United States Patent [19]

Gianese

[11] **3,757,619**

[45] **Sept. 11, 1973**

[54] **APPARATUS FOR FEEDING AND CUTTING WEB MATERIAL**

[75] Inventor: **Goffredo Gianese, Bologna, Italy**

[73] Assignee: **AMF Incorporated, White Plains, N.Y.**

[22] Filed: **Jan. 27, 1972**

[21] Appl. No.: **221,312**

[52] **U.S. Cl.** **83/65**, 53/64, 83/150, 83/161, 83/236, 83/261, 83/280, 83/327, 83/356.3, 83/365, 83/367, 83/402, 83/416, 83/441, 226/175

[51] **Int. Cl.** **B26d 1/36**, B65h 25/10

[58] **Field of Search** 53/54, 64; 83/58, 83/65, 236, 261, 436, 279, 356.3, 355, 416, 417, 441, 327, 280, 150, 367, 365, 161; 226/175, 155

[56] **References Cited**

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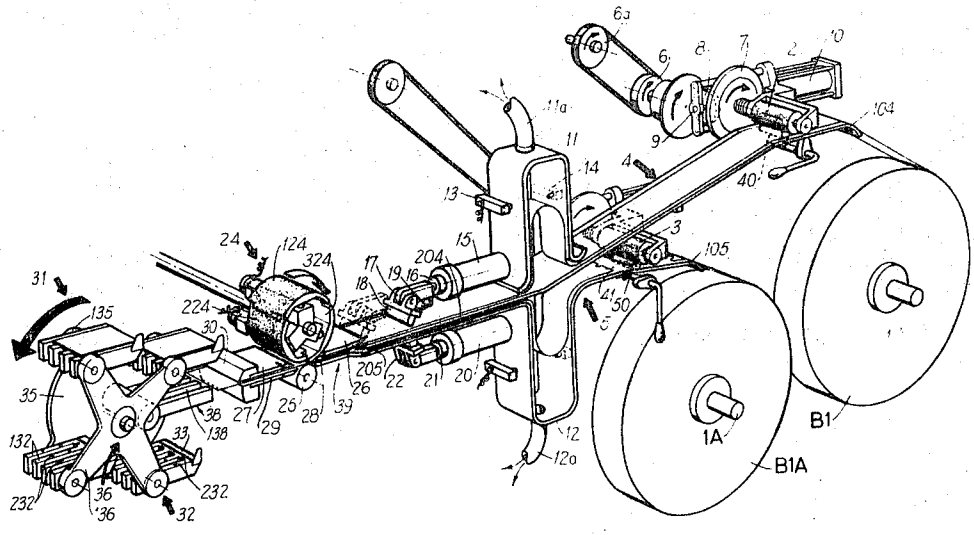
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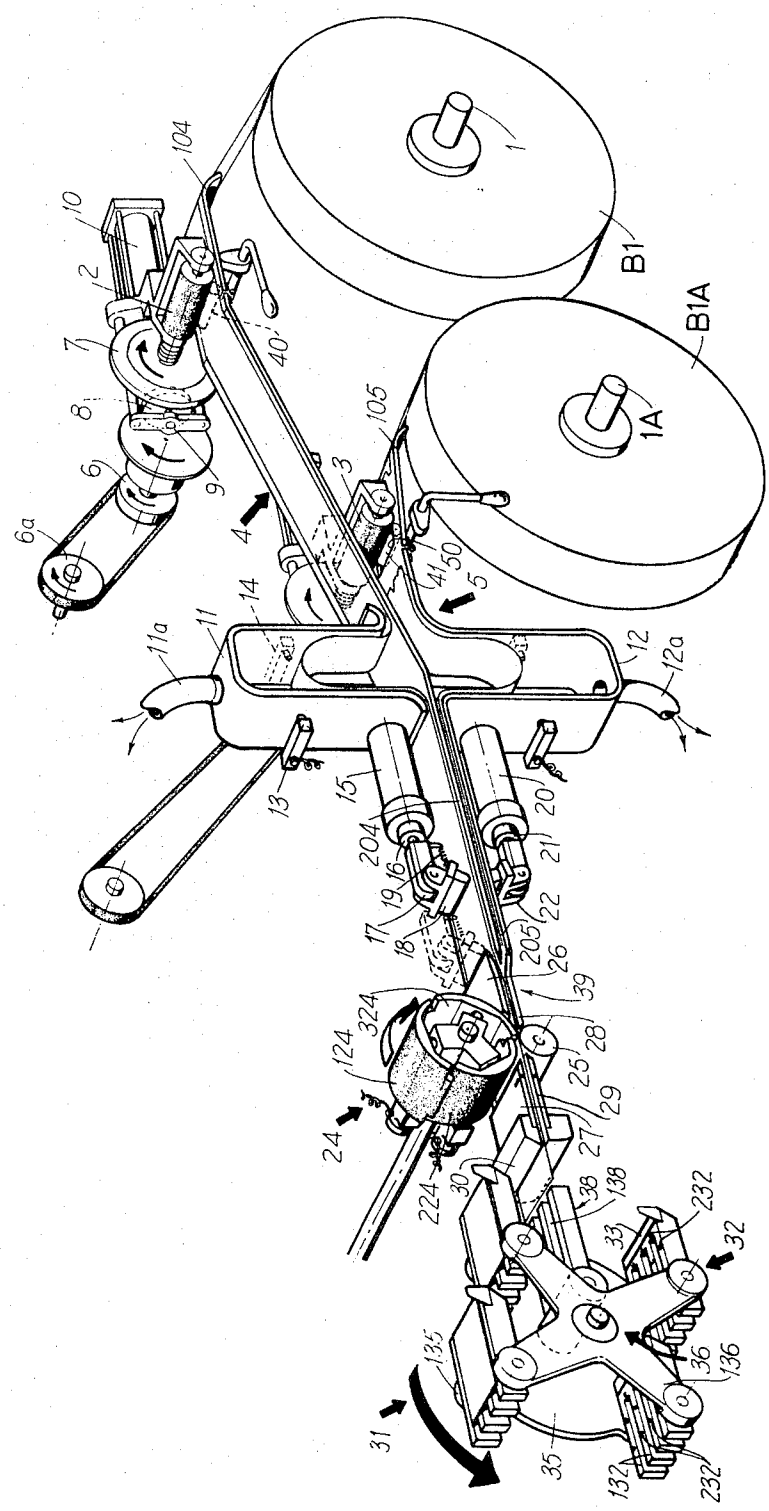
Primary Examiner—Frank T. Yost
Attorney—George W. Price et al.

