Feb. 1, 1966 G. GAMBERINI 3,232,297

PNEUMATIC SEPARATOR IN TOBACCO FEED

Filed April 20, 1962 3 Sheets-Sheet 1

FIG.1

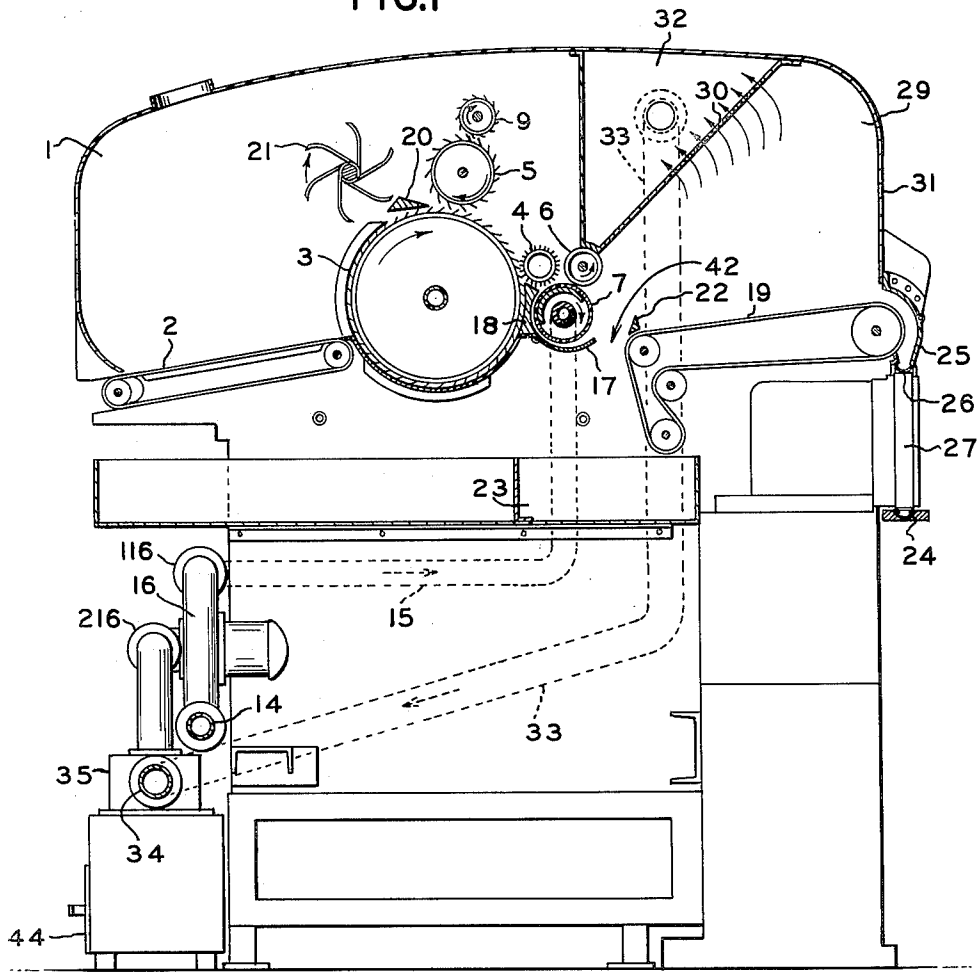
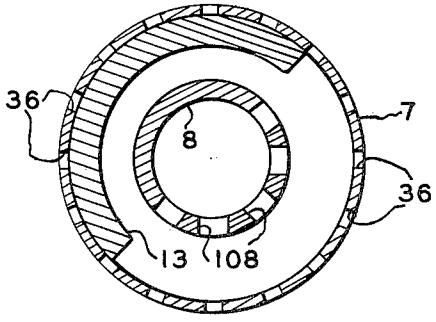


FIG.4



INVENTOR
GOFFREDO GAMBERINI
BY Bradley & Cohn
ATTORNEY

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PNEUMATIC SEPARATOR IN TOBACCO FEED

