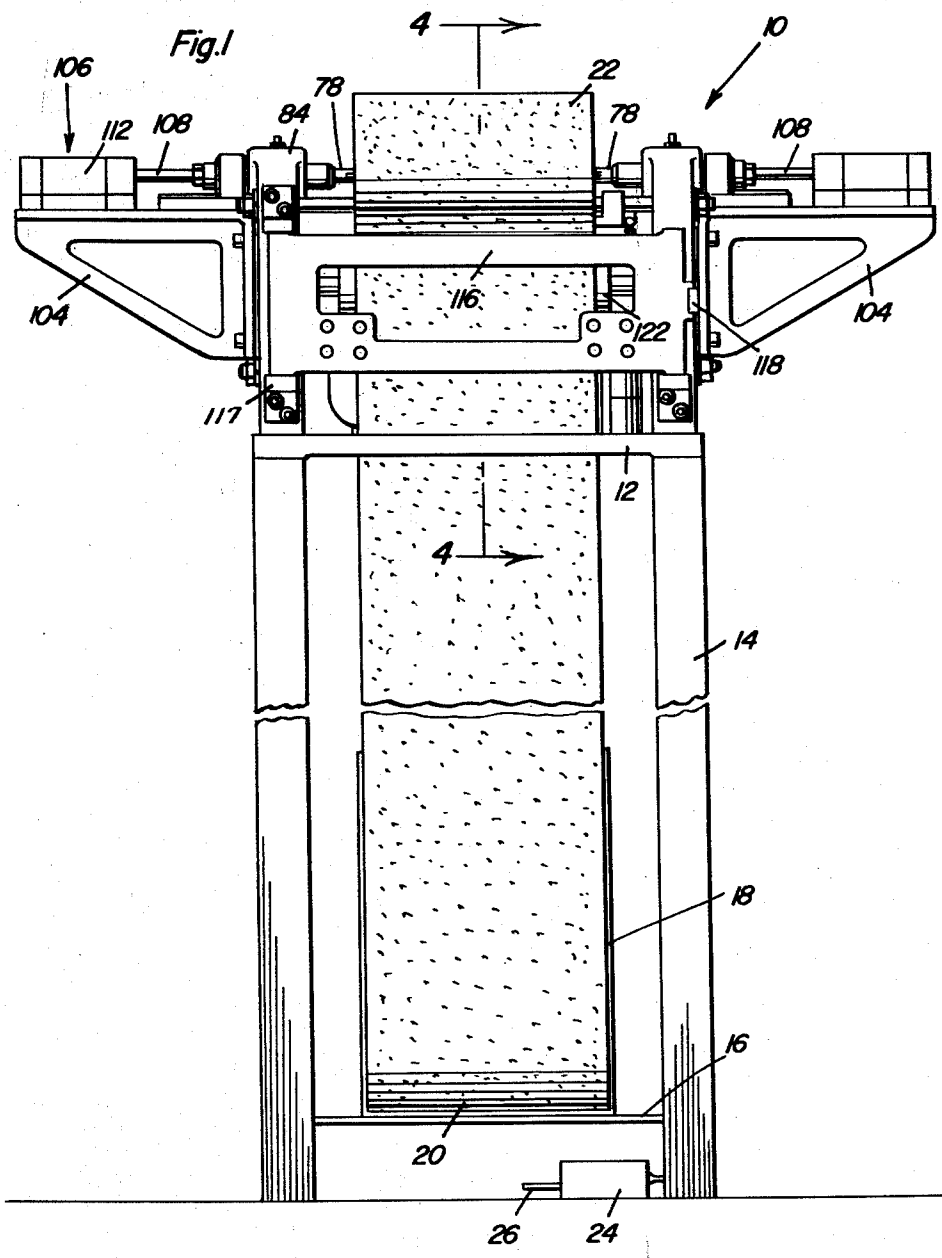
July 16, 1963 J. M. DARMAN 3,097,806

TOWEL ROLL WINDING MACHINE

Filed Feb. 21, 1961 4 Sheets-Sheet 1

Fig. 1



