April 8, 1975 W. RUDSZINAT Re. 28,383

TRANSFER APPARATUS FOR ROD-SHAPED ARTICLES

Original Filed Dec. 26, 1968 3 Sheets-Sheet 1

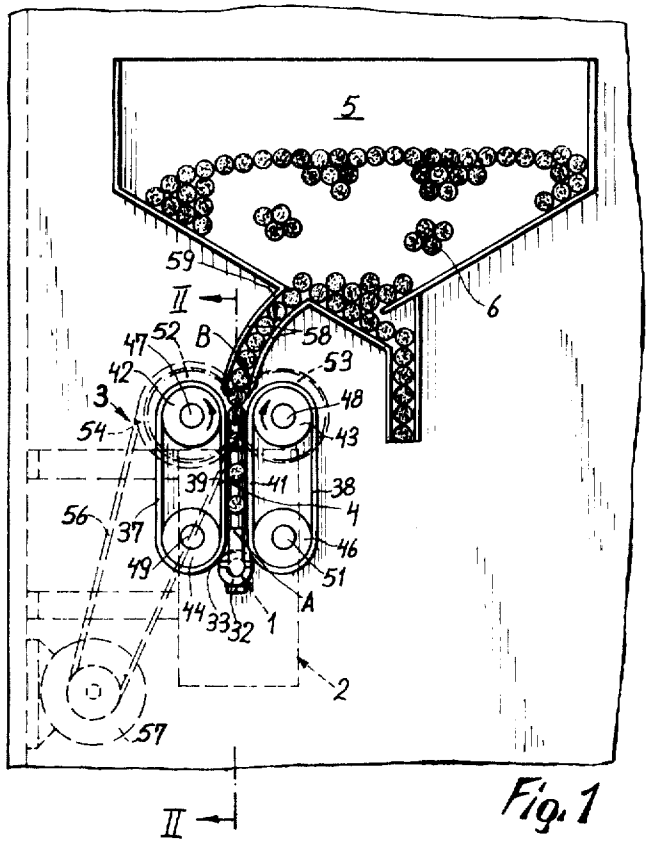


Fig. 1

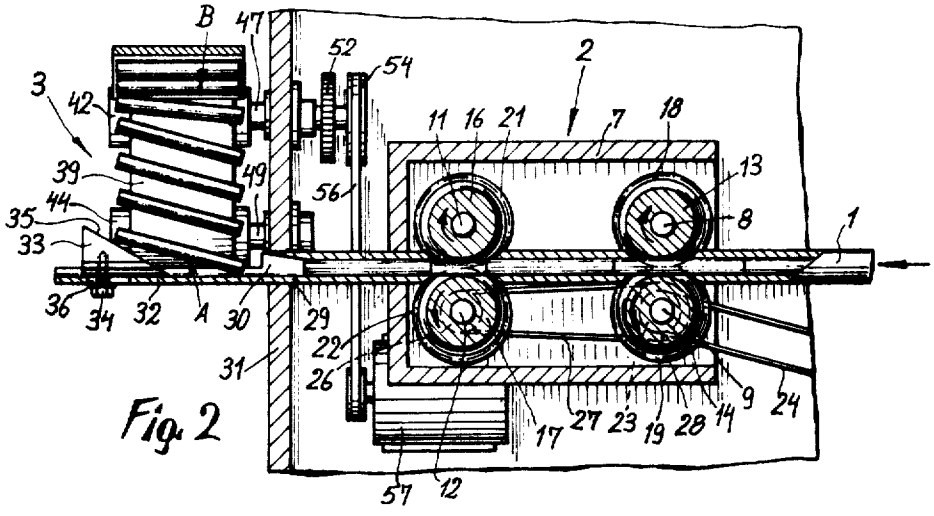


Fig. 2

TRANSFER APPARATUS FOR ROD-SHAPED ARTICLES

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Fig. 3

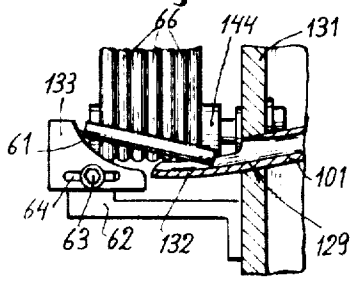


Fig. 4

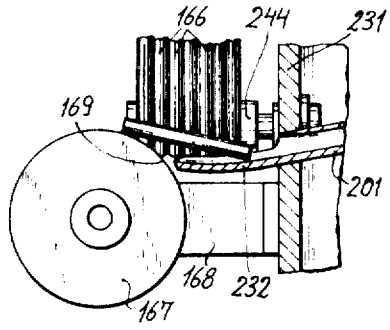


Fig. 5

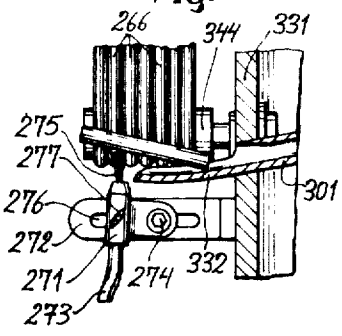


Fig. 8

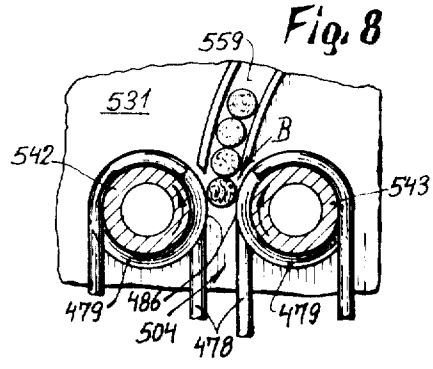


Fig. 7

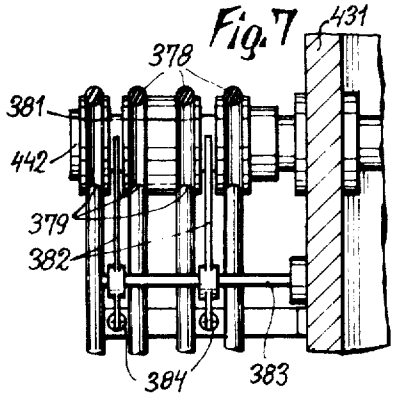
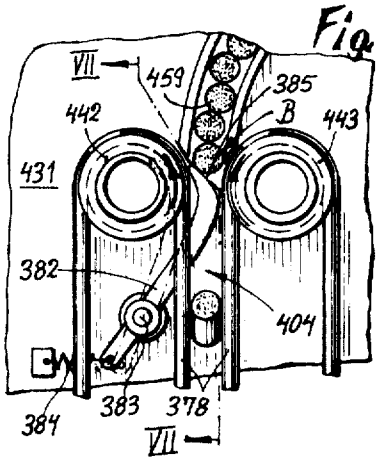