Filed April 20, 1962 3 Sheets-Sheet 2

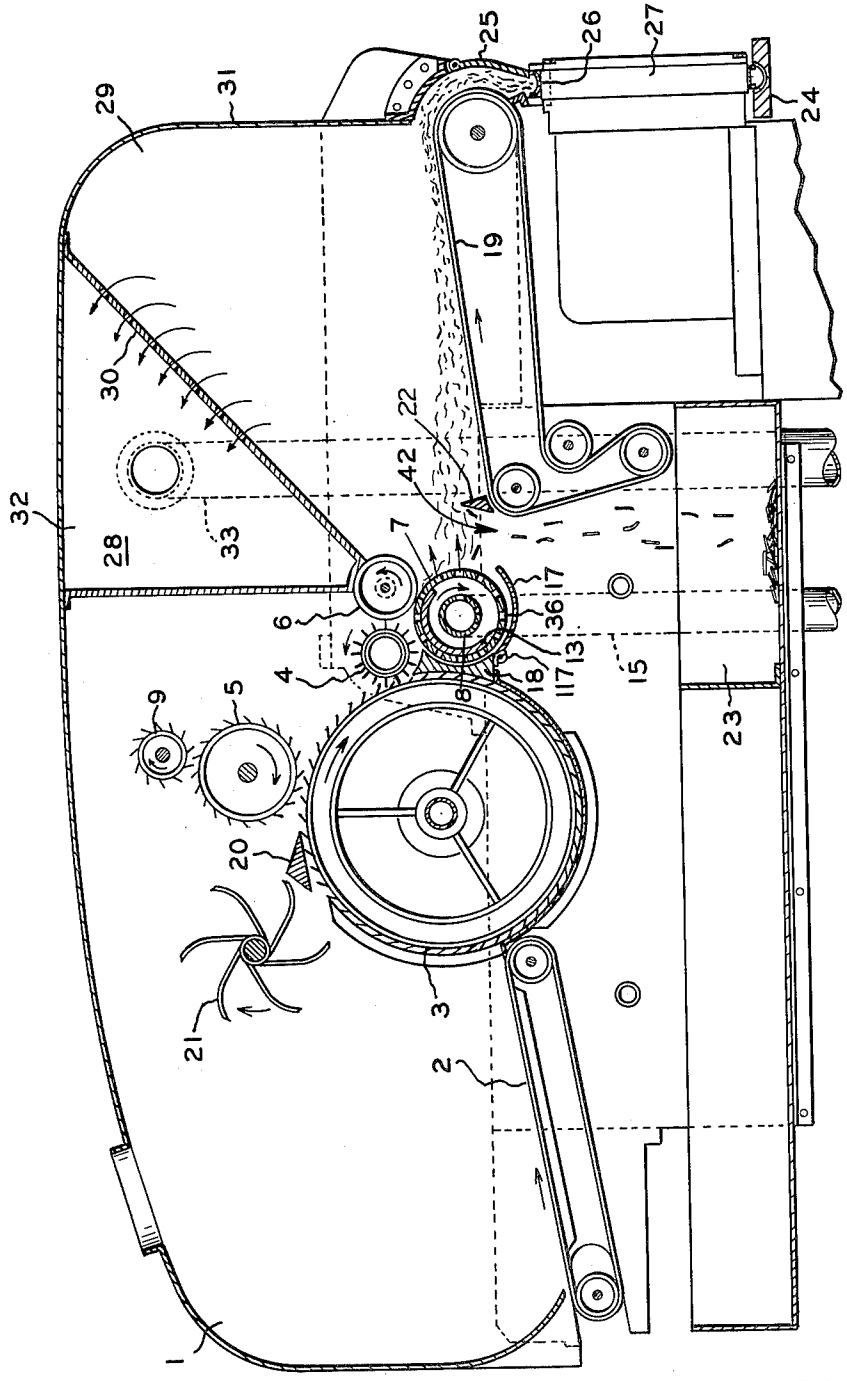


FIG.2

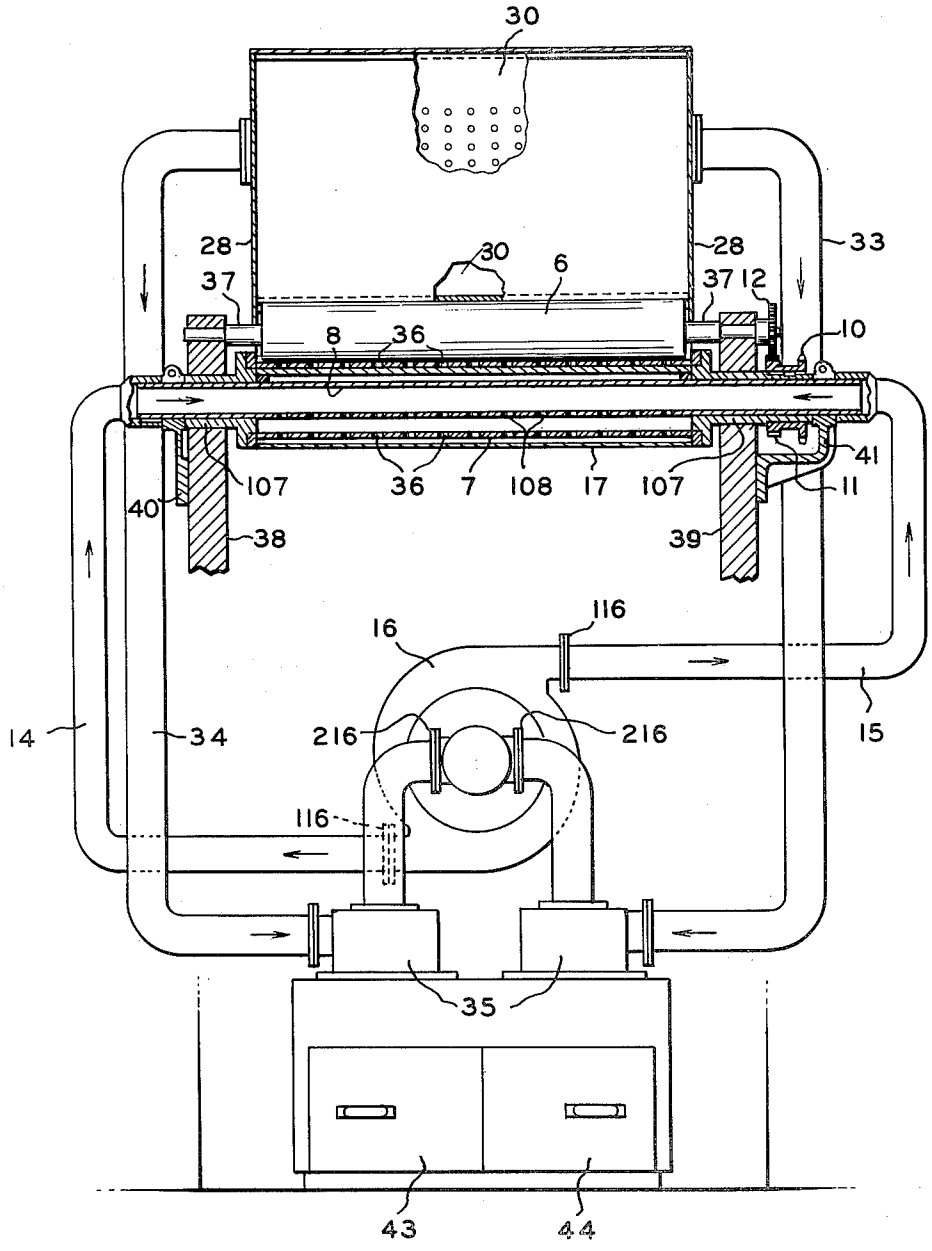
INVENTOR
GOFFREDO GAMBERINI
BY Bradley & Cohn
ATTORNEY

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PNEUMATIC SEPARATOR IN TOBACCO FEED

Filed April 20, 1962 3 Sheets-Sheet 3

FIG.3



INVENTOR
GOFFREDO GAMBERINI
BY Bradley Cohn
ATTORNEY

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3,232,297

PNEUMATIC SEPARATOR IN TOBACCO FEED

Goffredo Gamberini, Bologna, Italy, assignor to American Machine & Foundry Company, a corporation of New Jersey

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Claims priority, application Italy, May 12, 1961, 9,028/61
3 Claims. (Cl. 131—109)

This invention relates to automatic cigarette making machines, especially to the tobacco feeding components of such machines, and particularly to an apparatus for separating stems, ribs and other undesirable particles from shredded tobacco prior to forming the tobacco into a continuous rod or rope, for example, for delivery to the conventional cigarette rod forming means.