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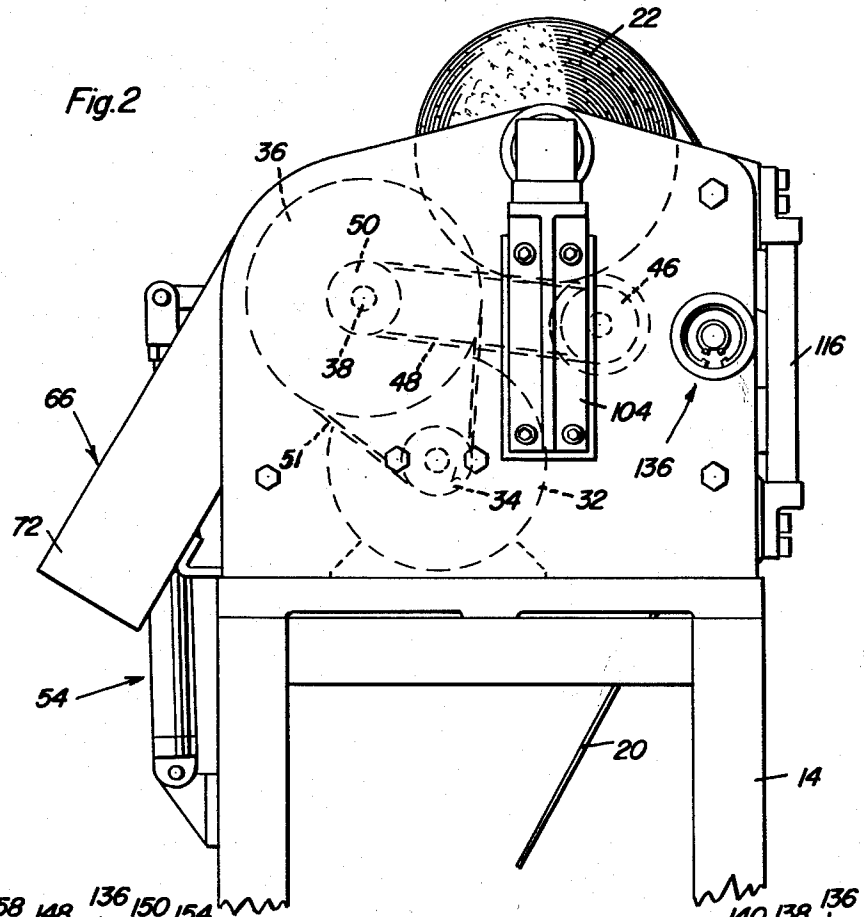
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July 16, 1963 J. M. DARMAN 3,097,806