Fig. 6



TRANSFER APPARATUS FOR ROD-SHAPED ARTICLES

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Fig. 9

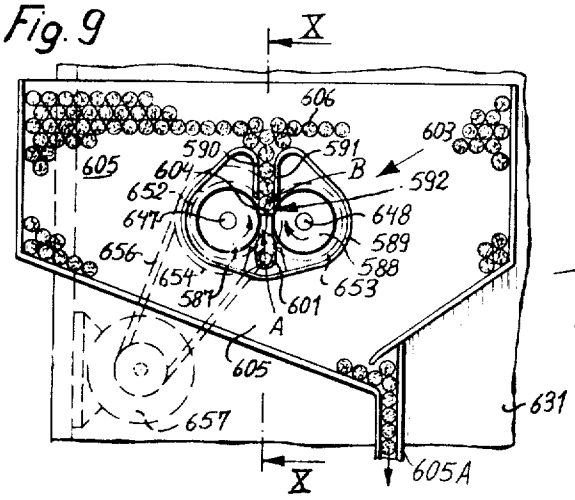


Fig. 10

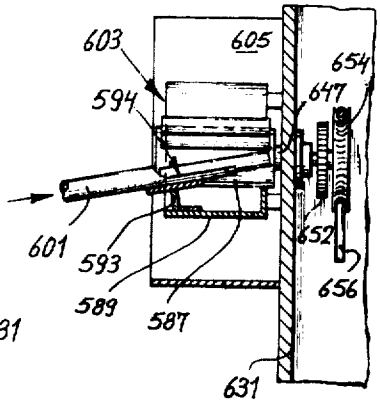


Fig. 11

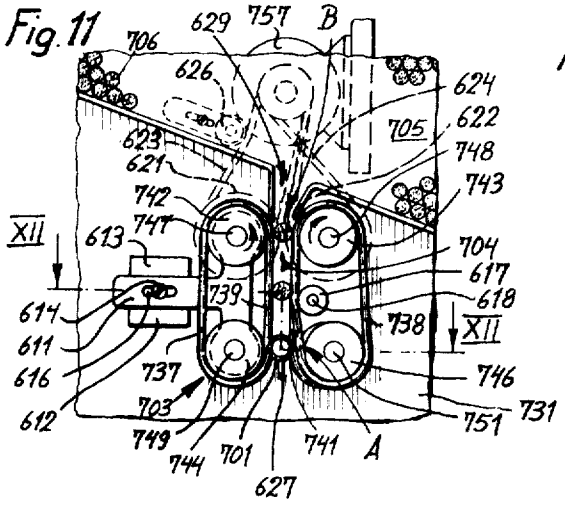


Fig. 12

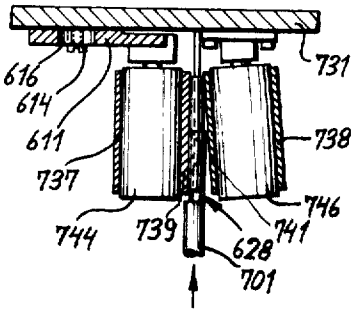
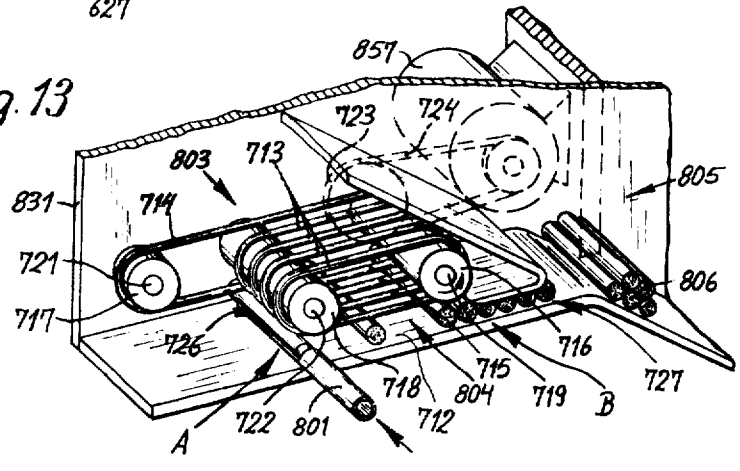


Fig. 13



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28,383

TRANSFER APPARATUS FOR ROD-SHAPED ARTICLES

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Original No. 3,608,972, dated Sept. 28, 1971, Ser. No. 786,932, Dec. 26, 1948. Application for reissue Oct. 6, 1972, Ser. No. 295,494

Claims priority, application Great Britain, Jan. 2, 1968, 306/68; Feb. 9, 1968, 6,479/68

Int. Cl. B65g *53/00*

U.S. Cl. 302—2 R **44 Claims**

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

Apparatus for transporting filter rod sections or analogous rod-shaped articles comprises a pneumatic tube discharging a succession of articles which move lengthwise into one end of a channel defined by two walls at least one of which travels toward the other end of the channel to transport the articles sideways toward the inlet of a magazine. The width of at least a portion of the channel is slightly less than the diameter of an article.

BACKGROUND OF THE INVENTION

The present invention relates to transfer apparatus or transporting apparatus for rod-shaped articles, for example, for sections of filter rods, plain cigars or cigarillos, filter tops or the like. One of the presently preferred uses of the apparatus is to transport filter rod sections of cellulose or other plastic material, paper tubes or analogous parts of filter tips or finished filter tips to the magazine of a filter cigarette, cigar or cigarillo machine.

U.S. Pat. No. 3,222,110 to Kelly et al. discloses a cigarette transfer apparatus wherein cigarettes are fed axially through pneumatic lift tubes and are thereupon accelerated to provide spaces between successive cigarettes. The thus accelerated cigarettes are caused to descend by gravity sideways in a serpentine transfer device and ultimately enter a conventional collector or stacker. The output of such apparatus is limited because the speed at which the cigarettes descend in the serpentine transfer device depends on gravity. Furthermore, the collector must always be located at a level below the accelerating unit and hence below the pneumatic lift tubes. This is a serious drawback in installations where it is desirable to transport cigarettes from a lower level to a higher level or where the space which is available for mounting of the transfer apparatus is not suited for placing of the lifting tubes above the collector. Another drawback of the just described transfer apparatus is that it is not suited for delivery of cigarettes or like rod-shaped articles into magazines of packing machines wherein the level of articles fluctuates within a very wide range. Serpentine transfer devices are likely to become clogged and to cause lengthy interruptions in operation of the patented apparatus.