It is an object of the invention to provide an apparatus for selectively separating ribs, stems and other undesirable particles from shredded tobacco prior to forming the tobacco into an endless rod or otherwise processing the tobacco.

Another object of the invention is to provide an apparatus for effecting a selective distribution of the shredded tobacco on conveyor means to a rod forming mechanism, whereby to insure formation of a uniformly compacted endless rod of tobacco.

Yet another object is to provide an improved method and apparatus for feeding tobacco to the rod forming mechanism of a cigarette making machine.

With the foregoing and other objects in view, the separating of undesirable particles from shredded tobacco is accomplished pneumatically by continuously showering a quantity of tobacco generally downwardly into a substantially uniform stream of air flowing transversely of the tobacco shower, whereby undesirable stems, ribs, grit and other particles pass through the air stream, by reason of their relatively heavy weight, and the relatively light shredded tobacco fibers are carried with the air stream and deposited on a conveyor.

The tobacco shower is substantially a free fall of tobacco particles. It is initiated at approximately the top of an air stream to promote a gentle take-up of the tobacco shreds by the air stream.

The tobacco laden air stream is diffused over the conveyor, thereby reducing the force of its current and permitting the tobacco to fall onto the conveyor. Furthermore, the stream is diverted upwardly at the receiving end of the conveyor to preclude disturbance of tobacco shreds deposited on the conveyor.

The objects and advantages of the method and apparatus of the present invention, as well as the features of construction, arrangement, combination and operation of the parts thereof, will become apparent from the following detailed description of a preferred embodiment with reference to the accompanying drawings wherein:

FIG. 1 is a transverse vertical section of a cigarette making machine, showing the tobacco feed and separating apparatus;

FIG. 2 is an enlarged sectional view of the upper portion of FIG. 1;

FIG. 3 is a longitudinal elevation, partly in section, of the tobacco feed and separating apparatus; and

FIG. 4 is an enlarged transverse section of the blower drum forming part of the present invention.

Referring to the drawings, a hopper 1 is provided for bulk tobacco which rests on a conveyor belt 2 forming the bottom of the hopper 1, the conveyor belt 2 being adapted to feed the tobacco upwardly to the right, as viewed in FIGS. 1 and 2, against the ascending surface of a carded drum 3, rotatable clockwise as viewed. A rotary rake 21 is mounted adjacent the upper portion of the ascending

surface of the drum 3 for the purpose of raking surplus tobacco from the carded drum 3. An elongated tine packing element 20 is provided, the function of which is to compact the tobacco between the tines of carding drum 3. The element 20 is fixed in position, substantially parallel with the axis of rotation of the carded drum 3, and spaced radially therefrom in such manner that its right-hand edge, as seen in FIG. 1, is in closer proximity to the free ends of the tines than is its left-hand edge. As carded drum 3 rotates clockwise, carrying the tobacco thereon, the tobacco is wedged between the confronting surfaces of the drum 3 and element 20 and firmly packed between the tines, or carding, on drum 3. Just beyond the guide 20 there is mounted a smaller carded drum 5, parallel to and rotatable in the same angular direction as the carded drum 3, and serving to further compress, comb and remove any remaining surplus of tobacco from the carded drum 3, thus leaving a substantially uniform tobacco mat of the desired density on the drum 3. The small carded drum 5 is kept clean by means of a rotary scraper 9. The drum 5 and its associated scraper 9 are adapted to be oscillated toward and away from the hopper 1, for example, through an angle of 10 to 30 degrees and preferably about the axis of the carded drum 3, so as to maintain tangency between the two carded drums. The means for effecting the oscillation are not shown herein as they are well known in the art and are not part of the present invention. The angle of oscillation of the carded drum 5 is preferably offset from the vertical in the direction of rotation of the carded drum 3, that is, the drum 5 cooperates with the descending surface of the drum 3 just a little beyond the top of the latter. Moreover, the drum 5 is preferably intermittently rotated, such that rotation occurs only during oscillation of the drum 5 toward the hopper 1, i.e., in the direction counter to the rotation of the drum 3, while its rotation is stopped when oscillating in the opposite direction, or vice versa.