TOWEL ROLL WINDING MACHINE

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Fig.2



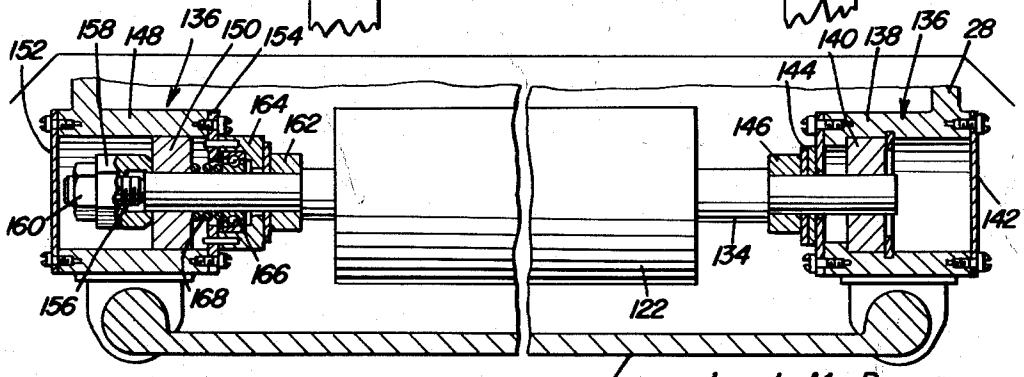


Fig.6

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TOWEL ROLL WINDING MACHINE

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Fig.3

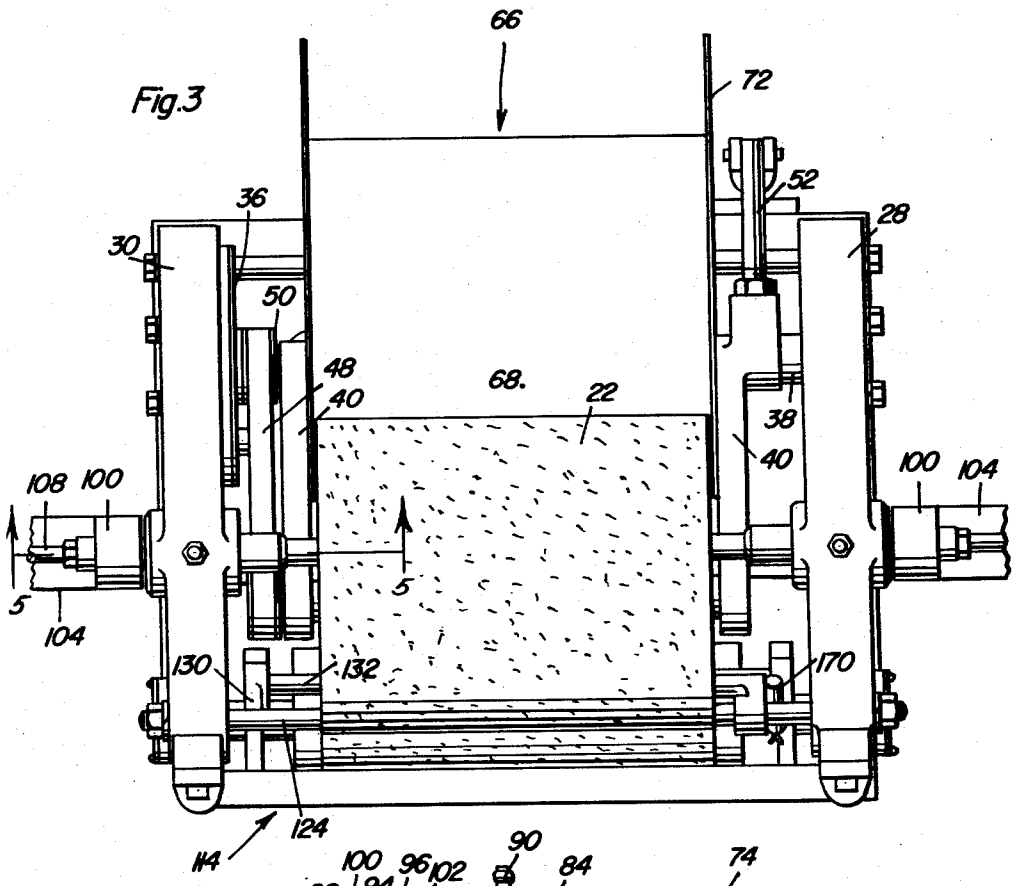
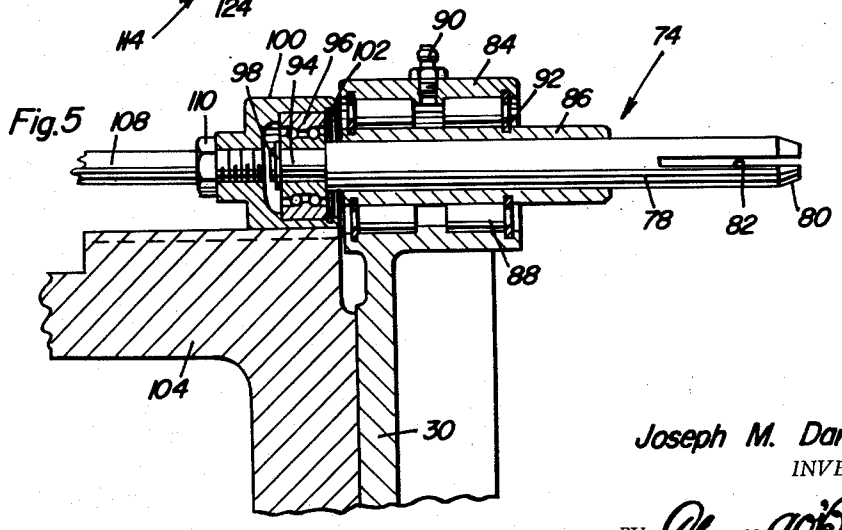


