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Heitmann et al.

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[54] **APPARATUS FOR TRANSPORTING ROD-SHAPED ARTICLES**

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[52] **U.S. Cl.** ..... **302/2 R,** 302/49

[51] **Int. Cl.** **B65g 53/00**

[58] **Field of Search** ..... 302/2 R, 3, 49; 221/278; 222/194

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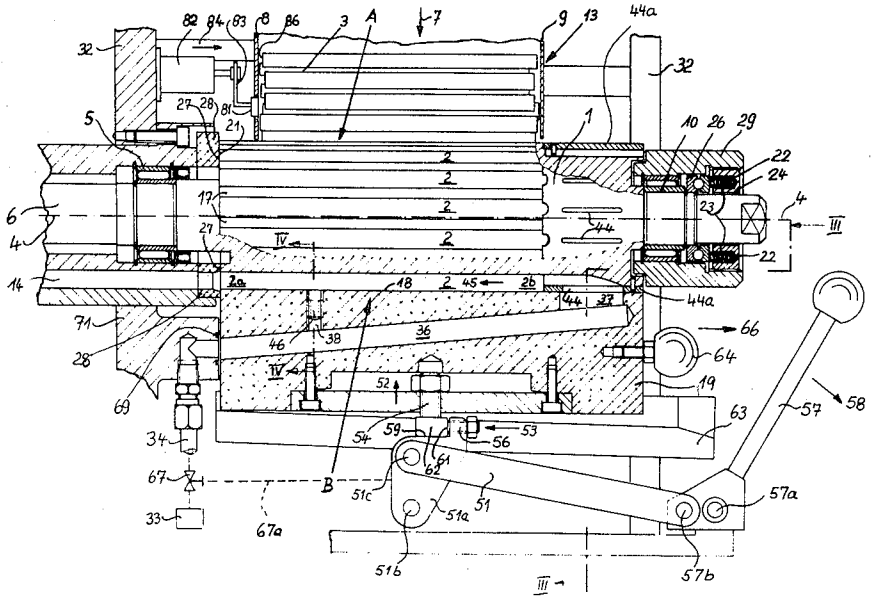
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Assistant Examiner—H. S. Lane
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[57] **ABSTRACT**

Apparatus for transporting filter stubs from a magazine having an open lower end into a tubular conveyor wherein the stubs are propelled axially into the hopper of a consuming or processing machine employs a single transfer drum which is continuously driven to move its axially parallel peripheral flutes from register with the open lower end of the magazine into register with the inlet of the tubular conveyor where the stubs are expelled from successive flutes by compressed air. A removable block is normally maintained in sealing engagement with ribs which separate the flutes from each other while the adjoining flutes register with the inlet of the tubular conveyor to thus prevent excessive losses in compressed air. Such compressed air is admitted by way of two ports one of which register with one end of a flute only while the other end of such flute registers with the inlet of the tubular conveyor. The other port communicates with successive flutes prior to, during and after the short interval of registry with the inlet. A mechanical intercepting device is movable into the lower end of the magazine to engage the adjacent ends of one or more layers of stubs and to press the other ends of such stubs against a stationary will of the magazine. This interrups the admission of stubs into the path of successive ribs on the transfer drum. The drum can remain in motion while the intercepting device dwells in its operative position.