A picker roller 4 is contra-rotatably mounted adjacent and parallel to the upper portion of the descending surface of the carded drum 3, and is adapted to rotate in the opposite direction from that of carded drum 3 and to pick tobacco from the drum 3 in a stream of substantially discrete particles and deliver the tobacco to the bite between a preferably smooth rotatable cylinder 6 and a contra-rotatable perforated blower drum 7. The cylinder 6 and the blower drum 7 are mounted parallel to the carded drum 3 and the picker roller 4, the cylinder 6 being arranged above the blower drum 7 whereby the bite between the cylinder and the blower drum is approximately alongside the bottom of the picker roller 4. The blower drum 7 is rotatable in a clockwise direction, as viewed in FIGS. 1 and 2, whereby the stream of tobacco picked from the carded drum 3 is projected in a direction approximately tangent to the top of the blower drum 7 and is carried by the latter into the bite between it and the cylinder 6. A partition 18 is located between the carded drum 3 and the blower drum 7, the partition extending parallel to the axis of rotation of the drums and throughout the length of the drums and having opposed concave sides in closely embracing relationship with the drums whereby to prevent tobacco picked from the carded drum 3 from falling between carded drum 3 and blower drum 7. The upper surface of the partition is also concave and slightly spaced below the bottom of the picker roller 4, to guide tobacco towards the top of the blower drum 7.

The cylinder 6 and the blower drum 7 are spaced closely one from the other and adapted to be rotated at substantially the same peripheral speed, but appreciably less than the peripheral speed of the picker roller 4, so that the tobacco stream projected by the picker roller and guided between the cylinder 6 and blower drum 7 is braked in its course and carried forward between said cylinder and

drum at their common peripheral speed. As the tobacco stream is discharged from between the cylinder and the blower drum, the kinetic energy of the tobacco shreds is negligible, so that the subsequent path of the tobacco stream is substantially downwardly with the descending surface of the blower drum **7**, from which surface the tobacco drops substantially as a freely falling shower little removed from the surface of the blower drum **7**. The tobacco shower is now subjected to a pneumatic stream issuing from the blower drum **7** for separation of undesirable particles and distribution of the tobacco shreds onto a conveying means to a rod forming apparatus, in a manner now to be described.

The blower drum **7** is hollow and provided along its entire surface with a plurality of holes **36** which are preferably aligned in rows along the drum surface and peripherally staggered. The drum is also provided with a pair of tubular end hubs **107** (FIG. 3) which are rotatably sleeved over a fixed tubular shaft **8** extending through the blower drum **7**, and may be driven by any suitable means, for example, by a chain transmission of which there is shown only a sprocket gear **10** fixed to one of the drum hubs **107**. The rotation of cylinder **6** in a direction opposite from that of the drum **7** is derived from the drum **7** through mating spur gears **11** and **12** mounted on one of the drum hubs **107** and on the cylinder shaft **37**, respectively. The drum shaft hubs **107** and the cylinder shaft **37** are journaled in vertical machine frame members **38** and **39**, and the ends of the shaft **8** are fixed in brackets **40** and **41** mounted on frame members **38** and **39**, respectively.

Within the blower drum **7** is a fixed arcuate shoe **13** in sliding engagement with the inner drum surface, the shoe running the length of the drum and extending, in the direction of rotation of the drum, from a lower ascending portion to an upper descending portion of the drum surface, whereby drum holes **36** are exposed to a source of air only on the descending and bottom surfaces of the blower drum, the descending surface being that from which tobacco falls as a shower.