Fig.5



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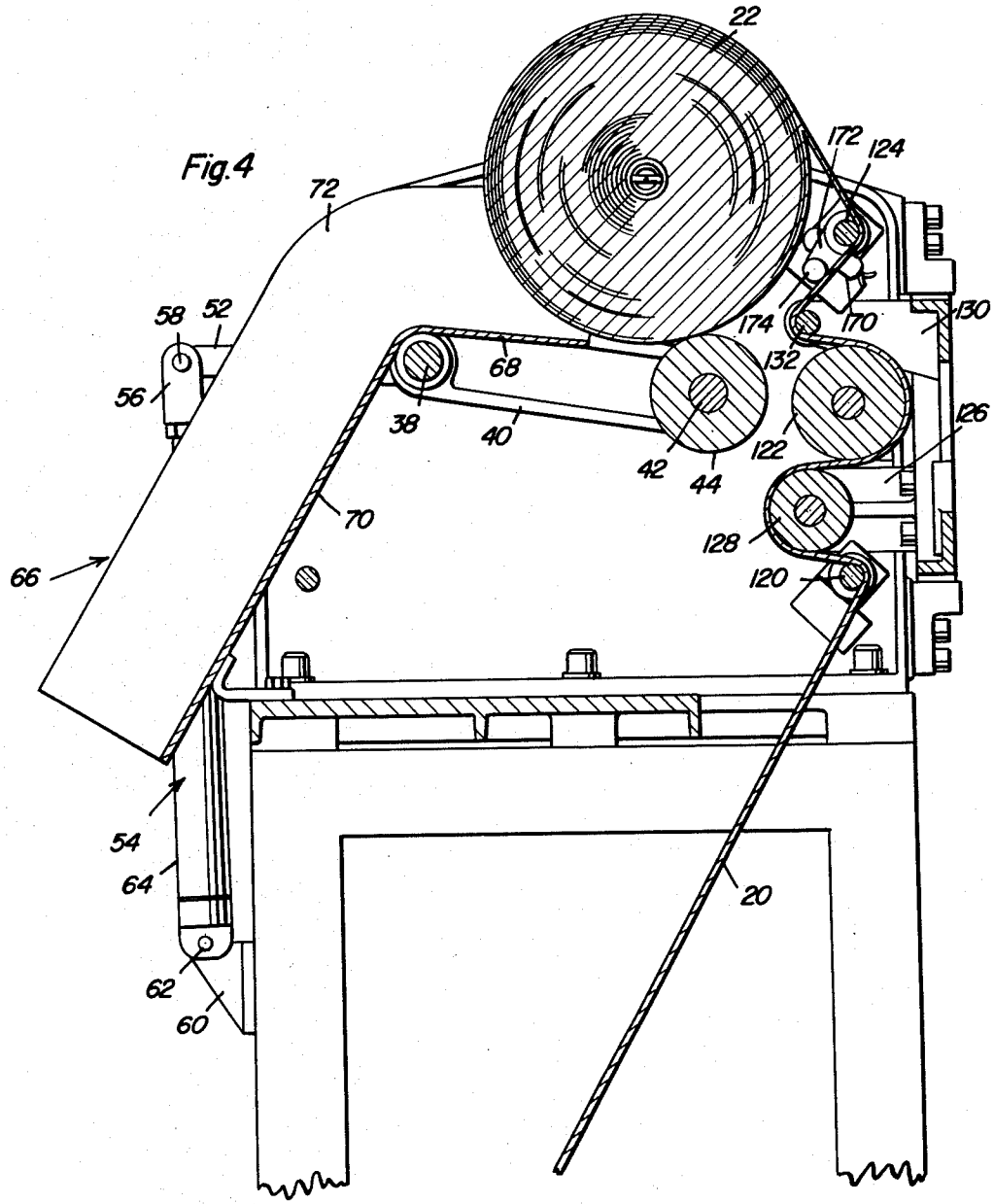
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TOWEL ROLL WINDING MACHINE

Filed Feb. 21, 1961 4 Sheets-Sheet 4

Fig. 4



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United States Patent Office 3,097,806 Patented July 16, 1963

3,097,806

TOWEL ROLL WINDING MACHINE

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Filed Feb. 21, 1961, Ser. No. 90,811
10 Claims. (Cl. 242—57)

The present invention generally relates to a winding machine for toweling and more particularly to such a mechanism which will automatically de-energize itself when the toweling has been completely wound into a roll and also automatically discharge the roll.

Towel winding machines have been employed previously in which the towel is wound on a take-up rod. Inasmuch as the rolls of toweling are supplied to the dispenser cabinet without the take-up rod, it is necessary to remove the rod after the toweling has been wound thereon. This is time consuming and laborious. Further previous towel winding machines employed a manually operated switch for stopping the machine after the toweling has been completely wound into a roll. Inasmuch as the winding of the toweling is in the nature of a high production procedure, the time wasted in the delay by the operator in cutting off the machine and removing the roll of toweling therefrom and then removing the wind-up rod sometimes takes as long as the winding or rolling operation itself and this, of course, reduces the efficiency of this operation. Therefore, it is the primary object of the present invention to provide a towel winding machine which will automatically stop itself when the towel has been completely wound into a roll and at the same time will automatically withdraw partial spindles thereby enabling the towel to automatically discharge itself from the machine.

Another object of the present invention is to provide a towel roll winding machine having a novel drive arrangement which is counterbalanced to maintain it in frictional contact with the exterior surface of the towel roll for driving the towel and also aiding in the ejection of a finished towel roll from the machine.

