United States Patent

[11] **3,629,991**

[72] Inventor **George H. Sundin**
Duluth, Minn.

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[73] Assignee **Conwed Corporation**
St. Paul, Minn.

[54] **BUNDLE-WRAPPING APPARATUS**
7 Claims, 13 Drawing Figs.

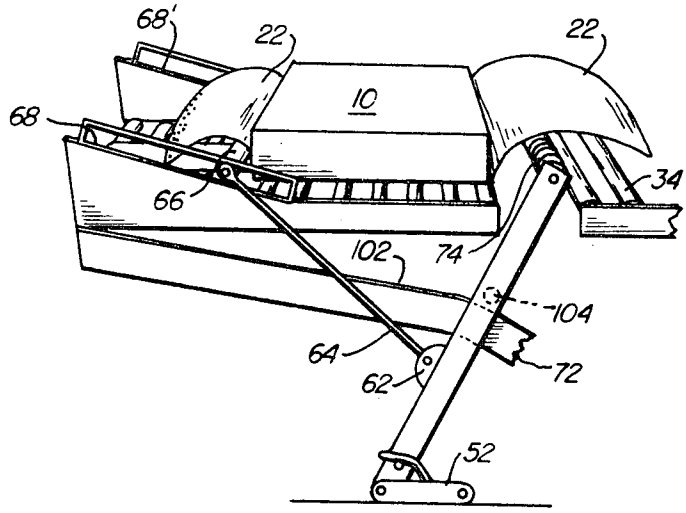
[52] **U.S. Cl.** ..... **53/209,** 53/198 R
[51] **Int. Cl.** **B65b 11/10,** B65b 49/16
[50] **Field of Search** 53/137, 198, 209, 211, 212, 214, 215, 217, 218

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Primary Examiner—Theron E. Condon
Assistant Examiner—Neil Abrams
Attorney—Gunnar A. Gustafson

ABSTRACT: A bundle-wrapping device is disclosed for wrapping paper about a bundle moving along a conveyor in the direction of movement of the bundle. The wrapping roller for wrapping the paper about the bundle is activated directly by the bundle moving along the conveyor.