[57] **ABSTRACT**

In apparatus wherein a reel of web material is unwound, fed in a substantially linear path by a web feeding means and cut into equal sized sheets by a web cutting means, the improvement comprising means for advancing the web material from the web feeding means to the web cutting means, means for forming a loop in the web material between the web feeding means and said web advancing means, the size of said loop being responsive to the rates of web feed by the web feeding means and the web advancing means, means for de-activating the web advancing means in response to the determination of a predetermined condition downstream thereof, said de-activation of the web advancing means enlarging the loop, means for sensing when the loop reaches a predetermined size, and means responsive to the sensing of a loop of predetermined size for controlling the rate of the web feeding means.

12 Claims, 1 Drawing Figure




B1
B1A
1A
1
104
10
12
7
8
6
6a
9
40
105
3
4
5
50
41
14
11
11a
12
12a
13
15
204
16
19
17
18
20
21
22
205
26
39
324
124
28
25
29
24
27
30
224
38
138
232
33
32
135
36
136
31
35
132
232

APPARATUS FOR FEEDING AND CUTTING WEB MATERIAL

BACKGROUND

This invention relates to wrapping or packing machines and more particularly to a foil feeding apparatus for use in a cigarette packaging machine.

In cigarette packaging machines which produce packs made of an outer paper wrapper and an inner foil wrapper, the foil wrappers are generally formed of sheets cut in sequence from a continuous roll of web material, or, more specifically, paper foil tape.