Still another object of the present invention is to provide a towel roll winding machine having partial spindles slotted for receiving the edges of the beginning end of the towel roll thereby forming a spindle for the towel in which the spindles are retractible to a position exteriorly of the ends of the towel roll for disconnecting the spindles from the towel roll.

A further object of the present invention is to provide a towel roll winding machine having a mechanism sensitive to the presence or absence of toweling for automatically cutting off the machine in the absence of toweling being wound into a roll and further including a novel assembly in the form of a swingable gate having certain of the smoothing and tensioning mechanism mounted thereon for enabling easier loading of the toweling into the machine for winding into a roll.

Yet another important feature of the present invention is to provide a towel roll winding machine which is quite simple in construction, easy to use, substantially foolproof in operation and relatively inexpensive to manufacture and maintain.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a front view of the machine of the present invention;

FIGURE 2 is a side elevational view of the winding machine;

FIGURE 3 is a top plan view of the machine;

FIGURE 4 is a vertical sectional view taken substantially upon a plane passing along section line 4—4 of FIGURE 1 illustrating the relationship of the various components of the invention;

FIGURE 5 is a detailed sectional view taken substantially upon a plane passing along section line 5—5 of FIGURE 3 illustrating the construction of the retractible spindles; and

FIGURE 6 is a longitudinal vertical sectional view of the mounting for one of the rollers illustrating the structure thereof.

Referring now specifically to the drawings, the numeral 10 generally designates the towel roll winding machine of the present invention which includes a base platform 12 supported by a plurality of legs 14 or any other suitable supporting means. The legs 14 may be conveniently angle iron members or the like and adjacent the bottom of the legs 14 there is provided a shelf or platform 16 receiving a bin 18 for holding folded toweling 20 which is to be wound into a towel roll 22 by the present machine. The folded toweling 20 is in the condition which enables it to be easily rolled since the folds are quite easily straightened out as the toweling is rolled into a roll. Adjacent the bottom of the stand is a foot control switch 24 having an operating lever 26 thereon for manipulation by the foot whereby the machine may be started after the toweling has been threaded into the machine. The particular details of the stand are not important to the present invention and the platform 12 may be secured thereto in any suitable manner.

The machine includes a pair of side members 28 and 30 generally in the form of side plates. The side plates are rigid with the platform 12 and are secured in rigid conditions therewith by welding, bolting or the like.

Supported on the platform 12 intermediate the side members 28 and 30 is an electric drive motor 32 of any suitable horsepower which is mounted in any suitable manner thereon. The motor 32 is provided with an output pulley 34 that is drivingly connected with an enlarged pulley 36 in alignment therewith and the enlarged pulley 36 is supported by shaft 38 journaled between the side members or plates 28 and 30. Mounted on the shaft 38 is a pair of arms 40 which are pivotal about the shaft 38 and the arms 40 have a shaft 42 at the free end thereof which journals a friction roller 44 for rotation. The friction roller 44 is driven from a V-belt pulley 46 connected thereto and a V-belt 48 which is in encircling engagement with a smaller pulley 50 rigid with the enlarged pulley 36. Thus, the driving of the friction roller 44 is accomplished by the motor 32, through the pulley 34, through a V-belt 51 to the enlarged pulley 36 which is a speed reduction pulley and from the large pulley 36, the small pulley 50 is driven due to rigid attachment and the V-belt 48 drives the pulley 46 which in turn drives the friction drive roller 44 due to its rigid connection therewith.

The end of one of the arms 40 remote from the shaft 42 is provided with an arm 52 extending in opposition to the arm 40. The arm 52 is connected to a spring loaded counter-balance device generally designated by numeral 54. The upper end of the counterbalance device 54 is provided with a clevis or shackle 56 connected to the arm 52 by virtue of a pin 58. The lower end of the counterbalance mechanism 54 is connected to a bracket 60 attached to one of the stand legs 14 with pivotal connection being accomplished by the pivot pin 62. The counterbalance mechanism 54 is in the form of a cylindrical casing 64 having a plunger slidable therein in which

the plunger is spring urged downwardly by virtue of a spring disposed between a head on the plunger and the top end of the casing 64 thus normally biasing the guiding roller 44 upwardly into driving engagement with the towel roll 22 whereby the towel roll 22 will be driven from the peripheral surface thereof and as the diameter of the towel roll increases, the friction drive roller 44 will merely move downwardly and bias the counterbalance mechanism 54. In lieu of the spring loaded counterbalance mechanism 54 as illustrated in the drawings, counterbalancing of the friction drive roller 44 could well be accomplished by providing a longer arm 52 having a movable weight thereon for varying the counterbalance force.