The fixed tubular shaft **8** about which the blower drum **7** is rotatable is provided with a plurality of holes or slots **108** suitably distributed along the length of the shaft and extending peripherally only over the surface portion of the shaft which is in confronting relation to the portion of the blower drum surface where the holes are uncovered, i.e., generally opposite the drum shoe **13**. The ends of the tubular shaft **8** are connected by means of ducts **14** and **15** to the respective outlets **116** of a centrifugal fan **16**. The air stream supplied by the fan **16** thus enters both ends of the tubular sleeve **8**, to maintain a substantially constant pressure within the sleeve **8**, and the sleeve **8** and blower drum **7** are so dimensioned that air issuing through the perforations **108** of tubular shaft **8** into the blower drum **7** and thence through the uncovered holes of drum **7** is under substantially constant pressure across the face of the drum, thus insuring an air current through the holes of the drum which is uniform across the drum.

As illustrated herein, air is blown through the perforations **36** of blower drum **7** both generally laterally from the descending surface and generally downwardly from the bottom surface of the drum. The downward air current, however, is deflected upwardly toward the descending surface of the blower drum **7** to merge with the air currents flowing laterally from the drum. A suitable deflector is shown in the form of an arcuate fin **17** adjustably pivoted at one end **117** to the bottom of the partition **18** between the blower drum **7** and the carded drum **3**, the upper or concave surface of the fin **17** being in generally spaced confronting relation to the bottom of the blower drum **7**. The fin **17** can be adjusted vertically about its pivot **117** thus varying the radial distance between the drum surface and the free end of the deflector fin **17**. Other forms of air deflectors may be provided under the drum **7**, and it is preferable that such deflectors permit radial adjustment of the deflectors relative to the blower drum **7** as well as adjustment of angular extension of the deflectors around the bottom of the drum. The vertical adjustability of deflector fin **17** permits varying the orientation of the upwardly deflected air current and consequent varying of the influence of the deflected air currents on the primary current issuing laterally from the descending surface of the blower drum **7**.

From the foregoing it will be appreciated that the resultant air stream blowing from the drum **7** is substantially transverse to the path of the stream of tobacco freely falling along the descending surface of blower drum **7** after being ejected from between drum **7** and cylinder **6**. Under the action of the air stream, the shredded tobacco fibers are intercepted and projected above a conveyor belt **19** on which the tobacco is deposited as a substantially uniform stream and conveyed to rod forming mechanism, for example. While being conveyed by the air stream, the tobacco shreds traverse a sufficiently wide space **42** provided between the blower drum **7** and the receiving end of the conveyor **19**, whereby ribs, stems, grit and other undesirable particles in the tobacco, instead of being projected across space **42** onto belt **19**, because of their relatively greater weight than the tobacco shreds and also their greater kinetic energy acquired during free fall, drop through the space **42** between the drum **7** and the conveyor **19**, and are collected in a suitable removal tray or box **23** disposed beneath the air stream. Since the air current issuing from the blower drum **7** is substantially uniform across the drum, the tobacco shreds selectively conveyed by the air stream onto the conveyor **19** are deposited as a layer uniformly over the entire width of the conveyor **19**.

A fixed elongated baffle **22** is mounted adjacent and transversely of the receiving end of the conveyor **19** and constitutes a threshold which must be overcome by the shredded tobacco blown to the conveyor belt **19**. The baffle **22** diverts the air stream upwardly to aid in the deposition of tobacco shreds on the belt and further to insure that the layer of tobacco deposited on the belt is undisturbed, since the baffle arrangement provides an air zone above the conveyor belt **19** which is substantially still, that is, free of appreciable air currents.

By varying the position of the deflector fin **17** beneath the blower drum **7**, or the distance between the drum **7** and baffle **22**, or both, and optionally the height of the baffle, the above described pneumatic tobacco separating and selective feeding apparatus can be adapted to various types of shredded tobacco, and the size or weight of ribs and other undesirable particles to be separated from the tobacco also can be predetermined.