Cigarette packing machines are generally provided with suitable detectors and mechanisms to reject defective packs, or packs containing a number of cigarettes not corresponding to the predetermined number, or packs in which one or more cigarettes have loose ends. Obviously, the rejection of a pack for these reasons involves the loss of a foil sheet and of a paper sheet.

In high speed cigarette packing machines with an output of 500 to 600 packs per minute, for example, that disclosed in U.S. Pat. Nos. 3,553,925, 3,531,911, 3,589,097, 3,583,130, 3,579,953 and 3,590,550, all assigned to the same assignee as this application, the rejection of defective packs, even at a very small rate, leads to a great waste of foil and paper.

SUMMARY

It is, accordingly, an object of this invention to provide an improved web material feeding and severing combination.

It is a further object of this invention to provide an improved web material feeding and severing combination for use in a cigarette packing machine.

It is a more specific object of this invention to provide in a device for feeding and cutting web material into sheets, means to preclude the feeding of a web sheet, for instance, the foil used in making cigarette packs, every time the group of cigarettes which must be wrapped with this sheet is, for any reason, irregular.

In accordance with the objects, a preferred embodiment of the invention may comprise a unit in combination with a reel of web material, means for withdrawing web material from the reel and feeding it in a generally linear path and means for severing the web into sheets, which unit comprises means for advancing the web material to the web severing means, means for forming a loop in the web material between the reel and the web advancing means, detecting means mounted in the web forming means for sensing when the loop reaches a predetermined size, means for de-activating the web advancing means in response to a predetermined condition, the continued operation of the web material withdrawing means causing an enlargement of the loop in the loop forming means, and means responsive to activation of said detecting means for controlling the web material feeding means.

Other objects, advantages and the like will be apparent from the following detailed description given as a non restrictive example, with reference to the attached drawings in which:

DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective assembly view of a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings, two spindles, designated 1 and 1A respectively, are mounted in parallel spaced relationship to each other and are adapted to receive reels of web material, such as foil to be used in the fabrication of a cigarette pack. The reel mounted on spindle 1 is designated B1 and that mounted on spindle 1A is designated B1A. Two reels are provided so that when one of the reels is supplying web material, the other reel can be readied for use.

Spindles 1 and 1A are free to rotate round their axes so that web material may be withdrawn from the respective reels B1 and B1A by a tangential pulling of the web material. A pair of feed rollers associated with each of the reels B1 and B1A supply the tangential pulling to unwind the web material from the reels. The feed rollers associated with reel B1 are designated 2 and 40 and those associated with reel B1A are designated 3 and 41. Rollers 2 and 3 are driven and rollers 40 and 41 are pressure idler rollers.

The web material is fed from the feed rollers along a web guide, designated 4 in the instance of web material withdrawn from reel B1 and 5 in the instance of web material withdrawn from reel B1A.

The initial sections of the guides, designated 104 and 105 respectively, are connected to the remainder by a hinged connection so that it can be swung away from the remainder of the guide to facilitate the introduction of the web material between the respective set of feed rollers 2, 40 and 3, 41 when a new reel of web material is fitted to spindle 1 or 1A. An aperture 50 is provided in each of the guide sections 104 and 105 above the pressure rollers 40 and 41 to provide the access for the pressure rollers to be engaged by their corresponding feed rollers 40 and 41.

Each of the feed rollers 2 and 3 is driven through a variable speed drive consisting of a disk 6 driven from a power source 6*a*, a disk 7 mounted parallel thereto and a wheel 8 disposed between and perpendicular to disks 6 and 7, in contact therewith and mounted for free rotation on the piston rod 9 of a pneumatic double-acting cylinder 10. Actuation of the cylinder 10 causes displacement of the wheel 8 along the diameter of disks 6 and 7 from the centers to the peripheries thereof, controlling the amount of the angular velocity of disk 6 transmitted to disk 7, and in turn to the feed rollers.