SUMMARY OF THE INVENTION

An object of my invention is to provide a novel and improved transfer apparatus which can transport components of smoking products, particularly filter rod sections, cigars, cigarillos or filter tips at a high rate of speed, in a small area, without any appreciable deformation of articles, through overhead or floor-mounted pneumatic tubes, and into upper, median or lower zones of magazines.

Another object of the invention is to provide a versatile transfer apparatus which can be converted for transportation of shorter, longer, thicker and/or thinner rod-shaped articles.

A further object of the invention is to provide a transfer apparatus which can be installed in presently known plants for the production of cigarettes, cigars, cigarillos or analogous smoking products with or without filter tips.

An additional object of the invention is to provide [as] *an* apparatus which can transfer rod-shaped articles at a desired rate of speed independently of the rate at which such articles are being supplied thereto.

An ancillary object of the invention is to provide the transfer apparatus with novel means for changing the direction of movement of a succession of rod-shaped articles in a small area, without the danger of clogging and practically without any deformation of articles.

Still another object of the invention is to provide a transfer apparatus which can transport rod-shaped articles with the same facility either upwardly, downwardly, in a horizontal path or in any other direction.

The improved transporting apparatus is particularly suited for transfer of filter rod sections, cigarettes or like rod-shaped articles having a predetermined diameter. The apparatus comprises novel conveying means including a pair of adjacent but spaced walls defining a channel at least a portion of which has a width which is slightly less than the predetermined diameter and has a first end and a second end, and drive means for moving at least one of the walls from one end toward the other end of the channel. The apparatus further comprises a pneumatic tube or analogous feeding means for admitting articles lengthwise into the one end of the channel whereby the one wall moves the articles substantially sideways toward and beyond the other end of the channel, for example, into the inlet of a magazine or hopper.

The conveying means may include a pair of driven rollers whose peripheral portions constitute the walls, or such walls may form part of endless travelling belts whereby each wall may form part of a single flat belt or of a set of endless belts of circular cross-sectional outline. The channel may extend vertically upwardly, vertically downwardly, horizontally or in any other desired direction and the apparatus may be further provided with suitable deflecting means for deflecting the leading ends of successive axially moving [particles] *articles* sideways into the range of the travelling wall or walls in the conveying means.

The apparatus can be further provided with suitable blocking means which can prevent return movement of articles from the other toward the one end of the channel when the delivery of articles is terminated or interrupted, especially if the one end of the channel is located at a level below the other end. Such blocking means may comprise one or more spring-biased levers or it may form part of the conveying means.

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 an elevational view of an apparatus which embodies one form of my invention;

FIG. 2 is a fragmentary vertical sectional view as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is a fragmentary vertical sectional view of a second apparatus;

FIG. 4 is a similar fragmentary vertical sectional view of a third apparatus;

FIG. 5 is a fragmentary vertical sectional view of a fourth apparatus;

FIG. 6 is a fragmentary elevational view of a fifth apparatus;

FIG. 7 is a sectional view as seen in the direction of arrows from the line VII—VII of FIG. 6;

FIG. 8 is a fragmentary partly elevational and partly sectional view of a sixth apparatus;

FIG. 9 is an elevational view of a seventh apparatus;

FIG. 10 is a vertical sectional view as seen in the direction of arrows from the line X—X of FIG. 9;

FIG. 11 is a fragmentary elevational view of an eighth apparatus;

FIG. 12 is a fragmentary horizontal sectional view as seen in the direction of arrows from the line XII—XII of FIG. 11; and

FIG. 13 is a fragmentary perspective view of a further apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus of FIGS. 1 and 2 comprises a feeding means including a pneumatic tube **1** which advances a succession of filter rod sections **6** lengthwise and in a direction to the left, as viewed in FIG. 2. The tube **1** can receive filter rod sections from a machine of the type disclosed, for example, in British Pat. No. 1,070,339. This tube cooperates with an accelerating or distancing unit **2** which serves to separate the filter rod sections **6** from each other so as to insure that the foremost section can be readily deflected sideways when it reaches the outlet of the tube **1**. The apparatus further comprises a novel conveying unit **3** which accepts sections **6** at a first transfer station A and moves them sideways to a second transfer station B where the sections enter an upwardly extending inlet **59** of a magazine **5**. The conveying unit **3** defines a substantially vertical channel **4** whose width is slightly less than the diameter of a filter rod section **6** and wherein the sections move sideways from the station A to the station B.

The aforementioned accelerating or distancing unit **2** comprises a casing **7** supporting the ends of four parallel horizontal shafts **8, 9, 11, 12** whose axes are normal to the axis of the tube **1**. This tube extends through the casing **7** exactly midway between the axes of the two upper shafts **8, 11** and the two lower shafts **9, 12**. The shafts **8, 9, 11, 12** respectively carry friction wheels **13, 14, 16, 17** each of which extends through a suitable cutout or window of the tube **1** so that the minimum distance between the wheels **13, 14** and **16, 17** is slightly less than the diameter of a filter rod section **6**. The shafts **8, 9, 11, 12** further carry gears **18, 19, 21,** and **22**. The gears **18, 21** respectively mesh with the gears **19, 22** and the diameters of all of these gears are the same. The shaft **9** is provided with a sprocket wheel **23** driven by an endless chain **24** which is trained over a further sprocket wheel, not shown, provided on the output shaft of a variable speed electric motor or another suitable prime mover. The shaft **9** drives the shaft **8** at the same speed but in opposite direction by way of intermeshing gears **18, 19,** and the shaft **9** further carries a second sprocket wheel **28** which drives a sprocket wheel **26** on the shaft **12** by way of an endless chain **27**. The shaft **12** drives the shaft **11** by way of intermeshing gears **21, 22**. The diameter of the sprocket wheel **28** is greater than that of the sprocket wheel **26** so that the shafts **11, 12** are driven at a speed which is somewhat higher than the speed of the shafts **8, 9**. The purpose of the just described driving arrangement is to rotate the friction wheels **13, 14** at the same speed but in opposite directions and to rotate the friction wheels **16, 17** at the same speed (which however, is higher than the speed of friction wheels **13, 14**) and in opposite directions. Such directions are indicated by arrows.

