapping edge 66 of the piece of paper 38 as shown in FIG. 2. As a consequence both front and rear edges of the piece of paper 38 are provided with overlapping tape except for the first and last pieces from the roll, which are rejected.

After the tape has been applied to the piece of paper, the piece of paper 38 is moved by storage belts 42 contacted at the opposite side of the paper by pressure belts 52, 56 and 61 under device 66 which contacts the forward edge of piece of paper 38, when the clutch 51 disengages and the belts cease to drive the paper forward.
The upper arms 147 are spring biased counterclockwise (FIG. 5) by helical tension springs 153 acting between spring abutments 154 on the carriage and spring abutments 155 on the arms. Tape guide roll 150 at its ends has follower bearings 156 (FIG. 2) which follow a track 157 in rails 158 extending widthwise and supported at the sides. Track 157 comprises an upper track 160 extending horizontally and carrying the ends of roll 150 in the forward direction as shown by arrow 161 (FIG. 5), to tip a diagonally upwardly directed latch 162 on the forward stroke, pivoted at 163, against the action of helical compression spring 164. On the return stroke the follower bearings on the ends of roll 150 move down diagonal surface 165 of the latch as shown by arrow 166 and follow horizontal track stretch 167 as shown by arrow 168 and at the end of the return stroke, which is the tape applying stroke, rise on inclined surface 170 as shown by arrow 171, and move back along track 160.

A pivot roll 172 (FIGS. 2 and 5) has bearings 173 at the opposite ends journalling in the carriage, and on bearings 174 journals lower arms 175. Near the lower ends, lower arms 175 are spring biased downward by helical tension springs 176 acting between spring abutments 180 on the carriage and spring abutments 181 on the lower arms, limited by stop pin 182. Follower bearings 183 on the end of roll 177 are guided by a track 184 in rails 158. On forward motion of the carriage, roll 177 follows upper tracks 185 so that no tape is applied. On the return stroke of the carriage, the downward bias of the lower arms makes roll 177 follow lower diagonal track 186 as suggested by arrow 187, and then roll 177 follows horizontal lower track 188 as suggested by arrow 190, roll 177 pressing the tapes against the paper to apply the tapes overlapping the edges of the paper by about one-half the tape width (for example one inch). When the roll 177 comes to the end of lower track 188, it encounters upward diagonal track 191 as suggested by arrow 192, and then continues its return stroke on upper track 185. In going up diagonal track 191, the roll 177 displaces latches 193 pivoted on the carriage at 194 and biased by tension springs acting between spring abutments on the latch 193 and spring abutments on the rails to hold the latches closed against the roll 177 on the forward stroke.

It will be evident that the lower track 188 for the lower roll 177 is longer on the right in FIG. 5 than the lower track for the upper guide roll 150 to assure that the tape applications will be as soon as roll 177 can apply pressure against the sides of the piece of paper. Rolls 177 and 150 generally move up and down together so as not to release the tension on the tape.

As the carriage reaches the end of its return stroke, the tapes are cut off after the roll 177 has gone up diagonal track 191 to a position above the cutting blade. A shear anvil or stationary blade 210 (FIGS. 8 and 6) extends horizontally above roll 177, and is pivoted at 211 on the lower arms 175, and urged by helical tension springs 212 acting between spring abutments 213 on arms 175 and spring abutments 214 on shear anvil 210, to bias shear anvil 210 against stop pins on lower arms 175. A cooperating shear blade 216 extends horizontally on brackets 217 mounted on the carriage. The blade 216 is held by retaining plate 218 anchored by bolts 220 into the bracket, the shear blade having guiding slots 221 which are diagonal so that it moves both laterally and longitudinally in shearing the tapes. Shear blade 216 is biased toward retraction by helical tension springs 222 acting between spring abutments 223 on the blades and spring abutments 224 on bracket 217. When the tapes have reached the end of the paper, a pin 225 engages an extension 226 from the shear blade to cause shearing.