A chamber 11 is mounted over guide 4 and is connected, as by a conduit 11a, with means for providing subatmospheric pressure, or suction, therein in order to draw back therein a section of the web, which will assume the loop shape shown in the drawings.

In the same manner, a vacuum chamber 12, connected by a conduit 12*a* to a source of suction, is mounted under guide 5, disposed in substantially vertical alignment with chamber 11. This vacuum chamber receives the tape unwound from reel B1A, in a manner analogous to that in which tape unwound from reel B1 is received in chamber 11.

A photosensitive element 13 is mounted in each of the suction chambers 11 and 12 and is associated with a suitable source of light 14.

A double acting air cylinder 15 having a piston rod 16 mounted therein is mounted above the portion of guide 4 downstream from chamber 11, which is designated 204. A "one-way" block 17 is hingedly mounted

to the end of piston rod **16**. A rubber pad **18** is mounted on the block **17** and is held in contact with web material on guide portion **204** by means of a spring **19**. The hinged connection between the piston rod **16** and the block **17** allows the rubber pad to engage and feed the web material on the outward stroke of the piston rod and to slide back over the web material on the rearward stroke of the piston rod.

In the same manner, a double acting pneumatic cylinder **20** is mounted under the portion of guide **5**, designated **205**, downstream of vacuum chamber **12** and includes a "one-way" block **22** mounted to its piston rod by hinged connection. A rubber pad **23** analogous to rubber pad **18** is mounted on block **22** and operates in a manner similar thereto on webs being fed along guide **5**.

A web advancing drum **24** and a cooperating pressure roller **25** are mounted at a position spaced from the ends of the guides **4** and **5** and are adapted to receive a web therebetween. The periphery of drum **24** is subdivided into a plurality of equal segments, three in the embodiment shown in the drawings, said three segments being designated **124, 224** and **324**, respectively. Each of the segments of the drum is of a length selected to be equal to the length of a sheet of web material to be utilized in the formation of a pack of cigarettes.

Each of the segments is mounted for radial movement towards and away from the shaft of the drum. This radial movement may be effected by mounting the segments at the end of the piston rods of pneumatic cylinders. In operation, the inward movement of a drum segment interrupts its coordination with the opposed pressure roller **25** and precludes the feeding of the portion of the web disposed therebetween for the period of time it takes for that segment to rotate past roller **25**.

A pair of guide members **26** and **28** are mounted at one side of drum **24** and guide the web thereto from guide portions **204** and **205**, depending on which reel is in use.

A web cutting mechanism **31** is mounted downstream from the advancing drum **24**. A pair of guide members, **27** and **29** guide the web from the advancing drum to the cutter.

The cutter consists substantially of a plurality of fork elements **32**, for instance, four, each of which carries at its end a cutting knife or blade **33** which cuts in cooperation with fixed counterknife or counterblade **30** mounted at the end of guide **27**.

Each fork element **32** is hinged at one side to a respective lug or a group of four lugs **135** mounted on a disk **35** and at the other side of one of the four arms **136** of a cross **36**, the disk and the cross being offset from each other.

A fixed fork member **38** is mounted so as to constitute a continuation of the web path defined by guides **26** and **28** and **27** and **29**. The tines **138** of fork member **38** are disposed in alignment with the spaces in between the tines **132** of the fork elements **32**.

With this arrangement, when disk **35** is rotated by a suitable drive (not shown), the fork elements **32** rotate, remaining always horizontal and parallel to themselves. While the forks **32** rotate, the tines **132** thereof pass through the empty spaces between the tines **138** of fixed fork **38** and engage the length of web material advanced to the fixed fork by drum **24**. The blade **33** on the fork element **32** severs the web material thereon from the rest of the web material as it passes blade **30** and the fork element carries the severed sheet of web material toward the packing machine. The tines **132** of the forks **32** are provided with suction holes **232** to hold the sheets cut from the web material as they are transported to the packer.