The front part of the pneumatic feeding tube **1** extends through a hole **29** in a panel **31** of the frame and has an outlet **30** which is located immediately adjacent to the left-hand side of the panel **31**, as viewed in FIG. 2, as well as a trough-shaped extension or front end portion **32** which extends forwardly beyond the outlet **30** and is of substantially semicircular cross-sectional outline. The panel **31** is located in a vertical plane and is normal to the axis of the tube **1**. The extension **32** accommodates a portion of an adjustable deflecting member or wedge **33**. The distance between the wedge **33** and the outlet **30** approximates the length of a filter rod section **6** and this wedge is installed at the transfer station A. Its function is to direct the leading ends of successive filter rod sections **6** upwardly into the aforementioned vertical channel **4** so that such sections can enter the conveying unit **3** to be transported sideways toward and beyond the transfer station B. The wedge **33** is provided with an upwardly inclined straight guide face **35** along which the leading ends of successive sections **6** travel after they emerge from the outlet **30** of the tube **1**. The bottom portion of the extension **32** has an elongated slot **36** for a screw **34** which is threaded into the wedge **33** and can arrest the latter in one of a large number of different positions.

The conveying unit **3** comprises two endless flat belts **37, 38** having inner stretches **39, 41** which constitute two upwardly travelling walls of the conveying unit and flank the chanel **4**. These belts are respectively trained over driven rollers **42, 43** and over idler rollers **44, 46**. The diameters of the rollers **42–44** and **46** are identical and these rollers are respectively mounted on horizontal shafts **47, 48, 49, 51**. The shafts are mounted in the panel **31** in such a way that the inner stretches or walls **39, 41** of the belts **37, 38** are parallel to each other and that the width of the channel **4** is slightly less than the diameter of a filter rod section **6**. The axis of the feeding tube **1** is located in a vertical plane which halves the channel **4**. Futhermore, the tube **1** is installed at such a level that the leading end of a filter rod section **6** which slides along the guide face **35** of the wedge **33** enters the lower end of the channel **4** and is engaged by the upwardly travelling walls **39, 41** only after its trailing end moves beyond the outlet **30**.

The shafts **47, 48** extend beyond the panel **31** and carry mating gears **52, 53** of identical diameter. The shaft **47** further carries a pulley **54** which is driven by an endless belt **56**. The latter is trained over a second pulley on the output shaft of a variable-speed electric motor **57**. The receiving end of the inlet **59** is located at the transfer station B and this inlet includes two arcuate guide walls **58**. The discharge end of the inlet **59** admits successive filter rod sections **6** into the bottom zone of the magazine **5**. The width of the inlet **59**, as seen at right angles to the plane of FIG. 1, is slightly greater than the length of a section **6**.

The operation:

The tube **1** advances a succession of filter rod sections **6** lengthwise toward the accelerating unit **2**. The rear friction wheels **13, 14** engage successive sections **6** and advance them at a predetermined speed. The sections then reach the front friction wheels **16, 17** and are accelerated so that the section which is engaged by [those] *the* friction wheels *16, 17* moves ahead of and away from the next following section. Each of the thus accelerated sections **6** travels through the outlet **30** and its leading end engages and slides upwardly and forwardly along the inclined guide face **35** of the wedge **33**. The position of the wedge **33** is selected in such a way that a section **6** whose leading end slides along the guide face **35** enters the lower end of the channel **4** and is engaged by the travelling walls **39, 41** after its trailing end moves beyond the outlet **30**. Thus, each section **6** begins to move substantially sideways (upwardly) when it enters the first transfer station A.

The motor **57** drives the walls **39, 41** at the same speed whereby these walls transport the sections **6** upwardly from the station A toward and beyond the transfer station B so that the sections enter the receiving end of the inlet **59**. Each preceding section **6** is pushed upwardly through the inlet **59** by the next following section so that it ultimately enters the botom zone of he magazine **5**. The walls **39, 41** engage he sections gently and without any apreciable deformation. This is due to the fact that the guide face **35** lifts the leading ends of successive sections [onto] *into* the lower end of the channel **4**.

It is to be noted that the accelerating unit **2** constitutes an advantageous but optional part of my apparatus. This accelerating unit is desirable when the ends of the sections **6** are rather soft; however, the apparatus can operate properly without the unit **2**, i.e., the ends of successive sections **6** can abut against each other during travel toward the transfer station A.

FIG. 3 illustrates the first transfer station in a slightly modified apparatus. Those parts of this apparatus which are clearly analogous to or identical with the corresponding parts of the previously described apparatus are denoted by similar reference numerals plus **100**. The discharge end of the pneumatic feeding tube **101** is inclined downwardly and its extension **132** is of arcuate shape so that it insures gradual transfer of successive filter rod sections toward the concave guide face **61** of a modified deflecting member **133**. Furthermore, the deflecting member **133** is mounted on a holder here shown as a bracket **62** which forms part of the frame and is affixed to the panel **131**. The deflecting member **133** has an elongated slot **64** for the stem of a screw **63** which is threaded into the bracket **62**. The screw **63** permits lengthwise as well as angular adjustments of the deflecting member **133**. The configuration of the concave guide face **61** is such that it insures gradual advance of the leading end of a filter rod section into the lower end of the channel in the conveying unit. This conveying unit comprises two upwardly travelling walls each of which is formed by a set of closely adjacent round belts **66** which are trained over driven and idler rollers (see the idler roller **144**). The operation of the apparatus shown in FIG. **3** is clearly analogous to that of the apparatus which is illustrated in FIGS. **1** and **2**. The round belts **66** may consist of elastic material. It is equally possible to employ in the apparatus of FIG. **3** a set of round belts **66** and one of the flat belts **37, 38** shown in FIGS. **1** and **2**.

The apparatus of FIG. **4** constitutes a modification of the apparatus shown in FIG. **3** and certain of its parts are denoted by similar reference numerals plus **100**. The deflecting member **133** of FIG. 3 is replaced by a movable roller-shaped deflecting member **167** which is freely rotatable on a shaft carried by a holder or bracket **168** secured to the panel **231**. The cylindrical peripheral surface **169** of the roller **167** is located in the path of movement of filter rod sections and causes the leading ends of such [section] *sections* to move forwardly and upwardly and into the range of upwardly travelling walls of the conveying unit. Each of these walls is formed by the inner stretches of two sets of endless round belts **166** (only one set shown). When the leading end of a filter rod section engages a point on the peripheral surface **169**, such point receives from the axially advancing section a movement having a component in the longitudinal direction of the section and an upwardly directed component which latter causes the leading end to move toward and to be engaged by the inner stretches of the belts **166**. The inclination of the extension **232** of the tube **201** is such that the axis of each section which engages the peripheral surface **169** is nearly tangential to the roller **167**. The latter begins to turn in a counterclockwise direction in response to frictional engagement with the advancing filter rod section and thereby assists the leading end of such section to move into the range of the belts **166**. Such mounting of the roller **167** insures that the leading ends of filter rod sections are lifted practically without friction. It is clear that the roller **167** can be replaced by a movable endless belt or band which is mounted in such a way that it can be set in motion by the leading ends of filter rod sections. Thus, the roller **167** can constitute a pulley and the just mentioned belt or band is then trained over such pulley to be set in motion by successive filter rod sections.