A pressure roll 227 pivotally mounted on arms 228 holds the tape against applicator roll 177 after the tape is cut. All rolls contacting the adhesive surface of the tape are surfaced with a material for example silicone rubber or polyethylene, which will not maintain firm adhesion with the adhesive surface. Arms 228 are pivoted on the shafts of roll 177 and prevented from turning by pins 230 supported by arms 175. The paper is backed up when the tape is applied by paper guides 41 (FIG. 1). In some cases it is desirable to fold the paper around the ends of the roll of sheet material. When this is done, the width of the paper is sufficient to extend past each end of the roll of sheet material for several inches, and edge folding attachments 240 are used as shown in FIGS. 1 and 7. An edge folding arm 241 extends initially in prolongation of the outside of the cylindrical paper along an edge extending paper portion 242, and is pivoted on a hinge 243 mounted on a bracket 244 which is removably fastened to the frame at each side of the drums by bolts 245 and 246. A fluid actuated double acting cylinder 247 is pivotally mounted on trunnions 248 on each bracket and manipulates a piston and rod combination 250 which is pivotally connected at 251 to the rear end of each arm 241. The arm has a curved edge 252 so that as it begins to turn in the direction of the arrow 253 it will gradually bend the overlapping paper to fold a wrap-around at the end which can be held by adhesive tape suitably in disc form to secure the end paper against unfolding. The paper folding arms should preferably be directed radially inward and their positions can be changed by adjusting the positions at which the bolts 245 and 246 are secured. It will be evident that the arms 241 can swing in as the roll rotates, in which case the effective ends of the arms may be rollers. The arms 241 are adjustable as to position so as to roll of different lengths and this adjustment can be accomplished by adjusting the position of the bracket 244 as desired. FIG. 8 illustrates an electrical circuit diagram which is constructed as follows:

In operation of the device, each time the paper drive is started, measuring or counting device 35 determines the amount of paper which is to be allowed to pass beyond the cutter. Near the end of the measurement of the required length of paper, the reciprocating carriage moves across the paper in the direction to move cutter 37 into operative position and cut the paper, and the cutter 37 then rises above the paper. After cutting the piece of paper 38 advances until its lagging end 66 is opposite limit switch 65, at which point clutch 51 disengages and forward progression of the paper ceases. The paper is then stored on storage belts 52, 56 and 61. The web 36 advances until its forward end 67 is opposite limit switch 68 as shown and then the forward progression by feed roller 33 ceases.

With the cutter head raised in inoperative position, and the tape applying roller in contact with the paper, the carriage then reciprocates to apply tape so that it engages and overlaps trailing edge 66 of the piece of paper and also forward edge 67 of the web of paper. At the end of the travel of the tape strip from tape applicators 40 across the paper, the tape is cut off and the tape applicator roll is retracted. At this point clutch 51 engages and drives the piece of paper 38 in the direction shown by the arrows until its leading edge is opposite limit switch 69, at which point clutch 51 disengages. All of these operations above described precede the wrapping of an individual piece of paper around a roll of sheet material.

When it is desired to wrap a roll of sheet material which is rotating on drums 20 and 21, a switch is manually operated which engages clutch 51 and feeds piece of paper 38 into the bight between drum 21 and roll of sheet material 24, and the overlapping adhesive tape on the leading edge of this piece of paper than adheres to the cloth on the outside of roll of sheet material 24 and the paper is fed at the same surface speed at which the roll rotates until the trailing edge of the piece of paper moves between the bight of drum 21 and roll 24 and its overlapping piece of adhesive tape adheres to the paper previously wrapped around the roll. The roll is then ready for tucking in of its ends by the edge wrapper attachment as previously described, and fastening of the tucks at the end by adhesive tape suitably of disc form.
When the switch engages clutch 51 to apply the piece of paper around the roll of sheet material, it also starts the web of paper forward under the action of feed roll 33 under the control of driving device 35, the paper eventually encountering and being driven forward by storage belt 42. When counting or measuring device 35 counts out, the carriage is reciprocated to cut the paper and the clutch 51 releases to cease forward drive as soon as the rear end of the paper comes opposite limit switch 65. A web of paper then continues under the action of feed roll 33 until the forward edge 67 of the web encounters limit switch 68 at which forward progression stops. The tape applying head now applies strips of tape to trailing edge 66 of the piece of paper and to forward edge 67 of the web of paper, the tape overlapping each edge with its adhesive face in position to engage the roll of sheet material or the paper wrap. The tape is applied, and the piece of paper 38 is carried forward by storage web 42 until its forward edge engages limit switch 69, at which point forward progression stops.

The further forward progression of the paper to wrap around the roll of sheet material desirably takes place when the switch is operated to raise the cutting device on the cloth winder.

In case of a very wide roll of sheet material, two webs of paper will be joined by tape 28 running longitudinally from tape roll 30, adhesive tape preferably overlapping each web for approximately half of the width of the tape.