20 Claims, 4 Drawing Figures



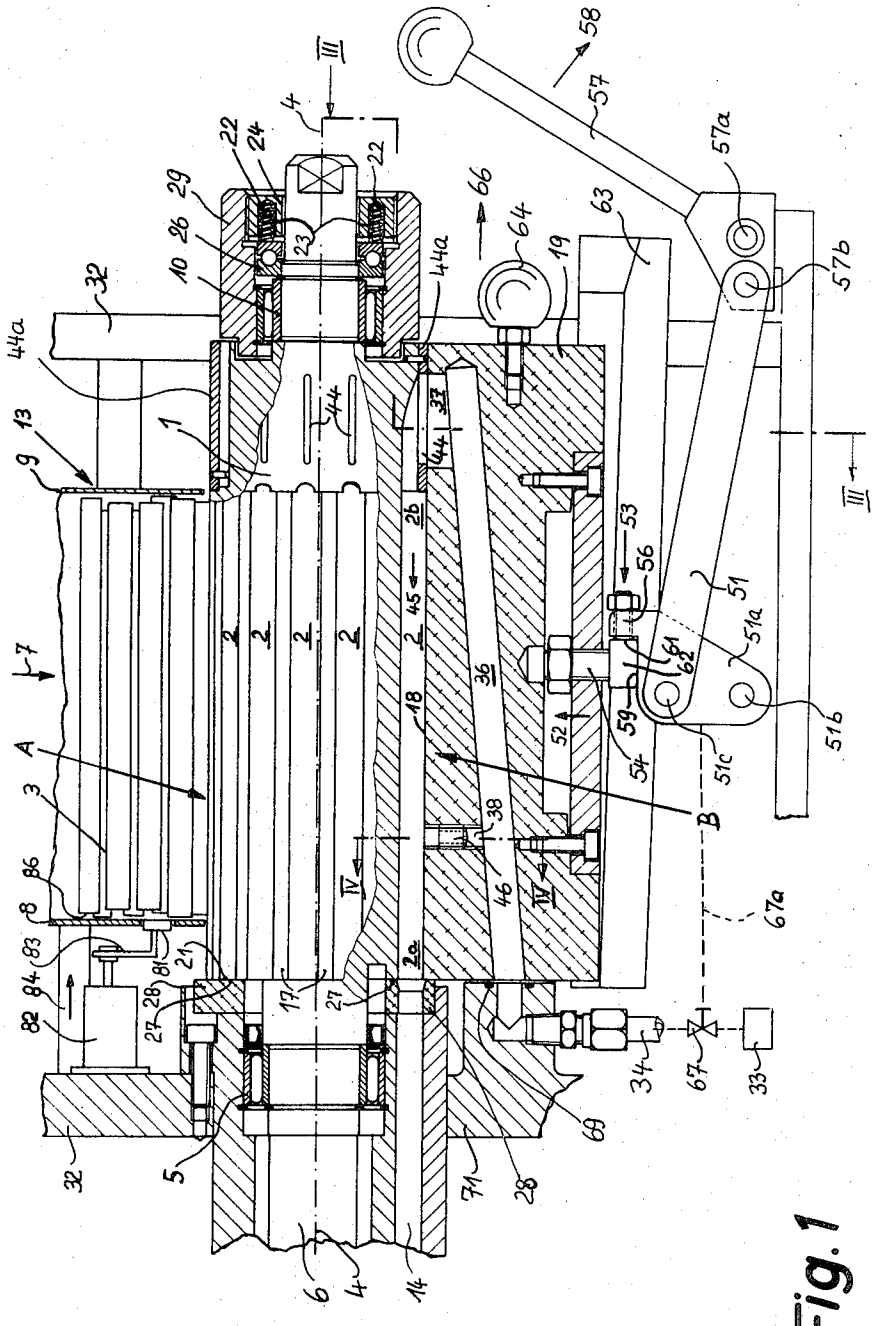


Fig. 1

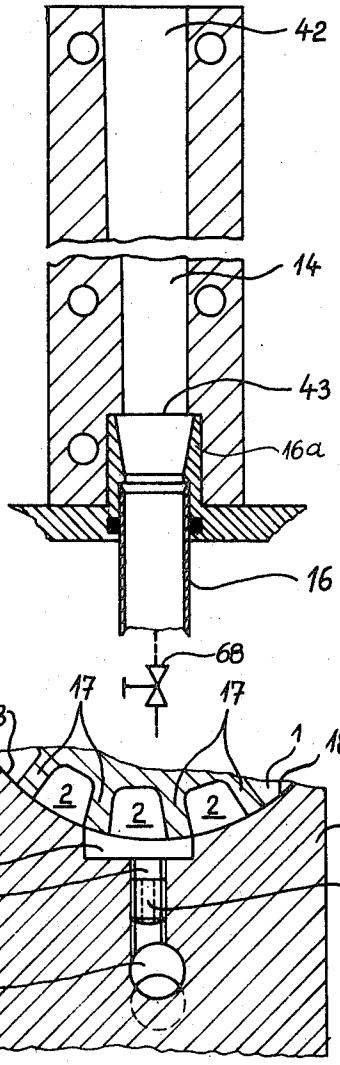


Fig. 2

Fig. 4

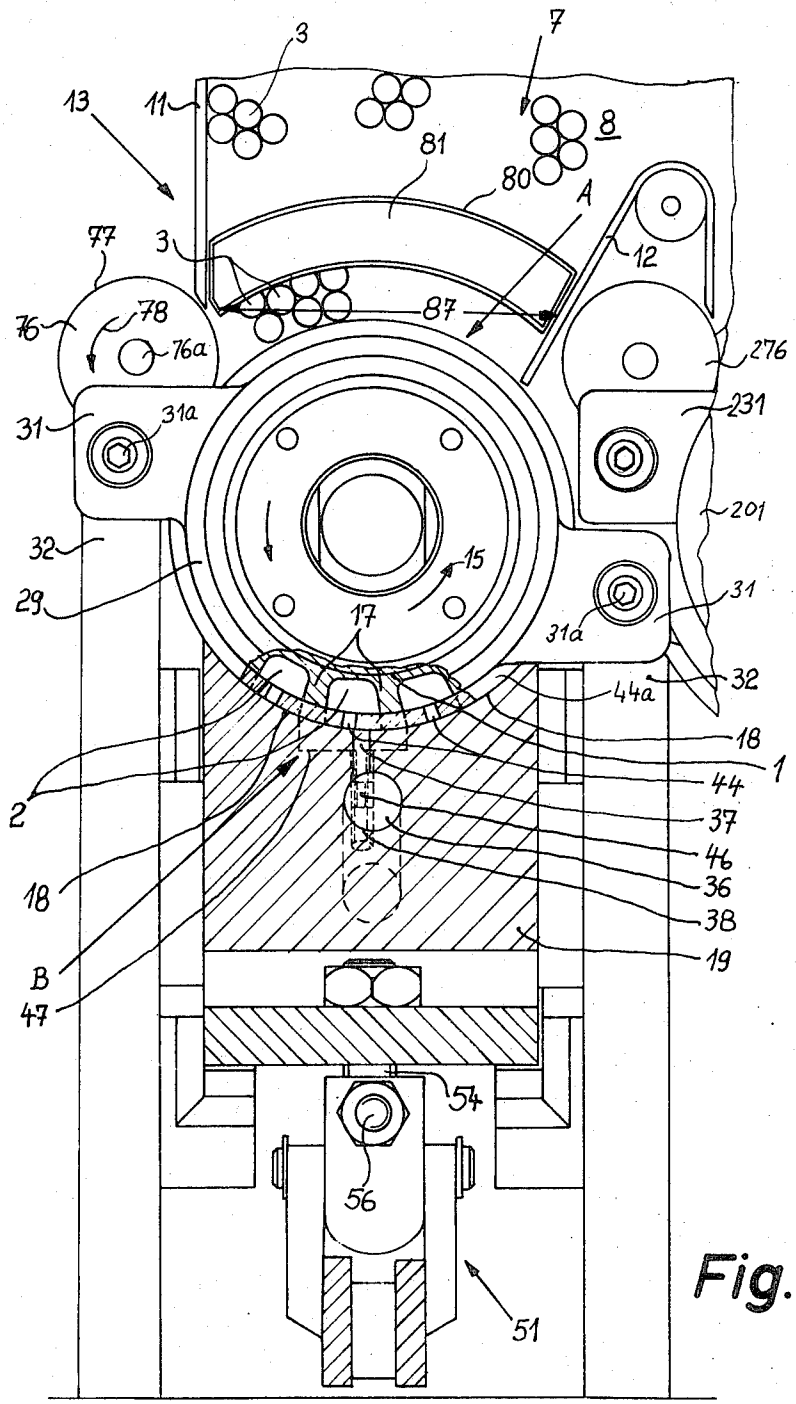

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Fig. 3

APPARATUS FOR TRANSPORTING ROD-SHAPED ARTICLES

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for transporting rod-shaped articles, such as filter rod sections, plain or filter-tipped sections of wrapped tobacco-containing rods or the like. More particularly, the invention relates to improvements in apparatus for transporting rod-shaped articles from a supply of such articles into a tubular conveyor wherein the articles are moved lengthwise by means of a gaseous fluid, preferably by means of compressed air, to be delivered to one or more consuming machines.

It is customary to transport rod-shaped articles which constitute or form part of smokers' products between spaced producing and consuming machines, for example, between a filter rod making machine and a machine which attaches filter rod sections or stubs to sections of wrapped tobacco rods to form filter tipped cigarettes, cigars or cigarillos. It is also customary to transport filter rod sections from a producing machine to a processing machine wherein such filter rod sections are further processed or assembled with different filter rod sections to form therewith so-called composite filter stubs or plugs for attachment to wrapped tobacco rod sections. If the rod-shaped articles must be transported through considerable distances, it is advisable to employ a pneumatic conveyor system which utilizes one or more tubes or hoses wherein the articles are conveyed at a high speed by means of a gaseous fluid, such as compressed air. For example, several pneumatic conveyor tubes may be utilized to transport filter stubs from a main magazine to a plurality of discrete filter cigarette making machines, such as those known as MAX and produced by the West-German Firm of Hauni-Werke, Hamburg-Bergedorf. The main magazine contains a substantial supply of filter stubs which must be transferred, one afer the other, into the inlet or inlets of one or more pneumatic conveyor tubes wherein they travel axially toward the hoppers of discrete filter cigarette making machines. This often presents serious problems, especially if the filter stubs must be manipulated without any deformation and if a pneumatic conveyor tube or hose is to receive a very large number of stubs per unit of time. The pressure in the pneumatic conveyor tube or hose differs from the pressure in the surrounding atmosphere and is usually higher than normal atmospheric pressure.

In accordance with a presently known proposal, filter stubs or analogous rod-shaped articles are first removed from the magazine and are thereupon moved to a position for introduction into a pneumatic conveyor tube or hose. The apparatus for effecting such transfer normally comprises a drum which is provided with flutes serving to receive rod-shaped articles which are being withdrawn from a large supply of such articles and to move the articles sideways. The articles are usually transferred onto one or more additional drums prior to being moved to a predetermined position for propulsion into the inlet of the conveyor tube. Such movement to a position of register with the inlet of the conveyor tube normally involves expelling or withdrawing the articles from the flutes of the last drum and thereupon subjecting successive articles to the action of a stream of compressed air which propels them into the tube wherein they move axially