The conveyor belt **19** rises slightly in its direction of travel and conveys the shredded tobacco stream to a rod forming mechanism, for example, by dropping the tobacco as a shower through a hopper **25** onto a transverse collecting belt **26** which feeds the tobacco to a tobacco pressing wheel **27**, such as shown in Patent 2,223,498 granted to Ruau on December 3, 1940, from which the pressed tobacco rod is delivered to the cigarette rod forming line **24**, all in a manner well known in the art and not described further herein as it forms no part of the present invention. Various tobacco rope and cigarette rod forming devices are adapted to be fed with tobacco prepared according to the present invention.

The conveyor belt **19** constitutes the bottom of a wide chamber **29** defined by lateral walls **28**, a frontal wall **31** and an inclined rear wall **30** which is perforated. Thus, the chamber assumes the form of a diffuser in that it presents a progressively larger cross sectional area in the direction of air flow. Under these conditions, the air current moves above the conveyor belt with little turbulence and its pressure per unit area is progressively reduced. This control of the air current, so that it has

little turbulence and its pressure per unit area is progressively reduced, promotes the deposition of the tobacco layer on the conveyor belt **19** with substantial uniformity.

The perforations in the wall **30** are such that they prevent passage of tobacco particles while permitting the air stream to pass into chamber **32**, thence into ducts **33** and **34** to the suction openings **216** of the centrifugal blower **16**. Cyclone separators **35** are interposed in the ducts **33** and **34** to remove entrapped dust from the air. The dust is collected in removable receptacles **43** and **44**.

The method and apparatus of the present invention is not to be limited to the specific embodiment described and exemplified, as variations and modifications may be resorted to within the scope of the appended claims defining the invention.

What is claimed is:

1. In a cigarette making machine; a feed hopper having a linear conveyor for feeding shredded tobacco toward a carded drum mounted in the hopper and arranged to be rotated about a horizontal axis, a picker wheel mounted adjacent to the drum on an axis parallel to that of the drum and adapted to remove tobacco therefrom and deliver the same to a perforated hollow blower drum adjacent to and parallel with the picker wheel and the carded drum, and arranged to be rotated about an axis parallel to that of the wheel, said blower drum having a stationary member adjacent the internal peripheral portion thereof for blocking the flow of air through adjacent perforations of the drum so that air issues from said blowing drum only on the descending portion thereof, and a partition member horizontally arranged and positioned between the carded drum, the picker wheel and the blower drum, the partition member having an arcuate surface adjacent to each of the said drums and the wheel, the upper surface thereof adjacent to the periphery of the picker wheel comprising a bridging member between said drums, and the partition member having a lower surface having a concave vane pivotally mounted thereon, said vane extending under and adjacent the lower portion of the blower drum for guiding the flow of air from said blower drum in a substantially horizontal direction radially outward of the blower drum at said descending portion thereof, a second conveyor spaced from the blower drum for receiving tobacco blown therefrom and for conveying the same to a rod forming means, the force and direction of the air issuing from the blower drum and guided by the vane, and the spacing of the second conveyor therefrom being such that heavier particles of the shredded tobacco fall from the blown tobacco stream, and means for collecting the heavier particles.

2. In the cigarette making machine defined in claim **1**; wherein the speed of rotation of the blower drum is less than that of the carded drum and that of the picker wheel and including a compressor drum mounted on a horizontal axis positioned adjacent to the blower drum and the picker wheel and arranged to be rotated at a speed such that the peripheral speed thereof is equal to that of the blower drum so that the speed of the tobacco leaving the picker wheel is materially reduced and the tobacco therein is compressed and forwarded to the descending portion of the blower drum to be acted upon by the air issuing therefrom.

3. In a cigarette making machine as defined in claim **2**; wherein the second conveyor has a portion in confronting relation with the blower drum and a baffle member mounted adjacent and above the said confronting portion for deflecting heavier particles in the blown stream for selecting the tobacco permitted to be conveyed to the rod stream according to the pivotal position of said vane.

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SAMUEL KOREN, *Primary Examiner.*

JOSEPH S. REICH, *Examiner.*