Electric power lines 275 and 276 are operatively connected to a power source, suitably of alternating current at commercial frequency. The power lines operate feed roll 277, electric counter 278, cutter drive 280, tape applicator drive 281, and clutch drive 282, by means of relay 1, relay 2, switches 1, 2 and 3, cutter drive limit switch 283, tape drive limit switch 284 and starter switch 285.

Relay 1 is a triple pole single throw relay, and when energized contacts 1 and 2 are both closed, and contacts 3 are opened.

Relay 2 is a single pole single throw relay and when energized it closes contacts 1 which are otherwise open.

Switch 1 is a double pole single throw switch. Contacts 1 are closed until paper enters switch 1 and then it opens contacts 1 and closes contacts 2. When paper leaves switch 1, the reverse takes place.

Switch 2 is a double pole throw switch. One pole is double throw and the other pole is single throw. Contacts 1 and 2 are closed until paper enters switch 2 and then contacts 1 and 2 open and contacts 3 are closed. When paper leaves switch 2, the reverse operation occurs.

Switch 3 is a double pole throw, one of which poles is double throw and the other of which is single throw. Contacts 1 are closed until paper enters and then when paper enters contacts 2 and 3 are closed and contacts 1 are open. When paper leaves switch 3, the reverse operation occurs.

Cutter limit switch 283 is a double pole switch, one of the poles being double throw and the other pole being single throw. Contacts 1 are normally closed and when the cutter comes to the limit of its motion, it opens contacts 1 and closes contacts 2 and 3. When the carriage moves the other way, the reverse operation occurs.

Tape applicator limit switch 284 is a double pole single throw switch. Contacts 1 are normally closed, and when the tape applicator comes to the limit of its motion contacts 1 are opened and contacts 2 are closed. When the carriage moves in the opposite direction, the reverse action occurs.

Start switch 285 is a single pole single throw switch, which is instantaneously operating.

One of contacts 1 and also one of contacts 2 of relay 1 is connected to power line 275 by lead 286, which also connects to one of counter contacts 2. The counter contacts are double pole single throw contacts, and until the counter counts out contacts 1 are closed and contacts 2 are open, and when the counter counts out contacts 1 are open and contacts 2 close.

One of relay contacts 1 of relay 1 is connected lead 287 to fixed contact 2 of cutter limit switch 283 and also to the double throw movable contact of switch 2. One of contacts 2 of relay 1 is connected by leads 294 and 288 to one side of feed roll drive 277, the other side of feed roll drive 277 being connected to power line 276 by lead 290. Lead 288 is also connected to counter contacts 1, to one side of the power driver for the counter by lead 291 and to fixed contact 1 of switch 1. The other side of the power drive 278 for the counter is connected to power line 276 by lead 292.

Contacts 3 on relay 1 are connected between lead 293 from power line 275 and lead 289 to contact 2 of switch 2.

The electromagnetic coil of relay 1 is connected across the power lines by lead 295, switch 285 to start and apply the paper to the roll of sheet material, when closed, lead 296 and lead 297.

Relay 2 has its electromagnetic coil connected across the power lines in series with lead 298 and switch 285 when closed through leads 295 and 300. Contacts 1 of relay 2 are connected to leads 301 and 299, switch 285 when closed and lead 295 to power lines 275, and also by lead 302 to one of contacts 3 of switch 3.

Switch 1 as already explained has one of contacts 1 connected to one of contacts 2 of relay 1 by lead 294. One of contacts 1 of switch 1 is connected by lead 303 to one of contacts 1 of switch 2. One of contacts 2 of switch 1 is connected to one of contacts 2 of switch 2 by lead 305. The other of contacts 2 of switch 1 is connected by lead 306 to one of contacts 1 of tape drive limit switch 284.

Switch 2 has its fixed contact 3 connected by lead 307 to one of contacts 2 of tape limit switch 284 and to fixed contact 1 of switch 3.

Switch 3 has its double throw movable contact, operating between contacts 1 and 2, connected by lead 308 to the clutch drive 282, the opposite side of the clutch drive being connected by lead 310 to power line 276. Fixed contact 2 of switch 3 is connected by lead 311 to starting switch 285 at lead 298. Contacts 3 of switch 3 are connected by lead 302 to contacts 1 of relay 2 and thence through leads 301 and lead 298 with starting switch 285.