Extending rearwardly and downwardly from the machine is a discharge chute generally designated by numeral 66 and including a generally short horizontal portion 68 and a downwardly inclined portion 70. Side walls or guides 72 are provided throughout the length of the chute 66 and the walls 72 are spaced in such a manner as to receive the towel roll 22 and, as illustrated in FIGURE 3, the inner end edges of the wall 72 actually lie alongside of the ends of the towel roll 22 after it has been substantially completed. The chute 66 may discharge into any suitable receptacle or onto any suitable mobile platform or the like and serves to guide the towel roll 22 during its discharge rolling movement into a desired area. When the towel roll is released from the position illustrated in FIGURE 4, the counterbalancing of the drive roll 44 will normally urge the released towel roll outwardly of the horizontal or slightly inclined portion 68 of the chute 66 so that the towel roll will be automatically discharged from the machine when the center thereof is released.

For supporting the towel roll 22, each of the side members 28 and 30 is provided with a partial spindle structure generally designated by reference numeral 74. Inasmuch as the spindle structures are the same, attention is directed to FIGURE 5 in which the details of one of the spindles is illustrated. The spindle structure 74 includes a partial spindle rod 78 having a tapered end portion 80 and a slot 82 extending longitudinally from the tapered end portion. The slots 82 are for the purpose of receiving a portion of the end edge of the toweling so that as the spindle rods 78 are rotated, the toweling will be wound thereon.

At the upper apex or top edge of the side member 30, there is provided a bearing housing 84 rotatably receiving a sleeve 86 and roller bearings 88 are provided between the bearing housing 84 and the sleeve 86. A lubrication fitting 90 is provided in the housing 84 for lubricating the bearings 88. Also, retainers 92 are provided for the roller bearings 88 and suitable grease seals may be provided if desired. The partial spindle rod 78 is reciprocal in the sleeve 86 and is provided with a reduced outer end 94 forming a bearing race for a thrust ball bearing assembly 96 which is retained on the end portion 94 by a retaining flange 98. The outer race of the thrust bearing assembly 96 is received within a cylindrical housing 100 and retained therein by a retaining ring 102. The thrust bearing assembly 96 is of the double thrust type in that it will enable relative rotation between the spindle rod 78 and the housing or socket 100 and at the same time transmit longitudinal or axial force therebetween without permitting relative longitudinal or axial movement. Thus, the spindle rod 78 may rotate while the housing 100 will not rotate but the housing 100 will effect reciprocation of the spindle 78 and the sleeve 86 when the housing 100 is reciprocated thereby retracting and extending the partial spindle rod 78. Thus, by retracting the partial spindle rod 78, the towel roll 22 may be released by virtue of pulling the tapered ends 80 out of the towel roll 22 thus completely disconnecting the towel roll and enabling it to be discharged in the manner set forth previously.

The mechanism for retracting and extending the partial spindle rod 78 is the same on both sides of the machine and includes a laterally extending wing or supporting bracket 104 which supports an actuating mechanism generally designated by the numeral 106 adjacent the outer end thereof. The actuating mechanism 106 is provided with a rod 108 extending therefrom and screw threadedly connected to the housing 100 and retained in connected relation by a lock nut 110. The actuating mechanism 106 may take several forms but the simpliest form is disclosed as a solenoid 112 for retracting the spindle rod when energized. If compressed air or pressurized hydraulic fluid is available, a pneumatic or hydraulic piston and cylinder arrangement may be provided for the actuating mechanism and suitable control valves either manually or automatically operated may be provided for effectively retracting the spindle rod when desired and extending the spindle rod after release of the roll 22.

The front of the machine is provided with a pivotal gate mechanism generally designated by the numeral 114 which includes an open rectangular gate member 116 hingedly attached to the side members 30 by hinge lugs 117 with the other end detachably connected to the side member 28 by a latch mechanism 118 of any suitable construction. The gate mechanism 114 is openable for facilitating the placement of the toweling in the machine. The toweling 20 is lifted from the bin 18 and the end thereof is attached to the partial spindle 78 by inserting the end edges into the slots 82 in an obvious manner. In this condition, the toweling is disposed exteriorly of a guide rod 120, an enlarged rubber roller 122 and an upper guide rod 124. The guide rod 120, roller 122 and rod 124 are generally in vertically spaced relation. Mounted on the gate 116 is a pair of brackets 126 which support a rubber roller 128 and also a pair of brackets 130 which engage a guide rod 132. The orientation of the various rods and rollers is illustrated in FIGURE 4 in which the roller 128 is between the guide rod 120 and the roller 122 and disposed generally inwardly thereof with the rod 132 being disposed between the roller 122 and the rod 124 and generally being disposed inwardly thereof. Thus, when the gate is closed, the toweling 20 which is overlying the rod 120, roller 122 and rod 124 is moved into a serpentine condition wherein it will pass outwardly of the rod 120 and around the inner surface of the roller 128 back out around the outer surface of the roller 122, around the inner surface of the rod 132 and around the outer surface of the guide rod 124 and then on to the roll 22. This structure serves as a tensioning mechanism and also somewhat of a smoothing mechanism to assure that the toweling will be tightly wound on the roll in a smooth and flat condition.