toward the hopper of the associated consuming or processing machine. Attempts to employ a single transfer drum which withdraws rod-shaped articles from a magazine and moves the thus withdrawn articles directly into register with the inlet of a pneumatic conveyor tube have met with little success, mainly because of high losses in pressurized fluid at the station where the articles are propelled into the tube. It is to be borne in mind that the pressure of the gas stream which is used to propel a rod-shaped article into a pnaumatic conveyor tube must substantially exceed the gas pressure in the tube proper. Furthermore, and since the just described types of apparatus must utilize a highly compressed gas which acts against the transfer drum, the latter is subjected to extremely high stresses with attendant pronounced wear on the bearings and high energy requirements of the drive means for the transfer drum.

In accordance with another known proposal, the rod-shaped articles are withdrawn from a large supply of such articles in a magazine and are propelled axially into the bore of a drum which moves the articles to a position of register with the inlet of a pneumatic conveyor tube. Such mode of operation is more satisfactory than the aforedescribed mode; however, the transfer of articles into the bore of the drum consumes much time so that such apparatus cannot be used to process the entire output of a high-speed filter stub making or analogous machine. As a rule, the drum must be moved intermittently which also contributes to a lower output of the apparatus. Moreover, the drive for the intermittently rotating drum is rather complex and prone to malfunction.

SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved apparatus for transfer of filter stubs, sections of wrapped tobacco filler rods and/or analogous rod-shaped articles from a main supply in a magazine or the like to one or more consuming machines which may be located at a considerable distance from the main supply so that the apparatus must employ one or more pneumatic conveyor tubes or hoses for rapid transport of a series of articles to the respective consuming machine or machines.

Another object of the invention is to provide an apparatus wherein a single transfer conveyor suffices to withdraw rod-shaped articles from a magazine and to move successive articles into register with the inlet of a tubular conveyor which delivers the articles to a remote consuming machine.

A further object of the invention is to provide an apparatus which is constructed and assembled in such a way that it need not be provided with bulky, complex and expensive means for regulating the withdrawal of articles from the supply of such articles in a magazine or the like, even if the articles are to be withdrawn at the rate of several thousand articles per minute.

An additional object of the invention is to provide the apparatus with novel and improved ejector means for effecting the transfer of rod-shaped articles from successive receiving means of a single transfer conveyor (particularly a continuously rotating drum whose receiving means constitute axially parallel peripheral flutes) directly into the inlet of a tubular conveyor wherein the articles are propelled lengthwise by means

of one or more streams of a gaseous fluid whose pressure differs from the atmospheric pressure.

Still another object of the invention is to provide the apparatus with novel and improved means for rapidly interrupting the withdrawal of articles from the main supply without necessitating any changes in the speed of the transfer conveyor.