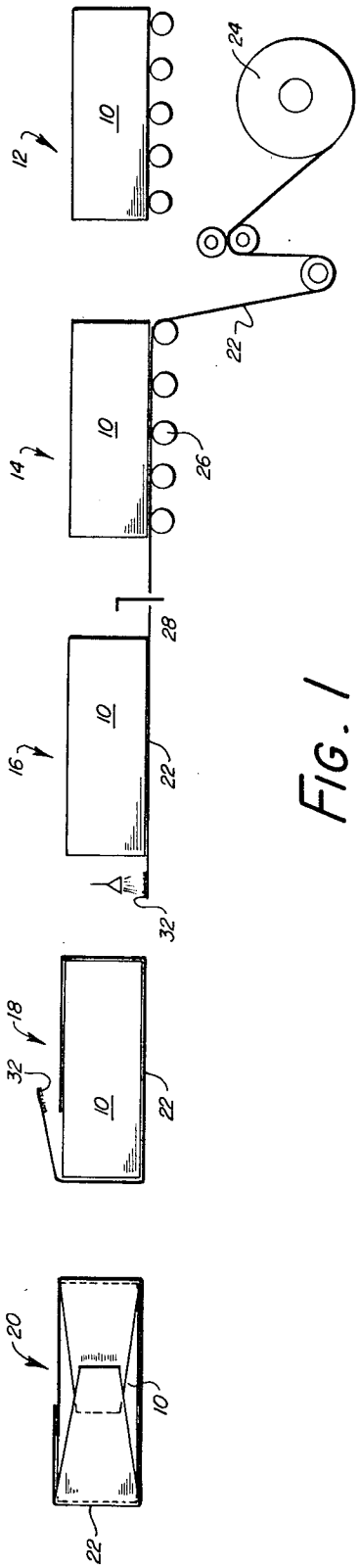


FIG. 1

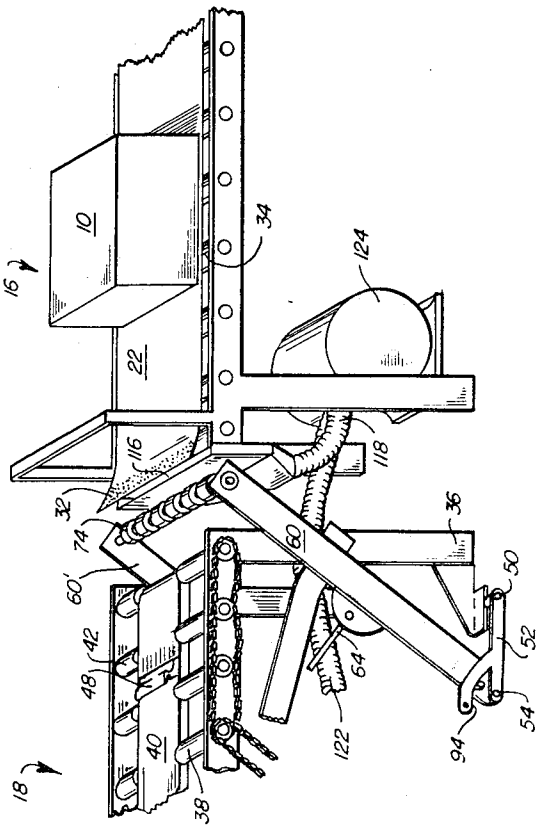


FIG. 2

INVENTOR.
GEORGE H. SUNDIN
BY
HIS ATTORNEY

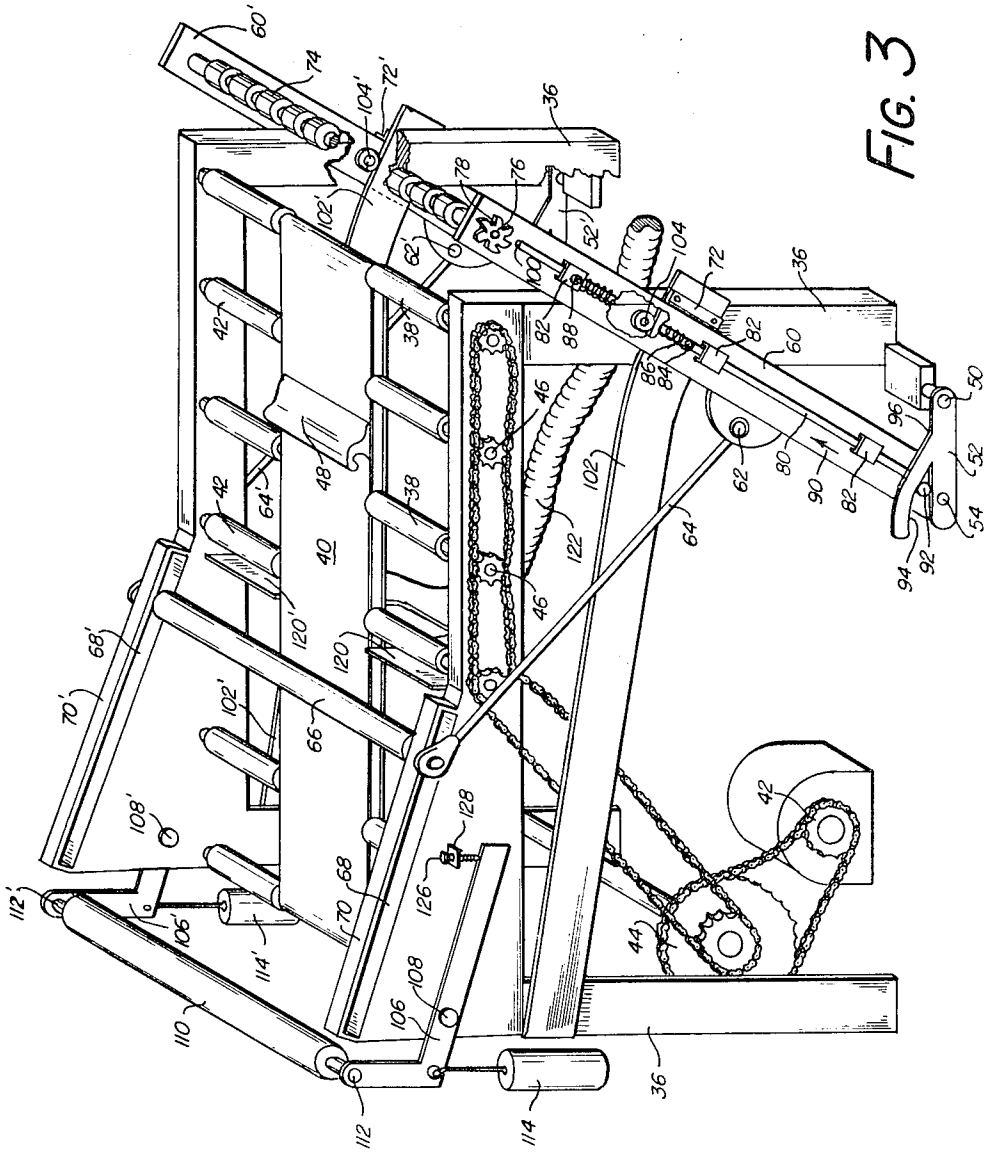


FIG. 3

INVENTOR.
GEORGE H. SUNDIN
BY
HIS ATTORNEY

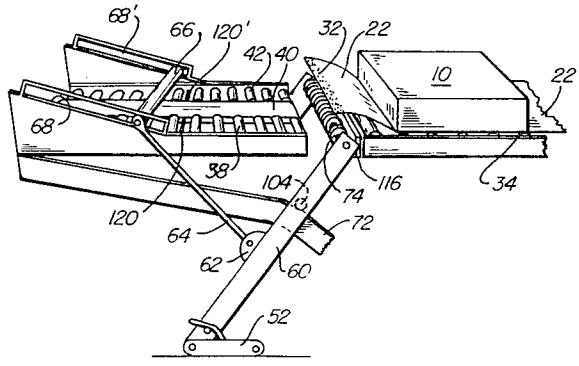


FIG. 4

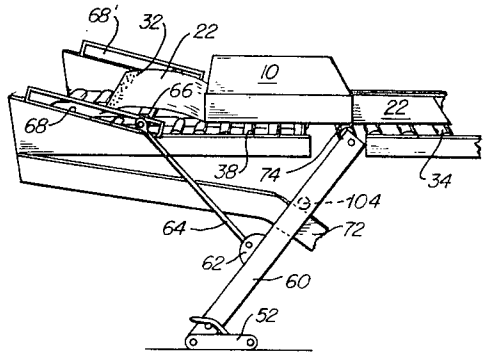


FIG. 5

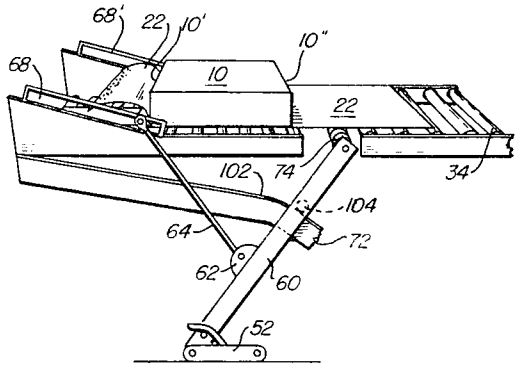


FIG. 6

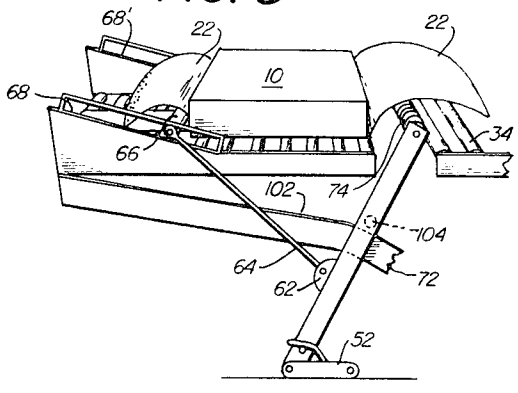


FIG. 7

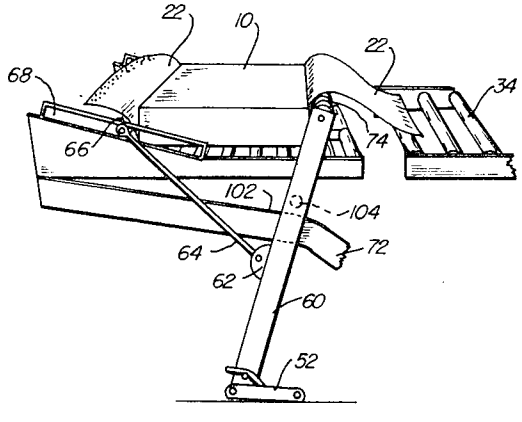


FIG. 8

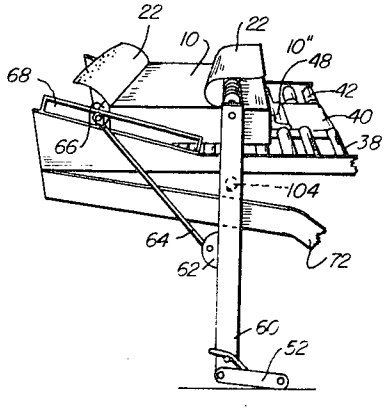


FIG. 9

INVENTOR.
GEORGE H. SUNDIN
BY
HIS ATTORNEY

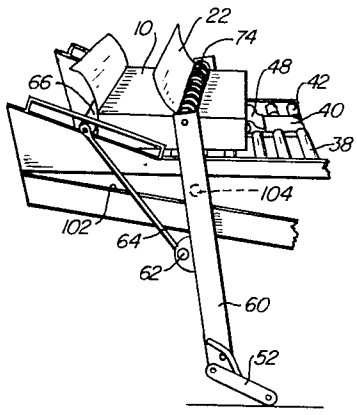


FIG. 10

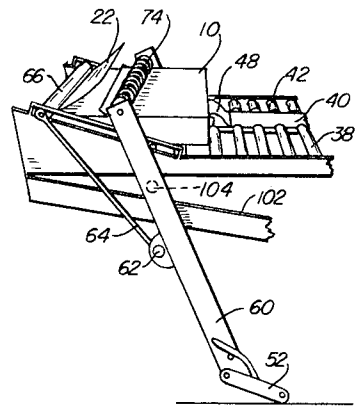


FIG. 11

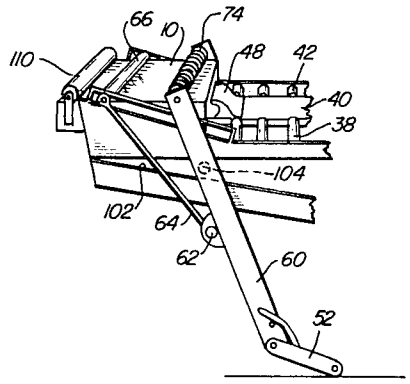


FIG. 12

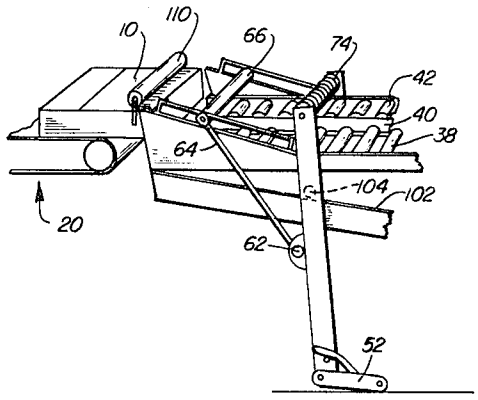


FIG. 13

INVENTOR.
GEORGE H. SUNDIN
BY
HIS ATTORNEY

BUNDLE-WRAPPING APPARATUS

A number of devices, usually referred to as girth wrappers, have been designed and built for wrapping paper about a bundle in one direction.

Prior art devices have required expensive timing mechanisms, arms, cams, and the like which have made such devices extremely expensive.