The apparatus of FIG. 5 constitutes a further modification of the apparatus shown in FIG. [,] . 3 or 4 and certain parts thereof are denoted by reference numerals similar to those employed in FIG. 3 plus 200. The deflecting member **133** or **167** is replaced by at least one deflecting nozzle **271** which is adjustably secured to a holder or bracket **272** provided on the panel **331**. The stream **275** of air which is discharged by the orifice or orifices of the nozzle **271** impinges at an acute angle against the leading ends of successive filter rod sections and causes the leading ends to move upwardly into the range of the inner stretches of belts **266**. The nozzle **271** is connected with a compressor or another suitable source of compressed gas by a supply conduit **273**. The means for adjustably securing the nozzle **271** to the holder **272** comprises a screw **274** which passes through an elongated slot **276** of the holder. This screw enables the operator to adjust the nozzle **271** in several directions so as to select the distance between the outlet of the tube **301** and the stream **275** as well as the angle between the stream and the axes of successive filter rod sections. The nozzle **271** is further provided with a throttle valve **277** which can be adjusted to determine the strength of the air stream **275**. The longitudinal and/or angular adjustment of the nozzle **271**, as well as the adjustment of the valve **277**, are selected in dependency on the speed and/or dimensions of filter rod sections. The airstream **275** effects gentle deflection of leading ends of successive filter rod sections so that the sections can be moved into the range of belts **266** without any noticeable deformation. Such apparatus can be used for transfer of readily deformable rod-shaped articles.

The apparatus of FIGS. 6 and 7 comprises many parts which are analogous to the parts of the apparatus illustrated in FIGS. 1 and 2. Such parts are denoted by similar reference numerals plus 400. For example, the numeral **431** denotes the vertical panel of the frame, the numeral **404** denotes the channel defined by the conveying unit, and the numeral **459** denotes the inlet of the magazine. The flat belts **37, 38** of FIGS. 1–2 are replaced by two sets of round belts **378** which extend into annular grooves **379** of semicircular outline provided with additional annular grooves **381** which are disposed between the respective belts **378** and can accommodate portions of two-armed spring-biased blocking levers **382**. These levers are pivotable on a common pin **383** which is carried by the panel **331** and is parallel to the axes of the rollers **442, 443**. The purpose of the blocking levers **382** is to hold the filter rod sections against downward or backward movement at the transfer station B. Each of these levers has a rounded blocking or arresting head **385** and each thereof is biased by a helical spring **384** so that it tends to move its head **385** into the upper end of the channel **404** to thereby hold the lowermost filter rod section in the inlet **459** against downward movement back into the upper end of the channel **404**. The heads **385** are then held at such a level that the lowermost filter rod section resting on the heads is held away from contact with the belts **378**.

When the apparatus is in operation, the filter rod sections which are caused to travel upwardly in the channel **404** pivot the blocking levers **382** against the opposition of springs **384** so that the heads **385** enter the adjoining annular grooves **381** and permit further upward movement of filter rod sections into the inlet **459**. When the delivery of filter rod sections is terminated, the springs **384** contract and pivot the blocking levers **382** to the blocking or arresting positions shown in FIG. 6 whereby the heads **385** automatically prevent return movement of filter [rods]

rod sections into the channel **404**. The drive for the rollers **442**, **443** need not be arrested because the heads **385** hold the lowermost filter rod section away from the adjoining portions of belts **378**.

In the apparatus of FIG. 8, the function of blocking levers **382** is taken over by the driven rollers **542**, **543** for the round belts **478**. These rollers are mounted on the panel **531** which also supports the inlet **559** of the magazine. The channel of the conveying unit is shown at **504**. The relatively shallow grooves **379** of FIG. 7 are replaced by deeper annular grooves **479** whch can fully accommodate the adjoining portions of the round belts **478** so that the peripheral surfaces **486** of the rollers **542**, **543** extend very slightly beyond the end turns of these belts. Such peripheral surfaces **486** are precision finished and the minimum distance between the rollers **542**, **543** is only slightly less (by one or more tenths of a mill'meter) than the minimum distance between the inner stretches of the belts **478** (i.e., the width of the major part of the channel **504**).

In normal operation of the apparatus shown in FIG. 8, the inner stretches of the belts **478** transport successive filter rod sections sideways, i.e., upwardly through the channel **504**, through the second transfer station B and into the inlet **559**. These belts move the filter rod sections into the narrowest portion of the channel **504** between the peripheral surfaces **486** of the driven rollers **542**, **543** whereupon the slighily compressed sections move through and beyond the station B. The actual transfer of successive filter rod sections into the inlet **559** is effected by the peripheral surfaces **486**. When the delivery of filter rod sections into the channel **504** is terminated, the last or lowermost filter rod section moves between and beyond the peripheral surfaces **486** and is thereupon held by such surfaces against downward movement back into the channel **504**. The lowermost filter rod section is then held away from contact with the adjoining portions of the belts **478** because such portions of the belts are fully accommodated in the respective annular grooves **479**.

Referring now to FIGS. 9 and 10, those parts of the apparatus shown in these [illustration] *illustrations* which are analogous to the parts of the apparatus shown in FIGS. 1 and 2 are denoted by similar reference numerals plus 600. The discharge end of the pneumatic feeding tube **601** is located within the confines of the magazine **605**. The motor **657** is a variable-speed motor or it drives the belt **656** by way of a variable-speed transmission. The conveying unit **603** of this apparatus comprises two rollers **587**, **588** whose peripheral portions constitute two upwardly travelling walls which define between themselves a channel **604** having a width which is slightly less than the diameter of a filter rod section **606**. The diameters of the rollers **587**, **588** are the same and their axes are parallel to each other and to the axes of filter rod sections in the magazine **605**. The shafts of the rollers **587**, **588** are shown at **647**, **648** and the axial length of each of these rollers approximates the length of a filter rod section **606**. The conveying unit **603** of the apparatus shown in FIGS. 9 and 10 further comprises a housing **589** which is installed in a median portion of the magazine **605** and accommodates the major portions of conveying rollers **587**, **588**. The housing **589** is affixed to the panel **631** and has two substantially vertical parallel sidewalls **590**, **591** corresponding to the walls **58** of FIG. 1 and defining an elongated channel which is an extension of the channel **604**. The receiving end of such extension of the channel **604** is shown at **592**. The distance between the walls **590**, **591** is preferably slightly greater than the diameter of a filter rod section **606**. The receiving end **592** is located at the transfer station B. The other transfer station A accommodates the discharge end of the pneumatic tube **601**. The axis of this tube is located in a vertical plane which halves the channel **604** and the tube is inclined upwardly (see FIG. 10) so that the leading end of each successive filter rod section **606** initially engages those ends of the rollers **587**, **588** which are adjacent to the panel **631**. A holder or bracket **593** secures the discharge end of the tube **601** to the housing **589**. The numeral **594** denotes the outlet of the tube **601**.