In operation, upon start-up, the web from reel **B1** (The operation will be described in connection with web feed from reel **B1**, it being understood that the operation is the same in connection with the analogous structure associated with reel **B1A**.) is threaded between feed roller **2** and the pressure roller **40** associated therewith, and is led along guide **4**, pad **18** and guide portion **204** and consequently, between guides **26** and **28**, bring the beginning of the tape in the area of arrow **39**.

At this time the pistons of cylinders **15** and **20** are at the rearward end of their travel in their respective cylinders, the segments **124, 224, 324** of drum **24** are inoperative, that is are moved radially inward towards the shaft of the drum **24** and the feed rollers **2** and **3** are stationary because pistons **9** are at the forward ends of their travel in cylinders **10** and the wheels **8** are in the area of the center of friction disks **6** and **7**.

The continued hand threading of the web along guide **4** causes the web to form a loop in chamber **11** until the loop interrupts the light beam between the light source **14** and its associated photosensitive element **13**. At this time, the pressing of an appropriate pushbutton associated with cylinder **15** will cause the plunger thereof to push its piston rod **16** out of the cylinder whereby pad **18**, which is coupled to the rod by means of hinged joint **17** will bring the leading end of the web in line with counterknife **30**.

This reduces the height of the loop of web material in chamber **11** and the light beam from light source **14** can reach the associated photocell **13**. This actuates a solenoid valve (not shown) which causes the plunger in cylinder **10** to retract, causing wheel **8** to transmit the motion from disk **6** to disk **7** which causes the feed roller **2** to rotate, drawing the web of material from the reel.

Furthermore, when the plunger of cylinder **15** is at its extended position, a microswitch (not shown) which controls the radial position of segments **124, 224,** and **324** of the drum **24** is actuated to extend the segments. This causes drum **24** and pressure roller **25** cooperating with it to feed onto fixed fork **38** a length of web material which is then cut to measure by one of the knives **33** of cutter **31**, rotating in synchronism with the drum.

The cut sheet of web material is held by suction on the tines of the corresponding fork **32**. The sheets so held are then transferred in succession to the packer (not shown, but see U.S. Pat. No. 3,589,097 for the infeed of the web material sheet to the packer and its use in the packing operation). The transfer of the sheet to the packer is obtained by interrupting the suction through holes **232** in the tines **132** of forks **32** when the sheet is adjacent the packer infeed.

When one or more groups of cigarettes to be packed are found to be irregular or defective, such as by a device disclosed in U.S. Pat. No. 3,590,550, an appropriate circuit memorizes a rejection signal so that one or more segments of drum **24** may be retracted at the appropriate time so that the forward movement of the web is halted for the appropriate interval. This precludes the feeding of a length of web material to the

cutter at the point in the cycle where the sheet which would be used to wrap the defective cigarette group would be severed from the web and delivered to the packer by a fork member 32.

This halting of the web advance by the drum 24 causes a corresponding increase in height of the tape loop in chamber 11, since the rotation of web feeding roller 2 continues undisturbed. As soon as the loop in the chamber reaches such a sufficient height of interrupt the light beam from light source 14 to element 13 chamber 11, the solenoid associated with cylinder 10 is deactivated, causing the plunger thereof to extend out of the cylinder and move wheel 8 toward the center of disks 6 and 7, slowing the rotation of feed roller 2. This rotation stops when the conditions of irregularity of the groups of cigarettes continue for many pitches.

When a segment of drum 24 engages the web and advances it toward the cutter 31, the height of the loop in the suction chamber is reduced, re-establishing contact between the photocell and its source of light and thus actuating the solenoid associated with cylinder 10, increasing the rate of feed from the reel.

When reel B1 on spindle 1 is depleted, the plunger of cylinder 15 is moved back, thus getting ready for the forward movement of the tape from a new stand-by bobbin which will be fitted to spindle 1.

At this time, the cylinder 20 is actuated so that piston rod 21 of its piston moves out of the cylinder; by so doing, pad 23, articulated to base 22 at the end of stem 21, pushes forward the tape of reel B1A until the tape leading end is brought in line with counterknife 30. From this moment, the tape unwinding and the device operation occur exactly as in the case of reel B1.