The larger rubber roller 122 is carried by a shaft 134 journalled in a bearing assembly 136 at each end thereof. The bearing assembly on the side member 28 includes a housing 138 receiving a bearing member or bushing 140 journalling the shaft 134. End plates 142 are provided for the housing 138 and shims 144 are provided between one of the end plates and a collar or spacer 146 on the shaft 134.

The other bearing assembly is somewhat different and includes a housing 148 receiving a bearing or bushing member 150 therein. End plates 152 and 154 are provided and the shaft 134 is provided with a threaded end portion 156 having a take-up member 158 thereon retained in position by nut 160. The shaft 134 is also provided with a collar or spacer 162 thereon which engages a bearing race 164 for a ball bearing thrust assembly 166. The housing 164 is rigid with the end plate 154 and engages the outer race of the thrust bearing assembly 166. The inner race of the ball bearing thrust assembly 166 is engaged by one end of a coil compression spring 168 which has the other end thereof engageable with the bushing 150 thereby providing a flexible mounting for the

roller **122** such that the roller may float or move slightly longitudinally so that the center of the roller will tend to align itself with the longitudinal central axis of the toweling for straightening the toweling as it passes thereover.

One of the essential features of the present invention is a mercury switch **170** mounted on an arm **172** swingable freely on the guide rod **124**. The arm **172** is provided with a feeler or lug **174** which engages the toweling **20** as it passes between guide rods **132** and **124**. As long as toweling is passing between the guide rods **132** and **124** generally in a straight line condition, the mercury switch **170** will be held in the position illustrated in FIGURE 4 for maintaining the circuit to the driving motor closed. As soon as the free end of the toweling passes the rod **132** and there no longer is any toweling between rods **132** and **124**, gravity will cause the arm **172** to swing downwardly to generally a vertical position thus causing the mercury switch **170** to pivot for opening the circuit to the electric motor thereby automatically stopping the electric motor without requiring the attention of an operator and without requiring any operation by an operator whatsoever. Thus, the machine is automatically stopped when the toweling has been completely wound into a roll. Of course, when the machine is loaded, the toweling **20** will engage the lug **174** and move inwardly when the gate **116** is moved to a closed position. Thus, the mercury switch also acts as a safety device in that the foot switch cannot effect operation of the motor until such time as the gate has been properly closed. Also, the mercury switch may be connected with the solenoid or actuating mechanism **106** through a suitable relay system or the like for automatically retracting the spindle rods **78** or the spindle rods may be separately controlled by a separate switch thus enabling an operator to place a piece of tape such as an adhesive tape, transparent plastic tape or the like across the free edge of the towel roll to prevent it from unrolling. This can be done prior to removal of the spindles by the operator thus enabling the operator to manually control retraction of the spindles by a suitable electric switch or the like or this may be done by a separate person after the towel roll has been discharged down the chute thus enabling the completely automatic operation of the spindle retracting mechanism.

The machine of the present invention provides a stationary axis of rotation for the toweling and a movable drive roller which is counterbalanced and biased into engagement with the towel roll which not only serves to drive the towel roll but also serves to aid in ejecting the towel roll when it has been released from the spindles. The structure is such that the machine cannot be operated until the gate is closed and the particular construction of the spindle rod enables easy engagement of the toweling therewith for reducing the time necessary in loading the machine. Further, stopping of the machine by the mercury switch may also serve to energize an electrical circuit for automatically releasing the partial spindle rod.