The operation of the apparatus shown in FIGS. 9 and 10 is as follows:

The conveying rollers **587**, **588** are driven by gears **652**, **653**, pulley **654** and belt **656** from the output shaft of the variable-speed motor **657**. These rollers rotate at the same speed but in opposite directions. In order to properly synchronize the speed of rollers **587**, **588** with the speed at which the filter rod sections **606** are supplied by the tube **601**, the speed of the motor **657** is adjustable within a wide range. The leading end of each successive filter rod section **606** advances between the front axial ends of the rollers **587**, **588** toward the panel **631** and is engaged by the rear or inner axial ends of these rollers to be thereupon transported sideways (i.e., upwardly) through the channel **604** and through the extension of this channel between the sidewalls **590**, **591**. Each filter rod section **606** assumes a substantially horizontal position after it passes through the receiving end **592** and thereupon moves sideways to enter the interior of the magazine **605**. Each section **606** which enters the extension of the channel between the sidewalls **590**, **591** is pushed upwardly by the next following section. The character **605A** denotes an outlet by way of which the filter rod sections **606** leave the magazine **605** to enter a filter cigarette machine or another consuming machine. In the apparatus of FIGS. 9 and 10, the function of the deflecting member is taken over in part by the discharge end of the tube **601** and in part by the conveying rollers **587**, **588**. Furthermore, a portion of the magazine **605** (namely, the sidewalls **590**, **591**) forms part of the conveying unit in that these walls define an extension of the channel **604** between the conveying rollers **587**, **588**.

FIGS. 11 and 12 illustrate portions of a further transfer apparatus wherein all such parts which are analogous to the parts of the apparatus shown in FIGS. 1 and 2 are denoted by similar reference numerals plus 700. The shafts **747** and **749** are mounted on a T-shaped carriage **611** in such a way that their axes are parallel to each other and to the axes of filter rod sections **706** in the magazine **705**. The carriage **611** is reciprocable along guide rails **612**, **613** to thereby displace the rollers **742**, **744** and the corresponding endless belt **737**. In this way, the operator can change the width of the channel **704** so that the apparatus can transfer different types of filter rod sections **706** or analogous rod-shaped articles. The upwardly travelling inner stretches or walls of the belts **737**, **738** are respectively shown at **739**, **741**; these stretches flank the channel **704**. The carriage **611** is formed with an elongated slot **616** which is normal to the stretch **739** and accommodate the stem of a screw **614** meshing with the panel **731**. The screw **614** and the slot **616** constitute a means for adjustably securing the carriage **611** to the panel **731**.

The shafts **748**, **751** for the right-hand rollers **743**, **746** of FIG. 11 are rotatably mounted in the panel **731** in such a way that the axis of the roller **746** is inclined with reference to the axis of the shaft **748** (and with reference to the axes of shafts **747**, **749** on the carriage **611**) in order to provide the channel **704** with a tapering lower end whose width diminishes in a direction toward the panel **731**, i.e., away from the discharge end of the pneumatic feeding tube **701**. The minimal distance between the belts **737**, **738** at the lower end of the channel **704** is slightly less than the diameter of a filter rod section **706** and the maximum width of this lower end is slightly greater than the diameter of a filter rod section.

An intermediate roller **617** of small diameter is freely rotatable on a horizontal shaft **618** which is mounted on the panel **731**. The roller **617** deforms an intermediate portion of the inner stretch **741** of the belt **738** so that the width of the channel **704** at a level above the roller **617** is substantially constant. Such width is slightly less than the diameter of a filter rod section **706**.

The shafts **747, 748** extend through and beyond the panel **731** and carry pulleys **621, 622** of identical diameter. The motor **757** is of the variable-speed type and drives the pulley **621** by way of a first belt **623**. A crossed second belt **624** drives the pulley **622** so that the belts **737, 738** travel at the same speed and that their inner stretches **739, 741** travel upwardly. A tensioning roll **626** is adjustably mounted on the panel **731** to maintain the belt **623** under requisite tension. The roller **626** is adjusted upon adjustment of the carriage **611** with reference to the panel **731**.

The discharge end of the pneumatic feeding tube **701** is parallel to the axes of the shafts **747–749**. This discharge end is located at the transfer station A and is secured to the panel **731** by a holder or bracket **627**. The axis of the discharge end of the tube **701** is located at a level slightly above the axes of the lower rollers **744, 746**. The arrangement is such that the leading end of a filter rod section **706** which emerges from the tube **701** is free to advance between the lower ends of the inner stretches **739, 741** toward the panel **731** and is engaged by such inner stretches when its trailing end is free to leave the tube **701**. The discharge end of the tube **701** is formed with an outlet **628** to facilitate evacuation of trailing ends of filter rod sections **706**. A mouthpiece or gate **629** is provided in [he] *the* magazine **705** as a substitute for the inlet **59** and serves to guide successive filter rod section **706** into the interior of the magazine.

The operation:

The motor **757** drives the belts **737, 738** by way of rollers **742, 743**, pulleys **621, 622** and belts **623, 624**. The inner stretches **739, 741** of the belts **737 738** travel upwardly at the same speed so that their lower ends entrain the leading ends of successive filter rod sections **706** which are fed by the tube **701**. Each filter rod section **706** is engaged by the inner stretches **739, 741** when its trailing end is free to leave the outlet **628** of the tube **701**. The belts **737, 738** transport the sections **706** upwardly and force them to enter the magazine **705** by way of the inlet or mouthpiece **629**.