During the roll replacement operation, the segments of drum 24 are rendered inoperative and drawing roller 2 stops.

Having now fully set forth both structure and operation of preferred embodiments of the concept underlying the present invention, it may be that various other embodiments as well as certain variations and modifications of the embodiments herein shown and described will occur to those skilled in the art upon becoming familiar with said underlying concept. All such embodiments, variations, and modifications as incorporate the spirit of the invention and depend upon its underlying concept are consequently to be considered as within the scope of the claims appended herebelow, unless the claims by their language expressly state otherwise.

I claim:

1. In apparatus wherein a reel of web material is unwound, fed in a substantially linear path by a web feeding means and cut into equal sized sheets by a web cutting means, the improvement comprising:

means for advancing the web material from the web feeding means to the web cutting means,

means for forming a loop in the web material between the web feeding means and said web advancing means, the size of said loop being responsive to the rates of web feed by the web feeding means and the web advancing means,

means for de-activating the web advancing means in response to the determination of a predetermined condition downstream thereof, said de-activation of the web advancing means enlarging the loop,

means for sensing when the loop reaches a predetermined size, and

means responsive to the sensing of a loop of predetermined size for controlling the rate of the web feeding means.

2. Apparatus according to claim 1, wherein the means for advancing the web material from the web feeding means to the web cutting means includes:

a drum having a periphery including a plurality of segments,

means mounting the drum at a position whereat the periphery thereof engages the web,

means for rotating the drum, and

means mounting the segments for inward radial movement to and from the normal periphery of the drum.

3. Apparatus according to claim 2, wherein said means for de-activating the web advancing means includes means for selectively retracting the segments of the drum.

4. Apparatus according to claim 1, wherein said means for forming a loop in the web includes an open ended housing mounted above the linear path of the web, the open end of the housing being adjacent said linear path, and means for creating a subatmospheric pressure in said housing to draw the web therein when there is slack in the web.

5. Apparatus according to claim 4, wherein the means for sensing when the loop reaches a predetermined size includes a photo-sensitive cell mounted in one wall of said housing and a source of light mounted in the opposite wall of the housing in spaced relationship thereto.

6. Apparatus according to claim 1, wherein the equal sized sheets are fed to a packing machine and the predetermined condition downstream of the web advancing means is a defect in a unit to be packaged.

7. Apparatus according to claim 1, wherein the web cutting means includes:

a platform comprising a plurality of spaced tines adapted to receive the leading portion of the web from the web advancing drum,

a cutting member comprising a plurality of tines and a blade at the end thereof, and

means for moving the tines of the cutting member through the spaces between the tines of the platform, the blade thereof severing the web portion on the platform.

8. Apparatus for advancing a web of material to a cutting mechanism, whereat the web is cut into sheets, which comprises:

a drum having a periphery including a plurality of segments,

means for mounting the drum at a position whereat the periphery thereof engages a web of material to advance the same to the cutting mechanism,

means for mounting the segments of the drum for inward radial movement to and from the normal periphery thereof, and

means for selectively retracting a segment of the drum in response to the determination that a cut sheet is not required at a predetermined time.

9. Apparatus according to claim 8, wherein the cutting mechanism includes:

a platform comprising a plurality of spaced tines adapted to receive the leading portion of the web from the web advancing drum,

a cutting member comprising a plurality of tines and a blade at the end thereof, and

means for moving the tines of the cutting member through the spaces between the tines of the platform, the blade thereof severing the web portion of the platform.

10. Apparatus according to claim **9**, wherein the cutting member is operable to convey the severed sheet to a position adjacent the infeed of a packing machine.

11. Apparatus according to claim **9**, wherein the means for moving the cutting member includes:

a shaft,

means mounting said cutting member on said shaft,

means for rotating said shaft, and

means for maintaining the attitude of said cutting member substantially parallel to said web receiving platform as it rotates.

12. Apparatus according to claim **11**, wherein there are a plurality of cutting members mounted on said shaft and means are provided for maintaining the attitude of each of said cutting members substantially parallel to the platform as the shaft rotates.

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