An additional object of the invention is to provide a transfer apparatus wherein the losses in gaseous fluid which serves to introduce rod-shaped articles into and to transport such articles in a tubular conveyor are negligible and invariably much lower than in heretofore known apparatus.

A further object of the invention is to provide the apparatus with novel and improved means for providing a pile-up of rod-shaped articles at the station where the articles leave the magazine to enter the receiving means of a single transfer conveyor.

A feature of the invention resides in the provision of an apparatus for transporting filter stubs, wrapped tobacco rod sections with or without filter stubs and/or analogous rod-shaped articles. The apparatus comprises transfer conveyor means (which preferably comprises a single continuously driven drum) having a plurality of open-sided receiving means (which preferably constitute axially parallel flutes machined into or provided at the periphery of the drum) and partitions (e.g., in the form of elongated ribs) alternating with the receiving means and arranged to travel therewith sideways along an arcuate path extending along spaced-apart first and second transfer stations, feeding means (which preferably comprises a magazine having an open lower end) for supplying articles through the open sides of and into successive receiving means at the first station, tubular conveyor means (e.g., an alongated tube or hose) having an inlet in temporary register with successive receiving means at the second station, ejector means for pneumatically transferring articles from successive receiving means at the second station into the tubular conveyor means by moving the articles axially, and sealing means including a surface in sealing engagement with those partitions of the transfer conveyor means which travel along the second transfer station to thereby minimize losses in gaseous fluid which is utilized to propel successive articles from their receiving means into and through the inlet of the tubular conveyor means.

In accordance with another feature of the invention, the apparatus further comprises intercepting or blocking means which is movable to and from an operative position in which the intercepting means mechanically engages and holds rod-shaped articles in the region of the lower end of the magazine to thus interrupt the admission of articles into the receiving means at the first transfer station. The intercepting means preferably comprises one or more pads consisting at least in part of elastomeric material and arranged to engage the adjacent ends of articles in the magazine to thereby bias the other ends of such articles against a remote wall of the magazine whereby the admission of articles into the receiving means is interrupted while the transfer conveyor means continues to move its receiving means and partitions at a desired speed so that the transport of articles into register with the inlet of the tubular conveyor means can be resumed as soon as the intercepting means is caused to leave its operative position.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary partly elevational and partly longitudinal vertical sectional view of an apparatus which embodies the invention;

FIG. 2 is an enlarged horizontal sectional view of a tubular mouthpiece which serves to guide rod-shaped articles between successive receiving means of the transfer conveyor means and the inlet of the tubular conveyor means;

FIG. 3 is an enlarged partly end elevational and partly transverse vertical sectional view as seen in the direction of arrows from the line III—III of FIG. 1; and

FIG. 4 is an enlarged fragmentary sectional view as seen in the direction of arrows from the line IV—IV of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing in detail, there is shown an apparatus which is utilized to transfer filter rod sections 3 (hereinafter called stubs or plugs) from a feeding unit including a magazine 13 into a tubular conveyor here shown as a tube or hose 16 (FIG. 2) wherein the stubs are propelled axially into the hopper or hoppers of one or more discrete consuming machines, such as one or more filter cigarette making machines. The apparatus comprises a drum-shaped transfer conveyor 1 having axially parallel receiving means 2 in the form of flutes which are machined into its peripheral surface and are open at their outer sides (see particularly FIGS. 3 and 4). The transfer conveyor 1 is secured to a drive shaft 6 whose axis is indicated at 4 and which is driven constantly (as contrasted with rotation in stepwise fashion) to rotate in the direction indicated by the arrow 15 (FIG. 3). The drive shaft 6 is rotatable in radial antifriction bearings 5 and 10.

Successive flutes 2 of the conveyor 1 receive discrete stubs 3 at a first transfer station A and place the thus received stubs 3 into register with a stationary tubular mouthpiece 14 at a second transfer station B which is shown as being located substantially diametrically opposite the first transfer station A. The bore of the mouthpiece 14 register with the internal space of the hose 16 which may consist at least in part of flexible material. The supply 7 of parallel filter stubs 3 is confined by the sidewalls 11, 12 and end walls 8, 9 of the magazine 13 (see FIGS. 1 and 3). Each flute 2 of the conveyor 1 is flanked by two axially parallel partitions in the form of elongated ribs or webs 17 (FIGS. 3 and 4) which sealingly engage a stationary concave sealing surface 18 while the respective flutes 2 approach, register with, and move beyond the stationary tube 14. The second transfer station B is located in the region of the concave sealing surface 18. This surface forms part of a displaceable sealing block 19 and its center of curvature is located on the axis 4 of the drive shaft 6 for the transfer conveyor 1. The block 19 preferably consists

of a synthetic plastic material (such as polyamide) having satisfactory self-lubricating or antifriction characteristics. For example, the block **19** may be made of "Trogamid" (trademark) which is being produced by the Firm Dynamit Nobel, Troisdorf near Cologne, Western Germany (Catalogue No. PA 6 E-Mo).

The left-hand end face **21** of the transfer conveyor **1** (as viewed in FIG. **1**) is biased against the adjacent surface **27** of a sealing ring **28** which is mounted in the frame **32** of the apparatus. The means for biasing the end face **21** against the surface **27** includes a set of helical springs **22** which are received in sockets **23** of a nut **24** which has external threads mating with the internal threads of a sleeve **29.** A thrust bearing **26** is interposed between the springs **22** and the inner race of the radial antifriction bearing **10** to urge this inner race against the adjacent axial end of the transfer conveyor **1.** The sleeve **29** has two outwardly extending wings or projections **31** which are secured to the frame **32** by screws **31a** or analogous fasteners.

The sealing block **19** is formed with a channel **36** which is connected with a source **33** of compressed gaseous fluid (e.g., air) by way of an ejector conduit **34** containing a shut-off valve **67.** The channel **36** is inclined with reference to the axis **4** (see FIG. **1**) and communicates with two axially spaced ports **37, 38** which extend substantially radially of the transfer conveyor **1.** The port **37** is an ejector port and communicates only with that flute **2** which is in sumultaneous register with the mouthpiece **14** and hence with the inlet **16a** of the hose **16.** The width of the bore in the mouthpiece **14** decreases in a direction from the sealing ring **28** toward the inlet **16***a* of the hose **16.** This is shown in FIG. **2** wherein the receiving end **42** of the bore in the mouthpiece **14** is wider than the discharge end **43.** The ejector port **37** can communicate with the adjacent flute **2** by way of one of an annulus of elongated slots **44** which are machined into a cylindrical shroud **44a** surrounding the right-hand end of the transfer conveyor **1,** as viewed in FIG. **1.** As mentioned above, a flute **2** can receive compressed gas from the ejector port **37** (by way of the respective slot **44**) only when such flute registers with the receiving end **42** of the bore in the mouthpiece **14.** The ejector port **37** and one of the slots **44** can admit compressed gas to that end **2***b* of the registering flute **2** which is remote from the sealing ring **28.** The stream of compressed gas which enters the end **2***b* of a flute **2** by way of the ejector port **37** and the respective slot **44** impinges against the right-hand end face of a stub **3** in such flute. The shroud **44***a* rotates with the transfer conveyor **1** and has a slot **44** for each of the flutes **2.**

The port **38** in the sealing block **19** contains a flow restrictor **46** and includes a recess **47** (FIG. **4**) which is machined into the concave surface **18.** The width of the recess **47** exceeds the width of the adjacent end **2***a* of a flute **2** so that an oncoming flute can register with the recess **47** before, while and after such flute registers with the bore of the mouthpiece **14.** As shown in FIG. **4,** the width of the recess **47** may be about twice the width of a flute **2,** as considered in the circumferential direction of the transfer conveyor **1.**

The sealing block **19** is displaceable by a lever **51** which can urge the concave surface **18** against the top lands of ribs **17** located at the second transfer station B. The lever **51** can also urge the left-hand end face of the sealing block **19** (as viewed in FIG. **1**) against the sealing ring **28.** The directions in which the sealing block **19** can be urged against the transfer conveyor **1** and sealing ring **28** are respectively indicated by the arrows **52** and **53.** The means for transmitting pressure from the lever **51** to the sealing block **19** in the radial direction of the transfer conveyor **1** (arrow **52**) comprises an adjustable threaded bolt **54.** A second threaded bolt **56** is adjustably mounted in a link **51***a* and serves to transmit to the sealing block **19** (via bolt **54**) stresses in the direction indicated by the arrow **53.** The lever **51** can be moved by a handle **57** which is pivotably mounted on the frame **32,** as at **57***a*, and carries a pivot pin **57***b* for the lever **51.** When the handle **57** is pivoted in the direction indicated by an arrow **58,** the surface **59** on the link **51***a* moves away from the head **62** of the bolt **54** to reduce or terminate the pressure acting in the direction indicated by the arrow **52.** At the same time, the surface **61** at the tip of the bolt **56** moves away from the adjacent side face of the head **62** to reduce or terminate the pressure acting in the direction of the arrow **53.** The link **51***a* is pivotable on a fixed pivot pin **51***b* and is coupled to the lever **51** by a further pivot pin **51***c*. The sealing block **19** can come to rest on a stationary support **63** which is mounted in the frame **32.** A handgrip portion **64** can be engaged by the attendant and enables such person to withdraw the sealing block **19** in the direction indicated by an arrow **66.** Periodic removal of the sealing block **19** is advisable to allow for inspection and/or cleaning of the ports **37, 38,** channel **36** and flow restrictor **46.** Also, the sealing block **19** can be removed to allow for removal of a stub **3** which happens to be caught at the transfer station B prior to or during entry into the bore of the mouthpiece **14.** When the handle **57** is pivoted in the direction indicated by the arrow **58,** an operative connection **67***a* (indicated by broken lines) between the link **51***a* and the valve **67** automatically causes the valve **67** to seal the source **33** of compressed gas from the channel **36** so that the gas cannot escape into the surrounding atmosphere while the concave surface **18** is moved out of sealing engagement with the ribs **17** at the transfer station B and the left-hand end face of the sealing block **19** is disengaged from the sealing ring **28.** the operative connection **67***a* may constitute a link train, a gear train or any other suitable means which can shut off the valve **67** in response to movement of the lever **51** in a direction to allow the sealing block **10** to descend onto the support **63.** The connection **67***a* preferably further serves to close a second shutoff valve **68** which is provided in the hose **16** and serves to prevent escape of compressed gas from the hose when the sealing block **19** is disengaged from the sealing ring **28.** The reference character **69** denotes in FIG. **1** a ring-shaped gasket which is installed in a stationary wall **71** of the frame **32** and surrounds the intake end of the channel **36** when the sealing block **19** is held in its operative position. The channel **36** receives compressed gas from the conduit **34** by way of a suitably configurated passage which is machined into the wall **71.**

The supply **7** of filter stubs **3** rests on the upper portion of the transfer conveyor **1** which later constitutes a movable bottom wall of the magazine **13** at the first transfer station A. An agitating roller **76** is mounted on a driven shaft **76** which rotates in the frame **32.** A portion of the very smooth and preferably highly polished cylindrical peripheral surface **77** of the roller **76** extends into the magazine **13** through an opening in the

sidewall **11** at the downstream end of the transfer station A (as considered in the direction of rotation of the transfer conveyor **1**). The arrow **78** indicates that the shaft **76a** drives the agitating roller **76** counter to the direction of rotation of the transfer conveyor **1** (arrow **15**). The shaft **76***a* may derive motion from the shaft **6** so that it rotates whenever the transfer conveyor **1** is in motion.

The apparatus further comprises mechanical intercepting means for interrupting or terminating the gravitational movement of stubs **3** into the range of flutes **2** and ribs **17** at the transfer station A. Such intercepting means comprises a composite or one-piece pressure pad **81** which is normally retracted into an opening or window **80** in the end wall **8** of the magazine **13** and can be moved into the interior of the magazine in response to energization or deenergization of an electromagnet **82** which is mounted in or on the frame **32.** As shown in FIG. **3,** the pressure pad **81** is of arcuate shape and this pad preferably consists of rubber or similar elastomeric material so that it cannot damage the adjacent ends **86** of the stubs **3** when it is caused to enter the interior of the magazine **13.** The armature of the electromagnet **82** comprises a substantially L-shaped holder **83** for the elastic pressure pad **81.** The direction in which the holder **83** moves in response to a change in the condition of energization of the electromagnet **82** is indicated by the arrow **84.** The pressure pad **81** extends across the full width (**87**) of the open lower or discharge end of the magazine **13** so that it can effectively intercept the lowermost layer or layers of stubs **3** which form the supply **7** whereby the delivery of stubs **3** to the flutes **2** at the transfer station A is terminated in automatic response to movement of the pressure pad **81** into the magazine **13.** In response to such penetration, the pressure pad **81** engages the adjacent ends **86** of the stubs **3** and presses the other ends of the stubs against the end wall **9.**

THE OPERATION:

The shaft **6** is driven by a variable-speed electric motor or the like (not shown) to rotate the transfer conveyor **1** in the direction indicated by the arrow **15.** The pressure pad **81** dwells in the retracted or inoperative position shown in FIG. **1** so that it does not interfere with gravitational descent of stubs **3** into the range of flutes **2** which enter, move through and beyond the first transfer station A. Thus, each flute **2** which leaves the transfer station A contains a filter stub **3** which is confined between two adjoining ribs **17.** The rapidly rotating agitating roller **76** prevents any jamming or pileup of stubs **3** in the region between the sidewall **11** of the magazine **13** and the oncoming ribs **17,** i.e., in the region where the flutes **2** move beyond the open lower end of the magazine. The transfer conveyor **1** can be provided with suitable suction ducts (not shown) which serve to hold the stubs **3** in their flutes **2** during transport from the first transfer station A toward the section transfer station B. Alternatively, the frame **32** may support one or more baffles or shrouds (not shown) which hold the stubs **3** in the respective flutes **2** while such flutes travel from the agitating roller **76** toward the recess **47** in the concave sealing surface **18.**

The stub **3** which is confined in a flute **2** registering with the bore of the mouthpiece **14** is propelled directly into the bore of the hose **16.** When such a flute reaches the recess **47,** it receives compressed gas from the channel **36** by way of the port **38** and flow restrictor **46.** The thus admitted stream of gas can flow around the stub **3** so that the pressure at the end **2***a* (close to the sealing ring **28**) of the flute equals the pressure at the other end **2***b* (close to the respective slot **44**). This insures that the gas which enters the flute **2** by way of the recess **47** cannot rapidly propel the stub **3** counter to the direction indicated by the arrow **45** (i.e., in a direction toward the ejector port **37**) when the flute moves into register with the mouthpiece **14** and hose **16.** The interior of the hose **16** is maintained at an elevated pressure by gas which is admitted through the recess **47.** When the flute **2** which already receives gas from the recess **47** reaches the ejector port **37,** it registers with the mouthpiece **14** and hose **16.** Consequently, the highly compressed gas stream which enters the end portion **2***b* of such flute **2** can propel the stub **3** axially (arrow **45**) through the end **2***a* and into the hose **16** during the very short interval of registry of the flute **2** with the mouthpiece **14.** The introduction of the leading end of the stub **3** into the mouthpiece **14** is facilitated due to the fact that the receiving end **42** of this mouthpiece is wider than the discharge end **43** (see FIG. **2**). The port **38** continues to admit compressed gas to the flute **2** which has moved beyond the position of register with the ejector port **37** (see the width of the recess **47**) so that the stub **3** which has entered the mouthpiece **14** is invariably caused to advance into the hose **16** prior to being severed by the left-hand end portion of the transfer conveyor **1.**

The ribs **17** which travel along the concave surface **18** are maintained in sealing engagement with the block **19.** At the same time, the end face **21** of the conveyor **1** bears against the surface **27** of the sealing ring **28.** Therefore, the leakage of compressed gas at the second transfer station B is negligible, even if the channel **36** admits to the ports **37, 38** a gaseous fluid at a relatively high pressure. This insures that the buildup of gas pressure in the flute **2** which registers with the ejector port **37** requires very little time and that the stubs **3** can be propelled into the hose **16** even if the transfer conveyor **1** is in constant motion and rotates at a high speed. The relatively narrow slots **44** insure that the gas flowing from the ejector port **37** into the adjacent flute **2** produces an impulse to propel the stub **3** into the hose **16** at the exact moment when the respective flute **2** registers with the receiving end **42** of the bore in the mouthpiece **14.**

The discharge end of the hose **16** is connected with the hopper or hoppers of one or more consuming machines (such as one or more filter cigarette making machines) which serve to further process the stubs (either by uniting them with similar or different types of stubs or by connecting them with tobacco-containing rod sections to form filter cigarettes, cigars or cigarillos. When the hopper or hoppers which receive stubs from the hose **16** contain a predetermined maximum supply of stubs, the withdrawal of stubs from the magazine **13** must be interrupted. The respective hopper or hoppers are provided with suitable detectors (for example, photosensitive detectors) which produce signals when the supply of stubs in such hoppers rises to a predetermined maximum value. The signal results in energization of the electromagnet **82** which moves the holder **82** in the direction indicated by the arrow **84** whereby the pressure pad **81** moves into the magazine **13** by way

of the window **80** and engages the adjacent ends **86** of the stubs in the lower portion of the magazine. Such stubs are pressed against the end wall **9** so that they cannot descent into the path of ribs **17** on the rotating transfer conveyor **1.** The pressure with which the pad **81** engages the ends **86** is selected with a view to prevent any appreciable deformation of or other damage to the stubs **3.** The delivery of stubs **3** into the hose **16** is terminated as soon as the transfer conveyor **1** removes from the supply **7** those stubs which are located below the stubs held by the pressure pad **81.** The transfer conveyor **1** can continue to rotate so as to be ready for renewed transport of stubs **3** into register with the mouthpiece **14** as soon as the aforementioned detector or detectors produce signals (or cease to produce signals) which deenergize the electromagnet **82** so that one or more springs (not shown) can retract the pressure pad **81** into the window **80** whereby the stubs **3** are again free to descend into the path of orbiting ribs **17** on the transfer conveyor **1.**