This invention is directed to a girth-wrapping machine in which the power provided by the conveyor itself and the bundle moving along the conveyor serves to activate the actual wrapping mechanism thus decreasing the power requirements and greatly decreasing the cost of such apparatus generally.

One object of the invention is to provide a girth wrapping machine that is simple to construct and economical to maintain.

Another object of the invention is to provide a girth wrapper which will operate to wrap paper around a bundle from a roll of paper.

Still another object of the invention is to provide a girth wrapper that requires the minimum amount of moving parts while at the same time providing for accurate wrapping of the bundle.

These and other objects of the invention will be apparent to those skilled in the art from the following specification and drawings in which:

FIG. 1 is a schematic showing of the sequence of steps involved in wrapping a bundle,

FIG. 2 is a view from the side and from somewhat above the the infeed end of the apparatus of this invention,

FIG. 3 is a perspective view of the apparatus of the invention, and

FIGS. 4 through 13 shows the sequence of operation of the device.

As shown in FIG. 1, a bundle 10 of generally flat and rectangular shape moves through successive stations 12, 14, 16, 18 and 20. At station 12 the bundle 10 is fed onto the line for wrapping and moves along to station 14 where wrapping paper 22 from a roll 24 thereof is fed beneath the bundle 10 and between it and the conveyor 26. From this station the bundle 10 moves to the station 16 where the wrapping paper 22 is cut from the roll as by a knife schematically shown at 28. Also at station 16 the adhesive 32 is applied to the leading edge of the paper 22 by any suitable means such as nozzle 30. The bundle 10 with the wrapping paper 22 thereunder is then fed to station 18 by suitable conveyors where the paper 22 is wrapped around the bundle in one direction, i.e. the direction of movement of the bundle. The bundle 10 is then moved to the station 20 where the ends of the paper are suitably folded and sealed. The end folding as indicated schematically at station 20 is accomplished by known commercially available devices. This invention is directed to apparatus for the station 18 where the wrapping paper 22 is folded about the bundle 10 and sealed by the adhesive 32 previously applied.

The infeed end of the apparatus of the invention for wrapping the paper 22 around the bundle 10 at station 18 is shown in FIG. 2. As shown in FIG. 2 the apparatus at station 18 is fed with bundles from the conveyor 34 of the station 16. The girth wrapper of the invention comprises a frame 36 supporting at its upper end two series of spaced driven roller conveyors 38 and 42, the tops of which are generally in the plane of the conveyor 34 from station 16. The rollers 38 and 42 are suitably driven by a motive source such as an electric motor 42 through reduction gears 44 and a chain drive 46 (see FIG. 3). The centrally located conveyor 40 is driven by suitable means such as a motor (not shown) to move articles thereupon in the same direction as such articles are urged by the rollers 38 and 42. The conveyor 40 has spaced lugs 48 for moving articles along the conveyor (from right to left) in FIGS. 2 and 3.

Pivoted at 50 to a portion of the lower end of the frame is a short link 52 which has pivoted at 54 a longer upstanding arm 60. On the opposite side of the machine a line 52' is pivoted at 50' to a lower portion of the frame and has pivoted thereto at 54' an arm 60' extending upwardly and rearwardly. The link 52 and arm 60 are parallel respectively with link 52' and arm 60'.

Intermediate their ends the arm 60 and 60' have pivoted thereto at 62 and 62' respectively two forwardly and upwardly projecting arms 64 and 64' respectively. At their upper ends the arms 64, 64' have journaled thereacross a roller 66. At its ends the roller 66 rests upon upwardly and forwardly inclined cam tracks 68 and 68'. Retainer members 70 and 70' hold the roller 66 downwardly in contact with the cam tracks 68 and 68' respectively.

The arms 60 and 60' are held by gravity against stop members 72 and 72' respectively. At their upper ends the arms 60, 60' have journaled therebetween a roller 74 extending transversely of the machine between the arms 60 and 60'.

The shaft 76 to which the roller 74 is fixed extends through and is journaled in the arms 60 and 60'. The shaft 76 extends well beyond the arm 60 and has fixed thereto a ratchet gear 78. Slideably mounted longitudinally of the arm 60 is a ratchet-engaging stop 80. The ratchet-engaging stop 80 lies against the arm 60 and is held in place in longitudinal sliding relationship by means of three straplike attachment brackets 82. The ratchet-engaging stop 80 has secured thereto at 84 a spring 86 which has the other end thereof secured upwardly therefrom to the arm 60 at 88. The tension of the spring 86 tends to urge the ratchet stop 80 in the direction of the arrow 90. The lower end of the ratchet stop 80 has a cam follower roller 92 engaged with a cam track 94. The cam track 94 is secured at 96 to the short link 52 as by welding or other suitable means. In the at-rest position of the device as shown in FIGS. 2 and 3 the cam follower 92 is caused by the shape of the cam track 94 to hold the ratchet stop 80 downwardly such that the upper end 100 of the ratchet stop 80 is out of engagement with the ratchet gear 78. Upon actuation of the device as hereinafter described, the cam track 94 will permit the ratchet stop 80 to move upwardly in the direction of the arrow 90 thus engaging the end 100 of the ratchet stop 80 in the ratchet gear 78 to prevent rotation of the roller 74 in one direction. Engagement of the ratchet stop end 100 with the ratchet gear 78 will permit rotation of the gear 78, the shaft 76 and the roller 74 only in the clockwise direction (as viewed in FIG. 3).

Between the arm 60 and the frame 36 is a downwardly and rearwardly extending cam track 102. On the opposite side of the machine a similar cam track 102' extends parallel to the cam track 102 downwardly and rearwardly of the machine between the arm 60' and the frame 36. Rotatably mounted to the inside of the upstanding arm 60 is a cam follower roller 104 (viewed in FIG. 3 through the broken-away portion of arm 60) which bears against the top surface of the cam track 102 when the apparatus is in its at-rest position as shown in FIG. 3. A similar roller 104' (viewed in FIG. 3 through a broken-away portion of the frame 36) is rotatably mounted to the inside of the upstanding arm 60' to bear against the cam track 102'. The rearward ends of cam tracks 102 and 102' fixedly support the stops 72, 72' respectively.

At the forward (downstream) end of the machine are two L-shaped levers 106 and 106' pivoted respectively at 108 and 108'. At the upper ends 112, 112' of the short arms of the L-shaped levers 106, 106' is journaled a roller 110. At the juncture of the two arms of the L-shaped levers 106 and 106' are hung weights 114 and 114'.

A narrow air outlet or air slice 116 (see FIG. 2) extends the width of the machine between the roller 74 and the end of the infeed conveyor 34 from station 16. The air slice 116 is connected by a suitable tube 118 to a blower fan 124. Another air slice comprises two outlets 120 and 120'. The outlet 120 is positioned in the series of conveyor rollers 38 immediately preceding the roller 66 and the other outlet 120' is positioned within the conveyor roller series 42 immediately ahead of the same roller 66. The air slice 120—120' is connected by a tube 122 to the blower fan 124.

OPERATION

In operation the motor 42 is energized to operate the two series of conveyor rollers 38 and 42 continuously in a counterclockwise direction as the ends are viewed in FIGS. 2 and 3, thus to move a bundle thereupon from right to left. The blower fan 124 is operated continuously to cause air to issue from the air slice 116 and the air slice 120—120'.

The conveyor 40 with the bundle-engaging and pushing lugs 48 thereon is operated to move the bundle from right to left as viewed in FIGS. 2 and 3 but is timed by a suitable mechanism, not shown, to push the bundle 10 through the device in a timed sequence with the succeeding end-sealing machine at station 20. That is to say that only when a bundle from station 16 can be received in station 20 will the conveyor 40 operate to move a bundle 10 through the girth-wrapping machine of station 18.

As shown in FIG. 4, the bundle 10 and the paper 22 are moved along conveyor 34 from station 16. The paper 22 has an adhesive line 32 sprayed along the leading edge thereof. As the paper reaches the air slice 116, the air issuing therefrom lifts the paper to permit it to ride over the roller 74. The paper 22 then will lay upon the series of conveyors 38, 40, and 42 and will move along with bundle 10 under the urging of conveyors 38 and 42. The conveyor 40 is not operated at this time, it being stopped with all lugs 48 positioned out of the path of the bundle. As the leading edge of the paper 22 reaches the air slice 120—120', the air slice 120—120' lifts the leading edge of the paper 22 over the roller 66 so that it rests above and upon the roller 66 as shown in FIG. 5. The paper 22 and the bundle 10 thereon can then continue to move forwardly as moved by the roller conveyors 38 and 42 until the forward edge of the bundle 10 comes up against and abuts the roller 66 with the paper 22 pinched therebetween as best shown in FIG. 6. It will be appreciated that the various parts are so dimensioned as to permit the roller 66 to be abutted by the leading end 10' of the bundle 10 slightly above the bottom of the bundle.

When the leading end 10' of the bundle comes up against the roller 66 with the paper 22 pinched therebetween the weight of the bundle-wrapping apparatus including the arms 60, 60' and the roller 74 as well as the associated parts will hold the bundle 10 against further forward movement and as such the rollers of the roller conveyors 38 and 42 will skid beneath and against the wrapping paper 22.

When the end-sealing apparatus at station 20 is capable of receiving another bundle 10 the conveyor 40 is automatically energized by means of a motor, switches, relays, and the like (not shown) to bring the driving lug 48 of the conveyor 40 upwardly from the rear of the bundle and against the rearward end 10'' of the bundle with the paper 22 therebetween as shown in FIG. 7. Further forward movement of the conveyor 40 and in particular of the lug 48 thereon forces the bundle 10 forwardly against the roller 66 with sufficient force to cause the roller 66 to begin to travel forwardly and upwardly along the cam tracks, 68, 68'. As the roller 66 moves along the cam tracks 68 and 68', the roller will move vertically upwardly along the leading end 10' of the bundle pressing the paper 22 tightly upwardly against the leading end 10' of the bundle. It will be appreciated that the roller 66 has a rubber surface thereon and may be a continuous rubber roller or a plurality of rubber discs of like diameter spaced along a central metal shaft. Additionally, as the roller 66 moves forwardly and upwardly along the tracks 68, 68' it pulls the arms 60, 60' after it by virtue of its connection to arms 60 and 60' through the rods 64, 64' at pivots 62, 62'.

It should be pointed out here that forward movement of the arms 60, 60' under the urging of the rods 64, 64' pulled by the roller 66 lifts the cam followers 104, 104' out of engagement with the cam tracks 102, 102' soon after the forward movement of the arms 60, 60' begins to take place (see FIG. 7). Accordingly, during the forward movement of the arms 60, 60' the rollers 104, 104' do not engage the cam tracks 102, 102' and serve no purpose.