In operation, the machine is threaded by simply pivoting the gate **116** to an open position. The edge of the folded towel is lifted upwardly from the bend **18** and disposed against the outer surface of the rod **120**, roller **122** and rod **124** and also against the lug on the pivotal arm carrying the mercury switch. The end edge of the toweling **20** is then inserted into the slots **82** in the spindles **78**. The spindles **78** may be given a partial turn or several turns by hand if desired. The gate **116** is then closed and the toweling is orientated in the manner illustrated in FIGURE 4 since the roller **128** and rod **132** are attached to the gate **116**. Inasmuch as the drive roller **44** contacts the external surface of the spindles and also contacts the toweling attached thereto, the motor then may be energized thus causing rotation of the roller **44** thereby causing rotation of the spindles and the roll of toweling wound thereon. Inasmuch as the drive roller **44** contacts the external surface of the roll of toweling, the peripheral lineal speed of the toweling will remain constant. As the supply of toweling is exhausted, the mercury switch will be rendered operative for stopping the motor thus enabling a piece of adhesive tape or the like to be used to retain the toweling in a roll. The spindles are then retracted thus discharging the roll of toweling onto the discharge chute with the counterbalance driving roller serving as the means for moving the roll of toweling along the initial part of the chute which is inclined slightly upwardly as illustrated in FIGURE 4.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A towel roll winding machine comprising a frame, means on said frame forming freely rotatable supporting spindle means for a roll of toweling, drive means mounted on said frame in engagement with the roll of toweling for rotatably driving the spindle means and roll of toweling at a constant peripheral linear speed, means on said frame for smoothing and straightening the toweling as it is wound into a roll, and means responsive to the presence or absence of toweling being rolled on the roll for automatically interrupting the operation of the drive means when the toweling has been completely rolled into a roll.

2. The structure as defined in claim 1 wherein said spindle forming means includes a pair of partial spindle members, means mounting the spindle members on said frame for extension and retraction whereby the spindle members may be retracted from engagement with the towel roll thereby releasing the towel roll.

3. The structure as defined in claim 2 together with a discharge chute including an upwardly inclined portion receiving the towel roll when discharged by the retraction of the spindles, counterbalance means urging said drive means against the periphery of the towel roll for rotating the towel roll and also urging the towel roll along the upwardly inclined portion of the discharge chute when the towel roll is released by the retraction of the spindle members.

4. The structure as defined in claim 3 wherein said means smoothing and straightening the toweling includes a plurality of guide rods arranged in vertically spaced relation, a plurality of rollers arranged in spaced relation intermediate certain of the guides whereby the toweling proceeds through the guide rods and the rollers in a serpentine manner.

5. The structure as defined in claim 4 wherein at least one of said rollers and guide rods are mounted on a swingable gate, said gate being mounted on said frame for pivotal movement about a vetical axis whereby the gate may be opened for enabling the toweling to be engaged with the spindle forming means after which the gate is closed for deforming the toweling into a serpentine path.

6. The structure as defined in claim 5 wherein said means for automatically stopping the machine includes an arm freely swingably mounted on one of said guide rods, a lug on said arm engaging with the toweling extending between adjacent guide rods, and a mercury switch mounted on said arm and normally being retained in an inclined circuit closing position by the toweling for maintaining operation of the machine, the absence of toweling between the guide rods releasing the lug on the arm thereby enabling the lug to freely swing to a vertical position thereby causing the mercury switch to open the circuit to the drive means.

7. The structure as defined in claim 1 wherein said frame includes a pair of side members, laterally and outwardly extending bracket connected to each of said side members, said spindle forming means including a partial spindle member extending inwardly from each side member and rotatably and reciprocably mounted thereon, and means mounted on each bracket in rotational engagement with the spindle members for retracting the spindle members while enabling rotation of the spindle members in relation thereto for releasing the spindle members from the towel roll.

8. The structure as defined in claim 7 wherein each of said spindle members is provided with a tapered inner end portion, each inner end portion of each spindle member having a longitudinally extending slot communicating with the inner end thereof for enabling the beginning end of the toweling to be connected with the spindle members for winding of the toweling thereon.

9. In a towel roll winding machine, a pair of freely rotatable retractable partial spindle members extending inwardly from opposite sides of the machine for engagement with the center of a towel roll, a drive roller having the periphery thereof in driving engagement with the periphery of the towel roll, arm means swingably mounting the drive roller on the machine for movement toward and away from the axis of rotation of the towel roll, a

discharge chute partially underlying the towel roll for receiving the towel roll when the partial spindle members are retracted, and means connected with said arm means for urging the drive roller against the periphery of the towel roll, said drive roller being disposed below and on the opposite side of the center of rotation of the towel roll with respect to the discharge chute thereby urging the towel roll toward the discharge chute when it is released by the retraction of the spindle members.

10. The structure as defined in claim 9 wherein said discharge chute is provided with side walls projecting alongside of the towel roll and extending partially radially inwardly toward the center thereof when the towel roll is completed.

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