Cutter limit switch 283 has fixed contact 1 connected to the cutter drive 280 by lead 313, the other side of the cutter drive being connected to power line 276 by lead 314. Fixed contact 2 of cutter limit switch 283 is connected by lead 287 to contacts 1 of relay 1 and to the double throw contact of switch 2 as already described. Fixed contact 3 of cutter limit switch 283 is connected by lead 315 with power line 275. Movable contact 3 of cutter drive limit switch 283 is connected with lead 316 which resets counter 278. The double throw movable contact of cutter limit switch 283, between contacts 1 and 2 is connected to one of counter contacts 2 by lead 317.

Tape limit switch 284 has contacts 1 connected by lead 306 to switch 1, contact 2, and lead 318 to the tape drive 281, the other side of the tape drive 281 being connected by lead 320 to power line 276. Fixed contact 2 of tape drive limit switch 284 is connected by lead 321 to power line 275. Movable contact 2 is connected by lead 307 with switch 3 contact 1 and with switch 2, fixed contact 3.

OPERATION

The operation is as follows:

Step 1
When start and paper applying switch 285 is closed instantaneously, either as a separate operation or incidental to the operation of the cutter on the winder for sheet material, relay 1 is energized, its contacts 1 and 2 are closed and its contacts 3 are opened. The closing of contacts 1 connected to the other side of the power drive of feed roll drive 277 and of electric counter 278. Switch 1 in the counter is closed and switch 2 in the counter is open. Relay 1 locks itself in operation through contacts 1 of the counter and relay contacts 2.

Step 2
When the forward end of the paper web comes to switch 1, contact 1 in switch 1 is opened and contact 2 in switch 1 is closed. The feed roll drive continues.
Step 3. When the forward end of the paper web comes to switch 2, the paper web also being threaded through switch 1, contacts 1 and 2 of switch 2 open and contacts 3 close. This starts the operation of clutch drive 282.

Step 4. When the counter 276 counts out, counter contacts 1 open and counter contacts 2 close. The opening of counter contacts 1 deenergizes relay 1.

Step 5. The closing of counter contacts 2 operates cutter drive 280, which shifts the carriage to cutting the paper and at the end of the cutting stroke operates cutter limit switch 283 to open contacts 1 and close contacts 2 and 3. When contacts 3 close, they cause the counter to reset by energizing counter reset circuit 316. The closing of cutter limit switch contacts 2 provides an alternate circuit to energize clutch drive 282 momentarily.

Step 6. The rear end of the piece of paper leaves switch 1 and then comes to and prepares to leave switch 2. At this point switch 2 shifts, opening contacts 3 which stops the clutch drive, and closes contacts 1 and 2. When contacts 1 are closed the feed roll drive is energized through contacts 1, switch 1 being closed.

Step 7. The feed roll drive 277 continues to advance the paper web until its forward end enters switch 1, and then the feed roll drive stops.

Step 8. The tape drive 281 is then energized through contact 2 of switch 1 through contact 2 of switch 2 and through contact 3 of relay 1, and this shifts the carriage to apply the tape to rearward end of paper, and forward end of new paper. At the end of the tape application then tape limit switches 284 are activated, opening contacts 1 and closing contacts 2. The closing of contacts 2 energizes clutch drive 282 through contact 1 of switch 3 which is then closed.

Step 9. The piece of paper is progressed forward until its forward end comes into contact with switch 3, opening contacts 1 and closing contacts 2 and 3. This stops the clutch drive by the opening of contacts 1.

Step 10. Now everything is ready to apply the paper around the roll of sheet material and the closing of start switch 285 energizes relay 1 and relay 2 and energizes the clutch drive 282 to apply the paper around the roll and also starts the next cycle in the preparation of a new piece of paper. The clutch drive 282 is energized at this point through contacts 1 of relay 2 which are closed. This energizes the clutch drive 282 through contacts 3 of switch 3. Relay 2 closes and is kept closed by contacts 1 of relay 2 and contacts 2 of switch 3. They stay closed even though switch 285 is released. The piece of paper continues to advance until it comes out from under switch 3 and then contacts 2 and 3 of switch 3 open. When switch 1 is closed by the paper web, this again energizes feed roll 277 to repeat the cycle.