Because of the relative dimensions and pivot points of the arms 60, 60' compared with the rods 64, 64' it will be appreciated that the speed of movement of the roller 74 will be considerably greater than the movement of the roller 66.

In this way the roller 74 "catches up" with the roller 66 as indicated in FIG. 7–12. As shown in FIG. 7 the roller 66 has moved but slightly along the cam tracks 68, 68' and yet the roller 74 has already moved out of its at-rest position and is coming into contact with the upper part of the rearward end 10'' of the bundle above the lug 48 with the paper 22 pressed against the end 10'' by roller 74. It will be appreciated that the roller 74 may, like roller 66, be a continuous rubber roller or may have a series of rubber discs mounted upon the metal shaft 76.

Further movement of the bundle 10 under the force applied thereto by the lug 48 continues to move the roller 66 further along and up the cam tracks 68, 68' and moves the roller 74 upwardly along the rearward end 10'' of the bundle 10 as shown in FIG. 8. As shown in FIG. 8, at about the time that the roller 74 comes into engagement with the top rearward corner of end 10'' of the bundle with the paper 22 nipped therebetween, the cam follower 92 has moved along the cam track 94 sufficient to permit the spring 86 to move the ratchet stop 80 upwardly thus engaging the ratchet stop end 100 with the ratchet gear 78 and preventing rotary movement of the roller 74 in one direction. In this way the roller 74 skids along the paper 22 pressing the same tightly against the bundle 10.

It will be appreciated that as the arms 60, 60' are caused to move by the roller 66, the arms in effect lengthen since there is a double pivot (one at 50—50' and another at 54—54') so that the links 52, 52' are added to the length of the arms 60, 60'. This extension of the arms 60, 60' takes place at various points in the cycle depending upon the size of the bundle being wrapped and the lengths of the arms 60, 60' and links 52, 52'. As shown herein the extension does not take place until FIG. 8. This double pivot and added link arrangement also permits the roller 74 to follow a straight path upward along the rearward end 10'' and then a straight path along the flat upper surface of the bundle 10 rather than describing an arc.

It will be seen from FIGS. 9 and 10 that as the roller 66 moves forwardly and upwardly along the cam tracks 68, 68' under the urging of the bundle 10 and the lug 48, the roller 74 continues to skid along the paper upwardly over the upper corner of the rearward end 10'' and is then moved forwardly along the top surface of the bundle 10.

Continued movement of the bundle 10 through the device continues to move the roller 66 up the cam tracks 68, 68' and continues to move the roller 74 forwardly at a greater rate than the forward movement of the roller 66. As previously indicated, the roller 74 cannot roll along the surface of the paper 22 by virtue of the engagement of the ratchet stop end 100 with the ratchet gear 78.

Continued movement leads to the position shown in FIG. 11. In FIG. 11 the roller 66 has now moved vertically completely along the vertical extent of the forward end 10' of the bundle and has reached the upper leading corner of the bundle 10. At this point the roller 74 has completed smoothing the trailing edge of the paper 22 and forward movement of the rollers 66 and 74 ceases. At this point the bundle 10 begins to move beneath the roller 66 thus smoothing the leading edge of the paper 22 onto the trailing edge thereof and sealing the same along the glue line 32 (see FIG. 12). At this time the roller 74 may rotate (clockwise as viewed in the figures) since the ratchet will permit rotation in that direction. At this point the bundle passes beneath the weighted roller 110 which is urged downwardly by the weights 114—114' and thus presses firmly upon the paper 22 over the glue line 32.

After the bundle 10 has passed out of engagement with the rollers 74 and 66 (see FIG. 13) the entire mechanism including the roller 66, the roller 74, the arms 60, 60' and the other parts attached thereto fall by gravity vertically downwardly such that the cam follower rollers 104, 104' engage the cam tracks 102, 102'. This engagement causes the apparatus to be

guided rearwardly and downwardly under the force of gravity until the same returns to its original position as shown in FIG. 2 with the arms 60, 60' in engagement with the stops 72, 72'.

It will be appreciated that bundles of varying thickness can be accommodated so long as their thickness does not exceed the vertical extent of the cam tracks 68, 68'. Additionally, various adjustments can be provided in the apparatus including adjustments for the lengths of the arms 60, 60' as well as the lengths of the rods 64, 64' and the lengths of the links 52, 52'. These various adjustments are not shown since they will be readily apparent to those skilled in the art. One adjustment for the roller 110 is shown as comprising a bolt 126 threadedly engaged in a threaded opening in a laterally extending lug 128 on the frame. The lower end of the bolt 126 engages the rearward end of the L-shaped arm 106 to limit the downward movement of the roller 110 about the pivot 108. This adjustment is so made as to insure that the lowest surface of the roller 110 when at rest (as shown in FIG. 3) is slightly below the top edge of the bundle 10. When the bundle 10 moves beneath the roller 110 the roller will be moved upwardly and will roll over the top of the bundle as the bundle moves therebeneath.