An important advantage of the improved apparatus is that a signal transfer conveyor can transfer stubs **3** (or analogous rod-shaped articles) from the magazine **13** directly into register with the hose **16.** Such mode of operation can take place even if the stubs which reach the second transfer station B are subjected to the action of a highly compressed gaseous fluid. Since the stubs can be expelled from the flutes **2** by moving axially while the conveyor **1** rotates continuously and at a high speed, the output of the apparatus is very high, e.g., this apparatus can process the entire output of a high-speed cigarette making machine which turns out up to and in excess of 4,000 cigarettes per minute.

The port **38** cooperates with the recess **47** to insure that the flute **2** which moves into register with the receiving end **42** of the mouthpiece **14** can receive a pressurized gaseous fluid before the respective slot **44** moves into register with the ejector port **37.** The gas which is supplied by the port **38** also serves to convey the stubs **3** lengthwise in and through the tubular conveyor **16.** The feature that the recess **47** communicates with a flute **2** not only during but also prior to and after the very short interval of registry of such flute **2** with the receiving end **42** insures that the stub which has entered the mouthpiece **14** is invariably propelled into and through the tubular conveyor **16,** i.e., that the action of the highly compressed gas stream issuing from the ejector port **37** and the corresponding narrow slot **44** is preceded and followed by the action of the gas stream which is supplied by the recess **47** of the port **38.**

The agitating roller **76** insures proper transfer of stubs **3** into successive flutes **2** even if the magazine **13** contains a relatively large supply **7** of filter stubs. This is attributed to the fact that the roller **76** is driven counter to the direction of rotation of the transfer conveyor **1** and also that the roller is provided with a very smooth peripheral surface. In other words, it is not necessary to provide or replace the magazine **13** with means for supplying to the transfer station A a single layer, row or stack of rod-shaped articles in spite of the fact that the transfer conveyor **1** rotates continuously and at a high speed.

The heretofore known apparatus for withdrawal of rod-shaped articles from a supply of such articles in a magazine having an open lower end by means of a fluted drum normally employ rotary or otherwise movable agitating device which are provided with knurled, ribbed or otherwise roughened external surface on a rubber sleeve or the like. It was found that such conventional agitating devices cannot insure satisfactory entry of rod-shaped articles into each of a series of flutes on a rapidly and continuously rotating conveyor. Therefore, the presently known magazines are normally provided with one or more vertical ducts which receive stacks of rod-shaped articles and whose lower ends discharge articles into the flutes of the rotating drum. The ducts are not always desirable because they are likely to be clogged with articles or with foreign matter and their cleaning necessitates lengthy interruptions in operation of the apparatus with attendant losses in output.

The agitating device which is shown in FIG. **3,** i.e., an agitating roller **76** with a smooth and preferably polished external surface **77,** is much simpler than the previously known agitating devices and operates properly even though the magazine is not provided with ducts or analogous means for orienting and stacking the articles before the articles move into the path of successive partitions **17** on the transfer conveyor **1.**

The improved intercepting pad **81** insures a practically instantaneous interruption of the delivery of stubs **3** into the range of the ribs **17** on the continuously rotating transfer conveyor **1.** Furthermore, the engagement between the elastic pad **81** and the adjacent ends **86** of stubs **3** does not cause any detectable deformation of the stubs even if the electromagnet **82** (or analogous signal-responsive actuating means for the pressure pad **81**) is designed to abruptly propel the holder **83** in the direction of the arrow **84.** Such mode of intercepting the stubs renders it possible to drive the conveyor **1** at a constant speed, or at least continuously, irrespective of whether the pressure pad **81** is maintained in its operative or retracted position. Such mode of operation renders it possible to simplify the construction of the drive means for the transfer conveyor **1** because the drive means need not be arrested when the consuming machine or machines which receive stubs **3** from the hose **16** accumulate a maximum supply of stubs.

Another important advantage of the intercepting pad **81** is that it can rapidly terminate the admission of stubs **3** into the path of movement of partitions **17** even though the magazine **13** is not provided with ducts or analogous means for orienting and stacking the articles at the first transfer station A. Heretofore known intercepting devices which employ mechanical means for interrupting the evacuation of rod-shaped articles from a magazine invariably employ clamping devices which engage the sides (rather than the ends) of articles. Such conventional mechanical intercepting devices have failed to gain acceptance in the tobacco processing and related industries because they invariably cause excessive deformation of or other damage to the articles. It was found that the improved intercepting pad **81,** which engages the ends **86** of the adjacent layer or layers of stubs **3** in the lower end of the magazine **13,** is capable of treating the stubs gently because it subjects such articles to axial rather than lateral stresses. The likelihood of damage to the stubs is further reduced due to the face that at least that portion of the pad **81** which engages the ends **86** of stubs **3** consists of a yieldable material, such as natural or synthetic rubber. However, it is equally within the purview of the invention to employ an intercepting device which is provided with

a set of needles, pins or analogous projections which engage the adjacent ends of one or more layers of rod-shaped articles in the lower end of the magazine **13** or an analogous feeding unit. The electromagnet **82** may be energized in automatic response to stoppage of the conveyor **1** to thereby cause the pressure pad **81** to assume its operative position.