In the apparatus of FIG. 13, all such parts which are analogous to those of the apparatus of FIGS. 1 and 2 are denoted by similar reference numerals plus 800. The conveying unit **803** is mounted externally of and adjacent to the magazine **805** for filter rod sections **806**. This conveying unit comprises a stationary wall **712** which flanks a nearly [horizontally] *horizontal* channel **804** from below, and a travelling wall formed by the lower stretches **715** of a set of endless round belts **713** trained over rollers **716, 718** whose shafts **719, 722** are mounted on the panel **831**. A longer endless round belt **714** is trained over the roller **716** and over a further roller **717** having a shaft **721** which is mounted on the panel **831**. The rollers **716–718** have identical diameters and their shafts are located in a common plane which is parallel to the plane of the wall **712**. The number and distribution of shorter belts **713** are selected in such a way that they engage successive filter rod sections **806** at several points substantially all the way between the ends of the sections which travel in the channel **804**. The width of the chanel **804** is slightly less than the diameter of filter rod section. Furthermore, the left-hand portion of the inner (lower) stretch of the longer belt **714** is installed at such a distance from the wall **712** that it invariably intercepts the leading ends of successive filter rod sections **706** which emerge from the outlet **726** of the feeding tube **801**. Such end portion of the belt **714** causes the leading ends of sections **806** to advance sideways toward the inner stretches **715** of the shorter belts **713** so that the sections are thereupon caused to roll along the wall **712** and toward the station B which is followed by a chanel **727** constituting an extension of the channel **804** and the inlet of the magazine **805**. The belt **714** also prevents the leading ends of filter rod sections **806** from striking and from rebounding on impact against the panel **831**. The discharge end of the tube **801** is affixed to [he] *the* wall **712** end/or to the panel **831** immediately adjacent to the left-hand end of the channel **804**, i.e., at the first transfer station A. The axis of the discharge end of the tube **801** is parallel to the axes of shafts **719, 721, 722** and is located in the central symmetry plane of the channel **804**. The roller **716** is driven by the variable-speed motor **857** by way of a belt **724** and pulley **723** to move the belts **713, 714** at the same speed whereby the inner stretches **715** travel in a direction from the station A toward the station B. The leading ends of successive filter rod sections **806** admitted by the tube **801** slide along the upper side of the wall **712** and are engaged by the left-hand portion of the longer belt **714** to move into engagement with the inner stretches **715** of the belts **713**. The sections **806** then roll in the channel **804**, through the transfer station B and inlet **727** and enter the magazine **805**.

A very important advantage of [he] *the* improved apparatus is that the operation of the conveying unit need not be synchronized with the operation of the machine which [supplied] *supplies* filter rod sections or other rod-shaped articles to the pneumatic feeding tube. Furthermore, the direction of travel of successive articles is changed gently without any appreciable deformation. Still further, the apparatus occupies little room and its parts may be mounted below, laterally adjacent to or even in the interior of a magazine. Moreover, the apparatus can be readily and rapidly adjusted to transport shorter, longer larger, diameter and/or smaller diameter articles at a speed which can be varied within a wide range.

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 characteritics of the generic and specific aspects of my contribution to the art.

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

1. Apparatus for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, one of said units being arranged to deliver articles to the other unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less [then] *than* said diameter, said channel having a first end and a second end and *said walls being movable generally lengthwise of said channel,* said conveying unit further comprising drive means for moving [at least one of] said walls from one end toward the other end of said channel to thereby transport the articles through the channel.

2. Apparatus [as defined in claim **1**, wherein] *for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, one of said units being arranged to deliver articles to the other unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and said conveying unit further comprising drive means for moving at least one of said walls from one end toward the other end of said channel to thereby transport the articles through the channel,* said conveying unit [comprises] *comprising* a roller having a circumferentially complete peripheral portion which constitutes said one wall.

3. Apparatus as defined in claim **1**, wherein said conveying unit comprises at least one endless belt and wherein said belt constitutes [said] one [wall] *of said walls.*

4. Apparatus [as defined in claim 1, wherein] *for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, one of said units being arranged to deliver articles to the other unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and said conveying unit further comprising drive means for moving at least one of said walls from one end toward the other end of said channel to thereby transport the articles through the channel,* said conveying unit [comprises] *comprising* a plurality of endless belts which constitute said one wall.

5. Apparatus as defined in claim 4, wherein each of said belts is of substantially circular cross-sectional outline.

6. Apparatus as defined in claim 1, further comprising means for adjusting at least one of said walls with reference to the other wall to thereby select the width of said channel.

7. Apparatus as defined in claim 1, further comprising blocking means operative to prevent return movement of articles into said channel.

8. Apparatus as defined in claim 7, wherein said blocking means comprises at least one spring-biased blocking lever.

9. Apparatus as defined in claim 7, wherein said blocking means comprises a pair of driven rollers forming part of said conveying means and defining said other end of said channel, the minimum distance between said rollers being at least slightly less than said diameter.

10. Apparatus as defined in claim 1, further comprising a magazine for articles, said magazine having inlet means adjacent to the other end of said channel.

11. Apparatus as defined in claim 10, wherein said feeding unit comprises an outlet located within the confines of said magazine.

12. Apparatus as defined in claim 10, wherein [aid] *said* magazine comprises a lower zone and said inlet means is arranged to admit articles into the lower zone of said magazine.

13. Apparatus [as defined in claim 10, wherein] *for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, one of said units being arranged to deliver articles to the other unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and said conveying unit further comprising drive means for moving at least one of said walls from one end toward the other end of said channel to thereby transport the articles through said channel,* said feeding unit [is] *being* arranged to admit articles into said channel lengthwise in such direction that the axes of articles make an oblique angle with the direction of travel of said one wall, *and a magazine for articles, said magazine having inlet means adjacent to the other end of said channel.*

14. Apparatus as defined in claim 1, [wherein one of said walls is stationary and] wherein said walls are located one above the other.

15. Apparatus as defined in claim 1, wherein said drive means comprises means for moving said [one wall] *walls* at a plurality of speeds.

16. Apparatus as defined in claim 1, wherein said one end is located at a level below the other end of said channel.

17. Apparatus as defined in claim 1, further comprising accelerating means for increasing the distance between successive articles prior to delivery of articles from said one unit to said other unit.

18. Apparatus for transporting rod-shaped articles of predetermined [distance] *diameter* between a magazine and a processing machine, particularly for transporting sections of filter rod or tobacco-containing rods, comprising a conveying unit operatively connected with the magazine and a feeding unit operatively connected with the processing machine, one of said units being arranged to deliver articles to the other unit along a first path and said other unit being arranged to transport the thus delivered articles along a second path which is inclined with reference to said first path, said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise and said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and *said walls being movable generally lengthwise of said channel,* said conveying unit further comprising drive means for moving [at least one of] said walls from one end toward the other end of said channel to thereby transport the articles through the channel.