As indicated above, after the bundle 10 exits from the girth-wrapping machine it enters into station 20 where the ends of the paper are folded in and glued in place by a known mechanism.

The cam 94 is so shaped that in the at-rest position of the apparatus as shown in FIGS. 2, 3, 4, 5, and 6 the stop 100 is out of engagement with the ratchet gear 78 thus permitting the roller 74 to rotate in either direction at this time. This is necessary since in the at-rest position as shown in FIGS. 2 through 6 the roller 74 serves to support a bundle entering the apparatus from station 16 and as such must be free to turn counterclockwise as viewed in the figures. Additionally, when the roller 74 first contacts the back end 10'' of the bundle (between FIG. 7 and FIG. 8) it must be free to rotate upward along the back end 10'' of the bundle or it would tend to lift the back end 10'' off of the conveyors 38, 40, and 42. As indicated above, ideally the ratchet stop 100 should engage the ratchet gear 78 just immediately before the roller 74 reaches the upper rear corner of the bundle as indicated in FIG. 8. This will not lift the bundle, but will insure a tight smooth pull of the paper 22 up and over the upper rear corner. As indicated, the cam track 94 is shaped to accomplish this timed engagement and disengagement of the stop 100 with the gear 78.

I claim:

1. An apparatus for wrapping a sheet about an article moving in one direction comprising a frame, a conveyor on said frame for moving articles in said one direction, a first pair of links pivoted to said frame, a second pair of links respectively pivoted to said first pair of links, a first sheet smoothing and wrapping roller extending between said second pair of links and journaled therein for smoothing and wrapping a wrapping sheet over an article, a pair of arms pivoted respectively to aid second pair of links intermediate the ends thereof, a second roller extending between said pair of arms and journaled therein for wrapping said sheet over said article toward said first roller, said second roller being positioned such as to be contacted by an article being conveyed by said conveyor.

2. An apparatus for wrapping a sheet about an article moving in one direction comprising a frame, a conveyor on said frame for moving articles forwardly in said one direction, a first pair of links pivoted to said frame, a second pair of links respectively pivoted to said first pair of links, a first roller extending between said second pair of links and journaled therein for rolling a wrapping sheet up and over an article, a pair of arms pivoted respectively to said second pair of links intermediate the ends thereof, a second roller extending between said pair of arms and journaled therein, said second roller being positioned such as to be contacted and moved forwardly by an article being conveyed by said conveyor, means for moving said second roller over a surface of an article being conveyed as said roller is being moved forwardly under the urging of an article being conveyed to wrap said wrapping sheet over said surface of the article toward said first roller.

3. An apparatus for wrapping a sheet about an article moving in one direction comprising a frame, a first arm pivoted at one end to said frame, a second arm pivoted at one end to said first arm intermediate the length of said first arm, a first sheet-smoothing and wrapping roller journaled in the other end of said first arm for wrapping a sheet over said article, and a second sheet-smoothing and wrapping roller journaled in the other end of said second arm for wrapping said sheet over said article in a direction opposed to that of said first roller.

4. An apparatus for wrapping a sheet about an article moving in one direction comprising a frame, a conveyor on said frame for moving articles forwardly in said one direction, a first pair of arms pivoted to said frame, a second pair of arms pivoted respectively to said first pair of arms intermediate the ends of said first pair of arms, a first wrapping roller extending between said first pair of arms and journaled therein for wrapping a sheet over said article, a second roller extending between said second pair of arms and journaled therein for wrapping a sheet over said article in a direction toward said first roller, said second roller being positioned such as to be contacted by an article being conveyed by said conveyor whereby forward movement of said article causes movement of said rollers over the surface of said article, and means to alter the length of said first pair of arms during operation of the apparatus whereby said first roller follows the contour of said article during the wrapping thereof.

5. The apparatus of claim 3 including means to prevent rotation of said first roller in at least one direction during at least a portion of the operation of the apparatus.

6. The apparatus of claim 3 in which said first arm comprises two links pivoted to each other.

7. The apparatus of claim 4 in which said means comprises said first pair of arms being jointed intermediate their length.

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