This invention relates to dispensing segments of a tenacious ribbon and more particularly to unwinding a roll of such ribbon and delivering equal lengths of the unwound ribbon to a desired work location.

The problem of automatically taking off a soft and tender sheet from a roll thereof and severing equal-sized segments from the unrolled sheet which are deposited in a smooth condition in a predetermined work area has rarely been encountered in commercial operations but has recently become particularly important with the recent development of tobacco sheets which, as disclosed in U.S. Patents 2,592,553 and 2,592,554 to W. G. Frankenburg and P. W. Garbo, are made by mixing dry-ground tobacco with a highly viscous aqueous solution of a binder to form a paste, spreading the paste in a thin layer and drying the layer to leave a coherent film or tobacco sheet. The ribbon segments are desired in the manufacture of smoking products; for instance, such pieces of tobacco sheet may be used as tobacco bunch binders in the manufacture of cigars. Prior mechanisms for the purposes contemplated herein have failed to function successfully with a tenacious ribbon because these mechanisms depend on an appreciable tensile strength in the ribbon for proper operation.

In accordance with this invention, segments of a weak and limp ribbon are dispensed from a roll thereof in a smooth condition in a predetermined work area by the steps of gently pulling out the starting or leading end of the ribbon away from the ribbon roll and over the desired work area while the roll is rotatably held in a fixed position, severing from the pulled out portion of the ribbon the desired segment while the pulled out portion is held in a smooth condition in the predetermined work area and repeating the pulling and severing steps using the new leading end of the ribbon which is formed with each severing step. In short, the invention contemplates means for rotatably holding the roll of ribbon in a fixed position, endless belt conveyor means adapted to move the leading end of the ribbon away from the fixed position of the roll, means to hold the ribbon against the belt conveyor, and cutting means operative to sever a desired ribbon segment from the ribbon pulled out by the belt conveyor.

For a better understanding of the invention, reference is now made to the accompanying drawings of which:

Figure 1 is an elevation of apparatus forming one embodiment;

Figure 2 is an enlarged, partial elevation, showing the belt conveyor of Figure 1 in section;

Figure 3 is a partial, broken-away plan view of the belt conveyor of Figure 1; and

Figure 4 is a sectional view taken along the line 4—4 of Figure 2.

The ribbon dispensing machine of Figures 1 to 4 comprises a supporting frame A having two horizontal bars 10, 12 and two vertical bars 14, 16 which are screwed or otherwise rigidly fastened together to form a rectangular frame. As shown in Figure 1, supporting frame A may be mounted on post pedestals 18, 20. Upper bar 12 rigidly holds an axle rod 22. Axle rod 22 carries rotatable sleeve 24 which is provided with two arms 26, 28. At the end of arm 26 is mounted a freely rotatable idler roll 30 while arm 28 carries counterweight 32 which may be set closer to or farther from sleeve 24 as desired. A rotatable bearing sleeve 34 surrounds axle 22 and supports spool ends 36 between which a roll 38 of the tenacious ribbon 40 is inserted. The ribbon roll 38 with its spool ends 36 is kept on axle 22 by collar 23 which is adjustable fastened on the free end of axle 22. A sensitive brake to control the rotation of roll 38 is provided by rigid bracket 42 mounted on bar 12 and holding one end of a leather strip or brake band 44 which is looped around a circumferential groove 46 in spool end 36 nearest bar 12 and which has its other end attached to a light coil spring 48 suspended from peg 50 on arm 26.

Ribbon 40 looping around idler roll 30 extends downwardly to lower parts of the machine. When a downward pull is exerted on the ribbon, idler roll 30 moves counterclockwise since it is attached through arm 26 to rotatable sleeve 24; such counterclockwise movement of idler 30 causes slackening of the loop comprising band 44 and spring 48 with the result that ribbon roll 38 with spool ends 36 and bearing sleeve 34 is free to rotate on axle 22 and ribbon 40 is unwound from roll 38 as it is pulled over idler roll 30 toward the lower portion of the machine. When the pull on ribbon 40 is stopped, idler roll 30 moves clockwise to its original position under the influence of counterweight 32 which was displaced counterclockwise while the ribbon was being pulled. Obviously, with the return of idler 30 and arm 26 to the original position, brake band 44 again engages groove 46 in spool end 36 and halts the rotation of ribbon roll 38 to keep it from unraveling itself through momentum.

Mounted on stationary frame A is a central post 52 which passes slidably through bearing blocks 54, 56 mounted on bars 10, 12, respectively. A clamp block 58 is fixed on post 52 and link bar 60 pivotally hangs therefrom, the lower end of link bar 60 being pivotally attached to cam lever or bell crank 62. The outer end of crank 62 is pegged to bar 16 by pivot rod 64 mounted on bar 16 while the lowermost end of crank 62 is provided with a roller bearing 66 which rides against the periphery of cam disk 68. A driven shaft 70 passes through bar 16 and imparts rotation to cam disk 65 mounted thereon with the result that when roller 66 is riding on the portion of cam disk 68 closest to shaft 70 (as shown in Figure 1) central post 52 drops to its lowest position, but when roller 66 is riding on the portion of cam disk 68 farthest from shaft 70, central post 52 is raised to its highest position, the vertical reciprocating motion of central post 52 being transmitted from cam disk 68 through bell crank 62 and link bar 60 which is pivotally attached to clamp block 58 on central post 52.

A second clamp block 72 is fastened near the lower end of central post 52. Attached to clamp block 72 is the belt conveyor structure B which comprises an enclosed vacuum housing 74 having imperforate side walls 76, 78, 80, 82 and foraminous bottom and top walls 84, 86, housing 74 being attached at side wall 78 to clamp block 72. Internally of housing 74 is an L-shaped rib 88 dividing housing 74 into upper and lower vacuum chambers connected by an opening 90 in rib 88. Vacuum is applied to housing 74 through suction tube 96 entering the upper chamber through side wall 78. A suction release passage 92 leads out from the lower chamber of housing 74 through upper wall 86. Valve 98 having an operating rod 100 slidably mounted in fixed stem 102 block 54 is positioned to open and close periodically passage 92 according to the vertical movement of central
post 52 and conveyor structure B. An adjustable stop 102 halts downward movement of operating rod 101 at a predetermined point and causes valve 98 to open as central post 52 carries housing 74 further down. Side walls 80, 82 of housing 74 carry brackets 104, 106, respectively, which in turn rotatably support rolls 108, 110 on axles 112, 114. A foraminous, endless belt 116 tightly disposed around rolls 108, 110, rides with its edges over ridges 118 (Figure 4) and across end ridges 120 on housing 74. The lower provides belt support spaces between bottom and side walls 84, 86 and belt 116 so that suction applied from vacuum housing 74 through openings 94 in these walls may be uniformly applied to foraminous belt 116, with ridges 118 and 120 forming side seals. Top wall 86 supports a pair of brackets 122 which carry an idler roll 124, spaced from belt 116.

A gear rack 126 is pivotally attached at one end to cam arm 128. The lower end of cam arm 128 is pivotally pegged to bar 16 by bolt 130 while the corner of angled cam arm 128 is provided with a roller 132, which rides in cam track 134 of internal cam 136, that is mounted on driven shaft 79. The other end of gear rack 126 is enclosed by a U-shaped housing 138 which serves to maintain gear rack 126 in meshing engagement with a gear wheel 140. Axle 114 which extends out from bracket 106 is surrounded by a rotatable bracket 142 which is integrally held thereto pivotally wheel 140 and a disk 144. U-shaped housing 138 is freely pivoted around bearing sleeve 142 for angular movement of gear rack 126. A small plane 146 mounted on the face of disk 144 can lock with any tooth of internal wheel 140 and thus form a one-way clutch. Ratchet wheel 148 and roll 110 are keyed to axle 114 which is rotatably supported in bearing 152 mounted on bracket 106. When gear rack 126 is pulled to the right (Figure 1) by cam arm 128, gear wheel 140 along with sleeve 142 and disk 144 turns clockwise and pawl 146 slips over teeth of ratchet wheel 148 with the result that ratchet wheel 148 as well as axle 114 and roll 110 remain stationary. When cam arm 128 pushes gear rack 126 to the left, gear wheel 140 and disk 144 are turned counterclockwise, and pawl 146 locks in ratchet wheel 148, thereby turning it, axle 114 and roll 110 also counterclockwise.

To operate the ribbon segment dispenser, the tenous ribbon 40 from roll 38 is looped over idler roll 30 and under idler roll 124, is laid along the top of belt 116 and around roll 108, and its leading end is positioned against the starting edge of ribbon 40 being substantially in line with the vertical portion of wall 88 in vacuum housing 74. With an operating vacuum pump (not shown) connected by flexible tubing attached to suction tube 96, air is sucked in through the opening 94 in housing 74 with the result that the portion of foraminous belt 116 which overlies top wall 86 and underlying bottom wall 84 are under a vacuum which acts on ribbon 40, causing it to adhere to the outer surface of belt 116. Since the invention not only dispenses a soft and tender ribbon from a roll thereof as smooth, flat, and uniform as the ribbon into a plurality of sheets of equal length, a fixed knife blade 154 is so positioned relative to belt 116 that the knife edge of blade 154 presses against belt 116, thereby cutting a segment from ribbon 40 when central post 52 with belt conveyor structure B is pulled down by belt crank 62 to its lowermost position. It is to be noted (Figure 2) that the upper vacuum chamber extends to the bottom portion of vacuum housing 74 lying to the left of the position of knife blade 154 and suction is continuously applied therethrough to the unsevered portion of the ribbon. To the right of knife blade 154 the portion is intermittently applied to belt 116 through the lower chamber in vacuum housing 74. With ribbon 40 disposed around conveyor belt 116 so that the leading edge of ribbon 40 is contiguous with knife blade 154 and with the vacuum of the upper chamber holding the ribbon to the outer surface of belt 116, the machine is ready for operation. Referring to Figure 1, when shaft 70 is applied to belt 116, cam disk 65 and bell crank 62 raise central post 52 and with it the entire belt conveyor structure B. Simultaneously, valve 98 which is stationary seats itself in passage 92 and suction is applied through opening 90 to the lower chamber in housing 74 and through openings 94 in bottom wall 84 to the portions of foraminous belt 116 underlying the lower chamber.

In timed relation to the operation of cam disk 68, internal face cam 136 and cam arm 128 push gear rack 126 to the left. While belt conveyor structure B is held in raised position and gear rack 126 is being pushed to the left, gear wheel 140 is being rotated counterclockwise with the result that pawl 146 on disk 144 which has locked into ratchet wheel 148 is causing ratchet wheel 148, axle 114 and roll 110 to rotate counterclockwise. When roll 110 is rotated counterclockwise, the upper reach of endless belt 116 travels to the lower upper reach travels to the right. This movement of belt 116 pulls ribbon 40 around idler roll 124 and over idler roll 30 which with its supporting arm 26 is moved a small distance counterclockwise so that brake band 44 is retracted and ribbon roll 30 is free to rotate clockwise. Thus, moving belt 116 unpowers ratchet roll 38, conveying the leading end of ribbon 40 along its lower reach from adjacent the knife blade 154 toward the right. Suction from vacuum housing 74 keeps the ribbon spread out flat against belt 116. At the end of substantial one half turn of cams 66, 136, belt conveyor structure B is dropped to its lowermost position and gear rack 126 begins to move to the right. When conveyor structure B is in its lowermost position value 98 is unseated from passage 92 and the vacuum in the lower chamber of housing 74 is broken; also with the dropping of structure B to its lowermost position, knife blade 154 cuts through ribbon 40. While gear rack 126 is being pulled to the right, gear wheel 140 and disk 144 are rotated clockwise, but pawl 146 slips over the teeth of ratchet wheel 148 and, therefore, ratchet wheel 148, axle 114 and roll 110 remain stationary. At about the end of a complete turn of cams 66, 136, bell crank 62 raises structure B to its uppermost position and value 98 again seats itself in passage 92 so that a vacuum is drawn through the lower chamber of housing 74. When structure B moves upward, the severed ribbon segment remains on a suitable work locus because it is not held by suction to the bottom reach of belt 116. With structure B in its uppermost position and with the severed ribbon segment removed from the bottom reach of belt 116, the foregoing cyclic operation repeats itself.

The opening 90 in rib 88 is of such size that despite the periodic inrush of air through value 98 and passage 92 into the lower chamber of housing 74, suction is continuously maintained in the upper chamber so that the new leading edge of ribbon 40 adjacent knife blade 154 and the portion of ribbon 40 lying to the edge of conveyor belt 116 are always under sufficient suction to adhere to belt 116. Alternatively, rib 88 may be made without any opening between the two chambers in housing 74; in such case, the upper chamber is still under continuous suction by the connection of tube 96 to an operating vacuum pump, while another tube like tube 96 is connected to the lower chamber and independently connected to a vacuum pump periodically provides suction to the lower chamber each time value 98 closes suction release passage 92.

The work area in which each ribbon segment is deposited is a smooth, unwrinkle-free condition in accordance with this invention may comprise various mechanisms for the further handling or utilization of the ribbon segments. For instance, a second, central belt conveyor structure may be positioned to receive each ribbon segment as it is dispensed and to convey it away in a
direction at right angles to the length of the ribbon segment. The operation of such a belt conveyor would be controlled through known mechanical or electrical devices that in response to movements of the dispensing machine would periodically set the second belt conveyor in motion after each ribbon segment is deposited thereon by the dispensing machine and would periodically stop the second belt conveyor while the dispensing machine is cutting and depositing another ribbon segment on the second belt conveyor. Similarly, part of a rotatable table or turret may lie under belt 116 to receive each dispensed ribbon segment; after the deposition of each ribbon segment, the turret rotates and carries the deposited ribbon segment away from under the dispensing machine to a new work locus. As an example of such operation with ribbon segments of tobacco sheet material, each segment conveyed by the turret from under the dispensing machine to a new work locus would there be picked up as a cigar binder by a vacuumized or suction binder carrier (such as shown in U. S. Patent 1,545,874) and transported to and laid on the chianti belt of a bunch-rolling mechanism of the type commonly used in cigar-making machines.

It is frequently advisable that the work area on which the ribbon segments are deposited pursuant to this invention have a perforated surface communicating with a subjacent suction box. In this way, the ribbon issuing from the dispenser of this invention will adhere to the perforated surface immediately upon contacting the same and will be held in a smooth, wrinkle-free condition until the deposited ribbon segment is utilized or transferred to a new work locus. Obviously, when the ribbon segment is about to be utilized or removed from the perforated surface, adherence of the ribbon segment thereto will be overcome by temporarily breaking the suction in the subjacent box.

Various modifications of the invention will be apparent from the foregoing disclosure. For instance, the spool of ribbon need not be mounted on supporting frame A and may instead have an independent pedestal. Also, the dispensing machine may be altered to omit the vertical movements obtained through central post 52 and its associated elements like cam lever 60; in such case, the fixed knife blade 154 and valve 98 would be replaced by like members which move up when gear rack 126 has completed its movement to the left (Figure 1) and then drop back before gear rack 126 again commences its leftward movement. Furthermore, the knife blade structure need not be mounted beneath belt 116. The principle of two vacuum chambers in housing 74 is also applicable if knife blade 154 is mounted to sever the ribbon on the upper reach of belt 116; the ribbon segment may then be removed from the lower reach of belt 116 by breaking the suction in the lower chamber of housing 74 when the entire segment has been conveyed by the lower reach of belt 116 beyond the point where rib 88 meets the bottom wall of housing 74.

What is claimed is:
1. A machine for dispensing ribbon segments of equal length from a roll of a tenacious ribbon, which comprises
2. A machine for dispensing ribbon segments of equal length from a roll of a tenaceous ribbon, a fixed supporting frame, conveyor means for a foraminous endless belt mounted on said supporting frame, a vacuum box disposed above the inner surface of the lower reach of said foraminous endless belt, the wall of said vacuum box adjacent to said inner surface having openings for applying suction from said vacuum box through said foraminous endless belt to hold the leading end of said ribbon in contact with said foraminous endless belt, intermittent drive means connected to said conveyor means to move said foraminous endless belt a distance substantially the same as the desired equal length of said ribbon segments, cutting means operative to cut a ribbon segment from said ribbon each time said ribbon in contact with said foraminous endless belt has been moved therewith a said distance and the movement has been interrupted and take-off means for removing each resulting ribbon segment from said endless belt before said movement has been resumed.
2. The machine of claim 1 wherein the cutting means comprises a fixed knife blade positioned below said lower reach and a vertically reciprocating mechanism for bringing said lower reach into contact with the cutting edge of said knife blade each time a ribbon segment is to be cut.
3. A machine for dispensing ribbon segments from a roll of a tenacious ribbon, which comprises spool means to hold said roll of tenacious ribbon, endless belt conveyor means having a foraminous endless belt, first and second vacuum boxes disposed between the upper and lower reaches of said belt and each having openings in a wall thereof adjacent to a portion of said lower reach, suction release means for periodically breaking the vacuum in said second box, intermittent drive means associated with said conveyor means for moving said lower reach successively across said first and second boxes, and cutting means to cut during the interruption of movement of said lower reach a ribbon segment from said ribbon while said ribbon is held in contact with said lower reach by suction from said first and second boxes.
4. The machine of claim 3 wherein the cutting means comprises a fixed knife blade positioned below said lower reach and a vertically reciprocating mechanism for bringing said lower reach into contact with the cutting edge of said knife blade each time a ribbon segment is to be cut.
5. The machine of claim 3 wherein the first vacuum box has a wall with openings adjacent to said upper reach.

References Cited in the file of this patent
UNITED STATES PATENTS
1,278,537 Wegner Sept. 10, 1918
1,497,765 Abbott June 17, 1924
1,505,212 MacDonald Aug. 19, 1924
1,833,781 Rider Apr. 12, 1932
1,916,845 Leland May 4, 1933
2,318,508 Martindell May 4, 1943
2,329,256 Edelman Sept. 14, 1943
2,388,433 Palmer Nov. 6, 1945
2,478,020 Stiles Aug. 2, 1949
2,466,196 Nebolsine Oct. 25, 1949