Although the above disclosure has been directed to a paper wrap, the method and machine of the invention also applies to a plastic web cover, such as sheet polyethylene.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the process and machine shown, and I therefore claim all such inssofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a machine for wrapping a roll of sheet material which is on a winder, at least one horizontal winder drum, means for turning the winder drum and for turning a roll of sheet material on the drum, means for feeding a piece of paper into the space between the roll of sheet material and the drum, means for securing the forward edge of the piece of paper to the roll as it engages the roll, and means for wrapping the paper completely around the roll as the roll turns while feeding the piece of paper between the drum and the roll, in combination with means for securing the rearward edge of the piece of paper to the previous turn of the paper, comprising means for applying adhesive tape longitudinally to said rearward edge of the piece of paper extending beyond the rearward edge, with the adhesive toward the roll of sheet material, said extension of the adhesive tape adhering to the rearward edge to the paper.

2. A machine of claim 1, in which the means for securing the forward edge of the piece of paper to the roll comprises means for applying adhesive tape longitudinally to the forward edge of the piece of paper extending beyond the forward edge, with the adhesive toward the roll of sheet material, said extension of the adhesive tape adhering to the roll of sheet material.

3. A machine of claim 2, which comprises means for applying adhesive tape longitudinally of the rearward edge of the piece of paper extending beyond the rearward edge, with the adhesive toward the roll of sheet material, said piece of paper wrapping completely around the roll of sheet material, said extension of the adhesive tape at the rearward edge adhering to the paper.

4. A machine of claim 1, in which means for cutting a web of paper transversely to make a succession of pieces of paper, and means for feeding a piece of paper extending beyond the rearward edge of each piece of paper extending beyond the rearward edge and to the forward edge of the web of paper adjoining each cut extending beyond such forward edge, so that when it contacts the roll of sheet material each piece of paper has adhesive tape extending beyond both its forward and rearward edges, the extension of the adhesive tape beyond the forward edge securing the piece of paper to the roll of sheet material, the piece of paper wrapping completely around the roll of sheet material, and the extension of the adhesive tape beyond the rearward edge of the piece of paper adhering to the paper to secure the wrap.

5. A machine of claim 4, in combination with means for storing a length of paper between the means for cutting and the drum.

6. A machine of claim 2 in which the means for applying adhesive tape includes parallel rails having upper and lower tracks, the means for applying the tape following the one set of tracks, and tension means for the tape following the other tracks.

7. A machine of claim 6, in which the tension means moves to its tracks nearer the paper after the means for applying adhesive tape has moved to its operating track to apply the tape.

8. A machine of claim 7, in combination with upper and lower pivoted arms, the means for applying the adhesive tape being operatively manipulated by one set of pivoted arms and the tension means for the tape being manipulated by the other set of pivoted arms.

9. In a machine for wrapping a roll of sheet material which is on a winder, at least one horizontal winder drum, means for turning the winder drum and for turning a roll of sheet material on the drum, paper supply means, means for feeding forwardly and measuring the paper from the paper supply means, means for cutting off a piece of paper of measured length, means for applying adhesive tape overlapping the forward and the rearward edges of said piece of paper, means for moving the paper between the means for applying the adhesive tape and the drum, and means for feeding the piece of paper into the bight between the drum and the roll of sheet material, applying the adhesive tape on the forward edge to the roll of sheet material, wrapping the paper around the roll of sheet material and applying the adhesive tape on the rearward edge to a previous wrap of paper.

10. A machine of claim 9 wherein the paper is fed from below into the bight between the drum and the roll of sheet material.
11. A machine of claim 9, in combination with a second paper supply providing a paper web parallel to that from the paper supply previously mentioned, and adhesive means for joining together the two webs of paper as they are progressed from the paper supplies.

12. In a roll wrapping machine, a carriage, means for guiding the carriage as it moves back and forth, means for reciprocating the carriage, cutter means on the carriage, means for providing a web of paper, means for moving the cutter means toward and away from the web of paper, tape applicator means on the carriage, means for moving the tape applicator means into operative position when the cutter means is in inoperative position and vice versa, and means for wrapping the severed sheet of the paper around the roll.

13. A method of wrapping a roll of sheet material which comprises cutting a web of paper transversely to make a succession of pieces of paper, applying adhesive tape simultaneously to the rear edge of each piece of paper extending beyond the rear edge and to the forward edge of the web of paper adjoining each cut, extending beyond the forward edge, so that each piece of paper has adhesive tape extending beyond its forward and rear edges, securing the piece of paper to the roll of sheet material by adhering the adhesive tape extending beyond the forward edge of the paper to the roll, wrapping the piece of paper completely around the roll of sheet material and securing the rear edge of the piece of paper to the paper by adhering the extension of the adhesive tape at the rear edge to the paper.