FIG. **3** illustrates a portion of a second transfer conveyor **201**, on wing **231** of a second sleeve (see the sleeve **29** of FIG. **1**), and the agitating roller **276** of a second apparatus which is adjacent to the heretofore described apparatus and can receive stubs **3** from a second outlet of the magazine **13** or from a discrete second magazine. The magazine **13** can be provided with an entire row of outlets so that it can serve as a means for feeding rod-shaped articles to an entire battery of transfer conveyors each of which delivers rod-shaped articles into register with a discrete tubular conveyor **16**. An advantage of such battery of apparatus is that their transfer conveyors, agitating rollers and other moving parts can receive motion from a single drive.

The sealing block **19** may also be made of carbon, especially if the partitions **17** of the transfer conveyor **1** consist of hardened steel. It was found that a sealing block of carbon will furnish a surprisingly satisfactory sealing action if the entire transfer drum or at least its partitions **17** are made of hardened steel.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended:

1. In an apparatus for transporting filter stubs, wrapped tobacco rod sections or analogous rod-shaped articles, a combination comprising transfer conveyor means having a plurality of open-sided receiving means and partitions alternating with said receiving means, and partitions and said receiving means being arranged to travel sideways along an arcuate path extending along first and second transfer stations; feeding means for supplying articles through the open sides of and into successive receiving means at said first station; tubular conveyor means adjacent to said second station and having an inlet in temporary register with successive receiving means; ejector means for pneumatically transferring articles from successive receiving means at said second station into said tubular conveyor means by moving the articles axially, said ejector means comprising a source of compressed gas, first port means connected with said source and registering with successive receiving means only during the intervals of full registry of successive receiving means with the inlet of said tubular conveyor means so that the expulsion of an article can begin immediately when said first port means registers with the respective receiving means, and second port means connected with said source and communicating with successive receiving means at said second station to admit into successive receiving means and into said tubular conveyor means a stream of compressed gas prior to and while successive receiving means receive compressed gas from said first port means; and sealing means including a surface in sealing engagement with those partitions of said transfer conveyor means which flank the receiving means registering with said first port means.

2. A combination as defined in claim **1**, wherein said transfer conveyor means comprises a drum which is rotatable about a predetermined axis, each of said receiving means constituting a peripheral flute provided in said drum and extending in parallelism with said axis, the open sides of said flutes facing away from said axis.

3. A combination as defined in claim **2**, wherein said drum has an end face adjacent to said inlet and further comprising second sealing means having a surface in sealing engagement at least with those portions of said end face which travel along said second station.

4. A combination as defined in claim **3**, wherein at least that portion of at least one of said sealing means which is provided with the respective surface consists of synthetic plastic material with superior antifriction properties.

5. A combination as defined in claim **1**, further comprising drive means for continuously moving said transfer conveyor means.

6. A combination as defined in claim **1**, wherein said second port means is further arranged to admit compressed gas into successive receiving means and into said tubular conveyor means after successive receiving means receive compressed gas from said first mentioned port means.

7. A combination as defined in claim **1**, wherein said feeding means comprises a magazine arranged to accommodate a supply of rod-shaped articles, said magazine having an open lower end into which the articles of said supply descend by gravity and said arcuate path extending along said open lower end of said magazine.

8. A combination as defined in claim **7**, wherein said magazine comprises a plurality of walls confining said supply of articles and further comprising a rotary agitating member extending through an opening provided in one of said wall means and having a peripheral surface containing the articles in the region of the open lower end of said magazine.

9. A combination as defined in claim **8**, wherein said opening is provided at the downstream side of said open end, as considered in the direction of movement of said receiving means and said partitions along said arcuate path.

10. A combination as defined in claim **9**, wherein said transfer conveyor means comprises a drum and means for rotating said drum about a predetermined axis in a predetermined direction, and further comprising means for rotating said agitating member about a second predetermined axis counter to said predetermined direction.

11. A combination as defined in claim **1**, wherein said feeding means comprises a magazine containing a supply of rod-shaped articles at said first transfer station, and further comprising intercepting means movable to and from an operative position in which said intercepting means mechanically engages and holds rod-shaped articles in the region of said first transfer station to interrupt the admission of articles into successive receiving means of said transfer conveyor means.

12. A combination as defined in claim **11**, further comprising drive means for constantly rotating said

transfer conveyor means independently of the movements of said intercepting means.

13. A combination as defined in claim **11,** wherein said magazine comprises a wall remote from said intercepting means and said supply consists of parallel rod-shaped articles each having a first end adjacent to said wall and a second end adjacent to said intercepting means, said intercepting means being arranged to engage the second ends of adjacent articles in said magazine in response to movement of said intercepting means to said operative position.

14. A combination a defined in claim **13,** further comprising actuating means for moving said intercepting means to and from said operative position.

15. A combination as defined in claim **11,** further comprising actuating means for maintaining said intercepting means in said operative position in response to stoppage of said transfer conveyor means.

16. A combination as defined in claim **11,** wherein said magazine comprises a discharge end through which the articles of said supply can enter successive receiving means at said first transfer station, said discharge end having a predetermined width and said intercepting means comprising a pressure applying device extending substantially across the full width of said discharge end.

17. A combination as defined in claim **16,** wherein said discharge end is located at a level above said first transfer station and said pressure applying device is arranged to engage and hold at least the lowermost layer of the supply of articles in said magazine.

18. A combination as defined in claim **11,** wherein at least that portion of said intercepting means which comes into engagement with articles in said magazine consists of elastomeric material.

19. A combination as defined in claim **1,** further comprising means for moving said sealing means into and from sealing engagement with the partitions at said second transfer station.

20. A combination as defined in claim **1,** wherein said transfer conveyor means comprises a drum which is rotatable about a substantially horizontal axis and said receiving means are axially parallel flutes provided in the periphery of said drum, said surface being a concave surface having its center of curvature on said axis.

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