19. Apparatus for converting a single file of exactly aligned rod-shaped articles having a predetermined diameter, particularly sections of filter rods or tobacco-containing rods, into at least one row of articles wherein the articles are disposed side by side, comprising a pneumatic unit for transporting the single file of articles and a mechanical unit for conveying the row of articles, one of said units having an outlet which discharges successive articles and the other unit comprising at least two adjacent but spaced walls defining a channel at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and said other unit further comprising drive means for moving at least one of said walls from one end toward the other end of said channel to thereby transport the articles through the channel, and deflecting means for continuously deflecting successive articles which issue from the outlet of said one unit into the one end of said channel.

20. Apparatus as defined in claim 19, wherein said deflecting means comprises means for mechanically deflecting the articles.

21. Apparatus as defined in claim 19, wherein said deflecting means is stationary.

22. Apparatus as defined in claim 19, wherein said deflecting means has a curved deflecting surface for articles.

23. Apparatus as defined in claim 19, wherein said deflecting means comprises a mobile article-deflecting member.

24. Apparatus as defined in claim 19, wherein said deflecting means comprises means for producing at least one article-deflecting stream of compressed gaseous fluid.

25. Apparatus as defined in claim 24, wherein said stream producing means comprises at least one nozzle which directs the stream of compressed gas across the path of articles issuing from said outlet.

26. Apparatus as defined in claim 19, further comprising means for adjusting the position of said deflecting means with reference to at least one of said units.

27. Apparatus for transporting rod-shaped articles of predetermined diameter, particularly sections of filter rods, comprising conveying means including a pair of adjacent but spaced walls defining a channel at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end, and drive means for moving at least one of said walls from one toward the other end of said channel, said one wall consisting of a plurality of endless belts

including at least one shorter belt and at least one longer belt; and feeding means for admitting articles lengthwise into said one end of the channel whereby said one wall moves the articles substantially sideways toward and beyond the other end of said channel, the articles admitted by said feeding means being engaged and moved sideways first by said longer belt and thereupon at least by said shorter belt.

28. Apparatus for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, said feeding unit being arranged to deliver articles to said conveying unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and *said walls being movable generally lengthwise of said channel,* said conveying unit further comprising drive means for moving [at least one of] said walls from one end toward the other end of said channel to thereby transport the articles through the channel, said walls converging toward each other in the direction of lengthwise travel of articles in said tube.

29. Apparatus as defined in claim **28**, wherein the maximum and minimum widths of said channel at said one end thereof respectively exceed and are less than said predetermined diameter.

30. Apparatus for transporting rod-shaped articles of predetermined diameter, particularly sections of tobacco-containing rods, comprising a conveying unit and a feeding unit, said feeding unit being arranged to deliver articles to said conveying unit and said feeding unit comprising a pneumatic tube wherein the articles are transported lengthwise, said conveying unit comprising at least two adjacent but spaced walls defining a channel wherein the articles are conveyed sideways and at least a portion of which has a width which is slightly less than said diameter, said channel having a first end and a second end and said conveying unit further comprising drive means for moving at least one of said walls from one end toward the other end of said channel to thereby transport the articles through the channel, and deflecting means for deflecting the leading ends of successive articles admitted by said feeding unit into the one end of said channel.

31. Apparatus as defined in claim **30**, wherein said deflecting means comprises a guide face which is inclined with reference to and extends into the path of movement of successive articles admitted by said feeding unit.

32. Apparatus as defined in claim **30**, wherein said guide face is of arcuate shape.

33. Apparatus as defined in claim **30**, further comprising means for adjusting the position of said deflecting means with reference to said conveying unit.

34. Apparatus as defined in claim **30**, wherein said deflecting means is movable.

35. Apparatus as defined in claim **34**, wherein said deflecting means comprises a convex guide face which is turnable about a predetermined axis.

36. Apparatus as defined in claim **30**, wherein said deflecting means comprises means for discharging at least one stream of compressed gas against the leading ends of successive articles admitted by said feeding unit to thereby deflect such articles sideways into said one end of said channel.

37. In an apparatus for transporting and storing cigarettes, filter rod sections or analogous rod-shaped articles of predetermined diameter, a combination comprising a magazine arranged to store a relatively large supply of rod-shaped articles for introduction into at least one consuming machine, said magazine having inlet means located below the uppermost level of the supply of articles therein; conveying means having two adjacent but spaced movable walls defining a channel at least a portion of which has a width slightly less than said predetermined diameter, said channel having a first end remote from and a second end nearer to said inlet means and at least a portion of said channel extending upwardly; feeding means for introducing articles seriatim into said first end of said channel; and drive means for moving both said walls in a direction from said first toward said second end of said channel whereby the articles which are introduced by said feeding means travel in said channel toward and into said inlet means.

38. A combination as defined in claim 37, wherein said second end of said channel is stationary relative to said inlet means.

39. A combination as defined in claim 37, wherein at least one wall of said conveying means comprises at least one endless flexible element.

40. A combination as defined in claim 37, wherein said second end of said channel is immediately adjacent to said inlet means.

41. A combination as defined in claim 37, wherein said inlet means comprises a pair of fixed walls defining a second channel in register with said first mentioned channel and having a width greater than said predetermined diameter.

42. A combination as defined in claim 37, wherein said second end of said channel is located above said first end of said channel.

43. A combination as defined in claim 42, wherein said channel is located in a substantially vertical plane.

44. A combination as defined in claim 37, wherein said feeding means comprises means for delivering articles to said first end of said channel in a substantially horizontal plane.

References Cited

The following references, cited by the Examiner, are of record in the patented file of this patent or the original patent.

UNITED STATES PATENTS

2,176,485	10/1939	Bronander	198—20 C
3,410,607	11/1968	Tempel	214—17 C
2,931,520	4/1960	Shields	214—6 BA
1,777,048	9/1930	Molins	198—20 C
1,824,413	9/1931	Stein	198—20 C
1,857,605	5/1932	Rapley	198—19 C
2,109,148	2/1938	Gwinn	198—20 C
2,142,271	1/1939	Herrmann	198—20 C
2,993,737	7/1961	Stephen	302—2
3,222,110	12/1965	Kelly et al.	302—2
3,280,961	10/1966	McCombie	198—165 X
3,404,921	10/1968	Vergales et al.	302—2

FOREIGN PATENTS

958,408	5/1964	Great Britain	198—20 C
497,218	9/1954	Italy	214—17 C

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CERTIFICATE OF CORRECTION

PATENT NO. : Re. 28,383

DATED : Reissued Apr. 8, 1975

INVENTOR(S) : Willy Rudszinat

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 1, cancel line 7 in its entirety and substitute -- 786,932, Dec. 26, 1968. Application for reissue Oct. 6, --.

Signed and Sealed this

ninth Day of *September 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks