Dec. 23, 1958 W. G. FRANKENBURG 2,865,449

UNWINDING AND CUTTING MACHINE FOR ROLLED-UP RIBBONS

Filed Sept. 26, 1952

2 Sheets-Sheet 1

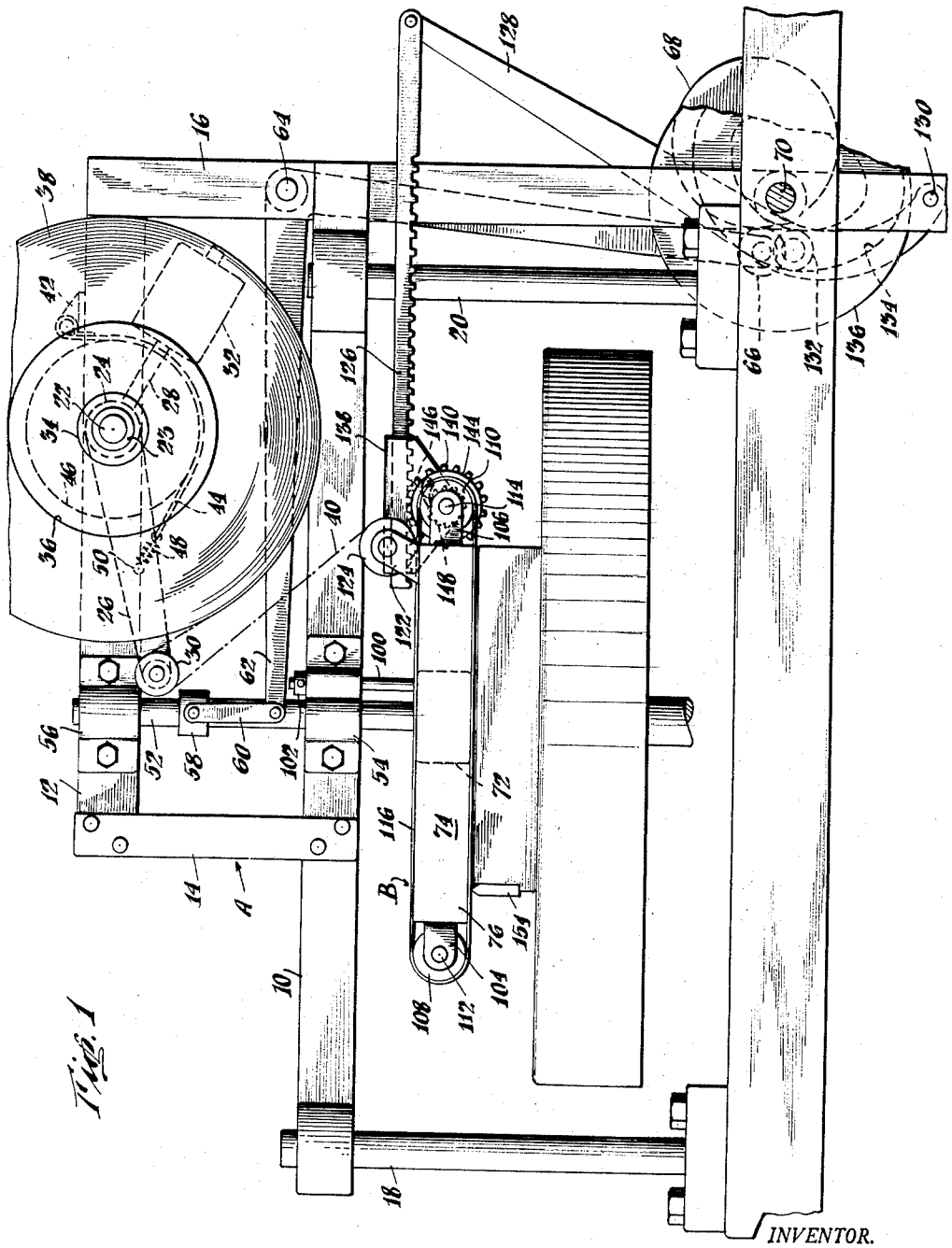


Fig. 1

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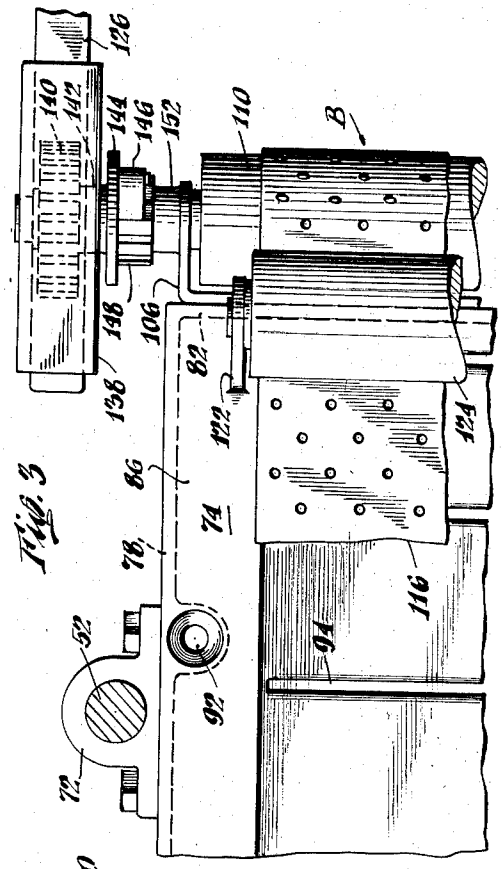


Fig. 3

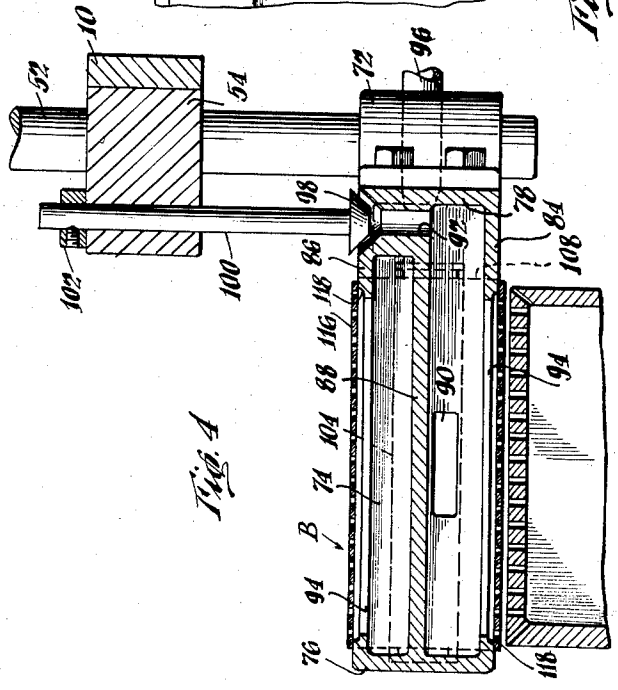


Fig. 4

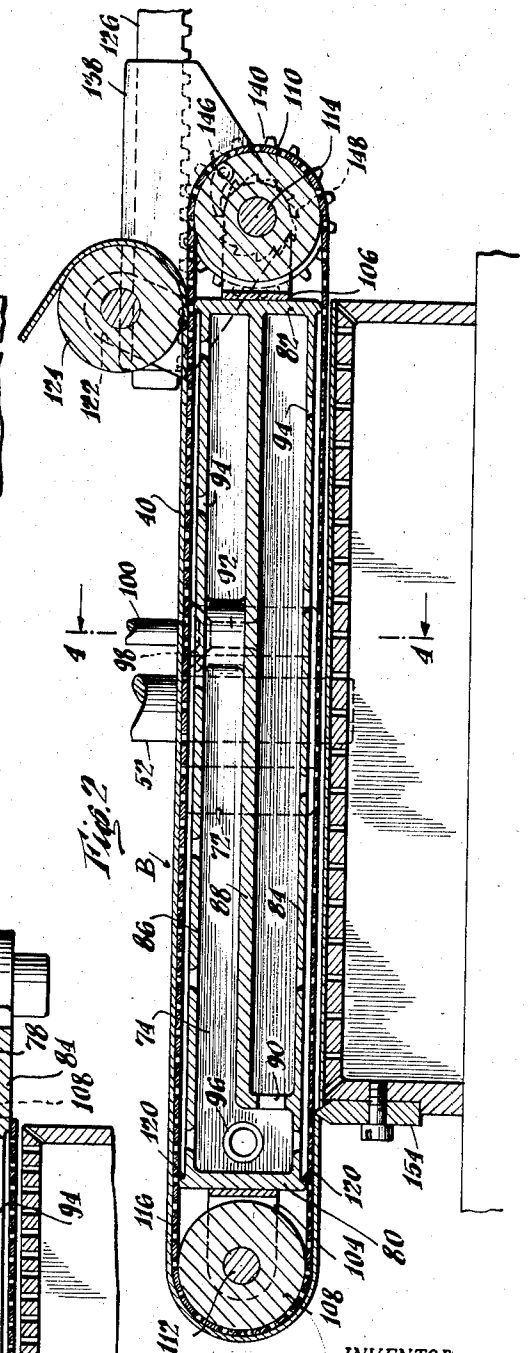


Fig. 2

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UNWINDING AND CUTTING MACHINE FOR ROLLED-UP RIBBONS

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Application September 26, 1952, Serial No. 311,743

5 Claims. (Cl. 164—48)

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

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 now has 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 tenuous 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 tenuous ribbon **40** is inserted. The ribbon roll **38** with its spool ends **36** is kept on axle **22** by collar **23** which is adjustably 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 **30** moves clockwise to its original position under the influence of counterweight **32** which was also 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 corner of crank **62** is pegged to bar **16** by pivotal 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 **68** 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 extending through stationary 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 100 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 to provide free spaces between bottom and top 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 angulated cam arm 128 is provided with a roller 132 which rides in cam track 134 of internal cam face 136 that is mounted on driven shaft 70. 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 bearing sleeve 142 which has integrally held thereon gear 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 pawl 146 mounted on the face of disk 144 can lock with any tooth of ratchet wheel 148 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 the 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 annd roll 110 also counterclockwise.

To operate the ribbon segment dispenser, the tenuous 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 lower reach of belt 116, 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 openings 94 in housing 74 with the result that the portions of foraminous belt 116 which overlie top wall 86 and underlie 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 a smooth, flat sheet but also cuts 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 bell 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, suction 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 power is applied to shaft 70 to rotate it clockwise, cam disk 68 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 portion 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 left and the lower 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 released and ribbon roll 38 is free to rotate clockwise. Thus, moving belt 116 unwinds ribbon 40 from 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 substantially 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 valve 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 valve 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 valve 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 on the upper reach 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 but communicating with the lower chamber and independently connected to a vacuum pump periodically provides suction to the lower chamber each time valve 98 closes suction release passage 92.

The work area in which each ribbon segment is deposited in a smooth, wrinkle-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, conventional 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 revolves 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 1,543,874) 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 **62**; 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 tenuous ribbon, which comprises spool means to hold said roll of tenuous ribbon, a fixed, supporting frame, conveyor means with 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 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 tenuous ribbon, which comprises spool means to hold said roll of tenuous 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.

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