United States Patent

Korber

[15] **3,643,669**

[45] **Feb. 22, 1972**

[54] TOBACCO ROD FORMING MACHINE

[72] Inventor: **Kurt Korber,** Hamburg-Bergedorf, Am Pfingstberg 10, Germany

[22] Filed: **Apr. 18, 1966**

[21] Appl. No.: **543,438**

Related U.S. Application Data

[63] Continuation of Ser. No. 264,145, Mar. 11, 1963, abandoned, Continuation-in-part of Ser. No. 852,060, Nov. 10, 1959, abandoned.

[30] **Foreign Application Priority Data**

Nov. 12, 1958 Germany.....H 34791
Dec. 11, 1958 Germany.....H 35078

[52] **U.S. Cl.** .....**131/84 C,** 131/110
[51] **Int. Cl.**.....**A24c 05/18**
[58] **Field of Search** .....131/84, 84 A, 84 B, 84 C, 110, 131/66, 66 A, 108, 109

[56] **References Cited**

UNITED STATES PATENTS

2,169,582	8/1939	Dearsley et al.	131/84 A
2,181,229	11/1939	Gooch, Jr.	131/84 UX
2,239,335	4/1941	Molins	131/84 A
2,247,413	7/1941	Rundell	131/66 A
2,629,385	2/1953	Kochalski	131/110 X
2,835,297	2/1958	Kochalski	131/84 C UX
2,237,033	4/1941	Herrmann	131/66
2,243,703	5/1941	Herrmann	131/84

FOREIGN PATENTS OR APPLICATIONS

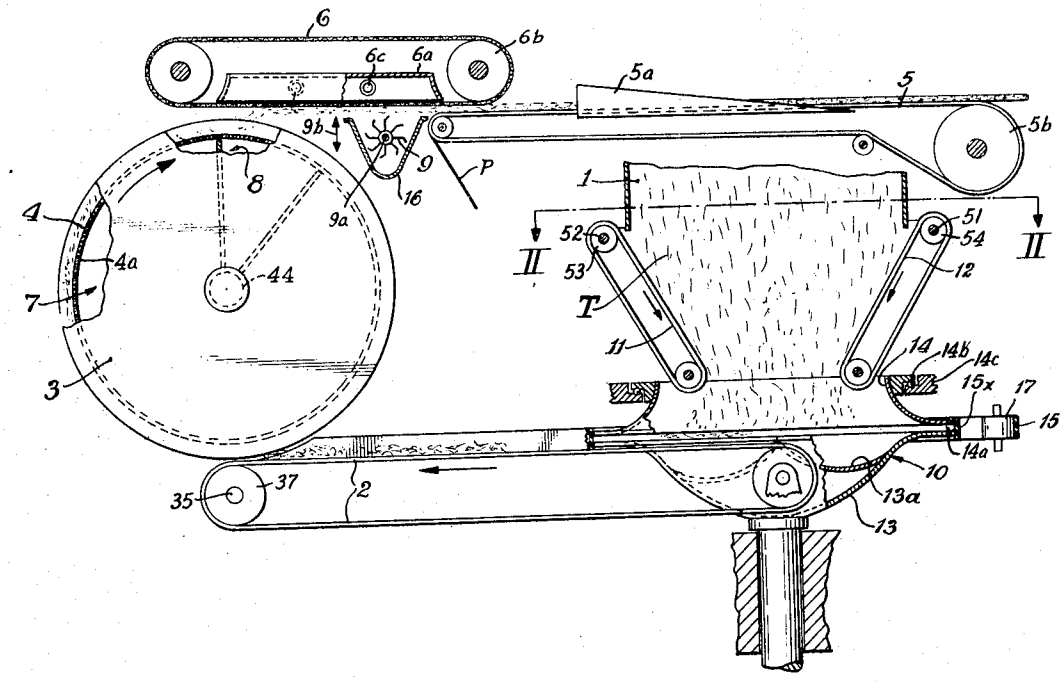
286,421	3/1928	Great Britain	131/110
457,779	12/1936	Great Britain	131/66 A
184,314	4/1907	Germany	131/109
624,871	1/1936	Germany	131/108

Primary Examiner—Joseph S. Reich
Attorney—Michael S. Striker

[57] **ABSTRACT**

An automatic cigarette making machine wherein tobacco shreds are showered from a hopper through a guide and onto the upper stretch of a narrow elongated collecting tape which accumulates a stream containing a surplus of tobacco. Such stream is transferred into the circumferential groove of a suction wheel and is trimmed to remove the surplus prior to delivery to a horizontally extending rod former wherein the trimmed stream is enclosed in wrapper tape to form a cigarette rod.

3 Claims, 5 Drawing Figures



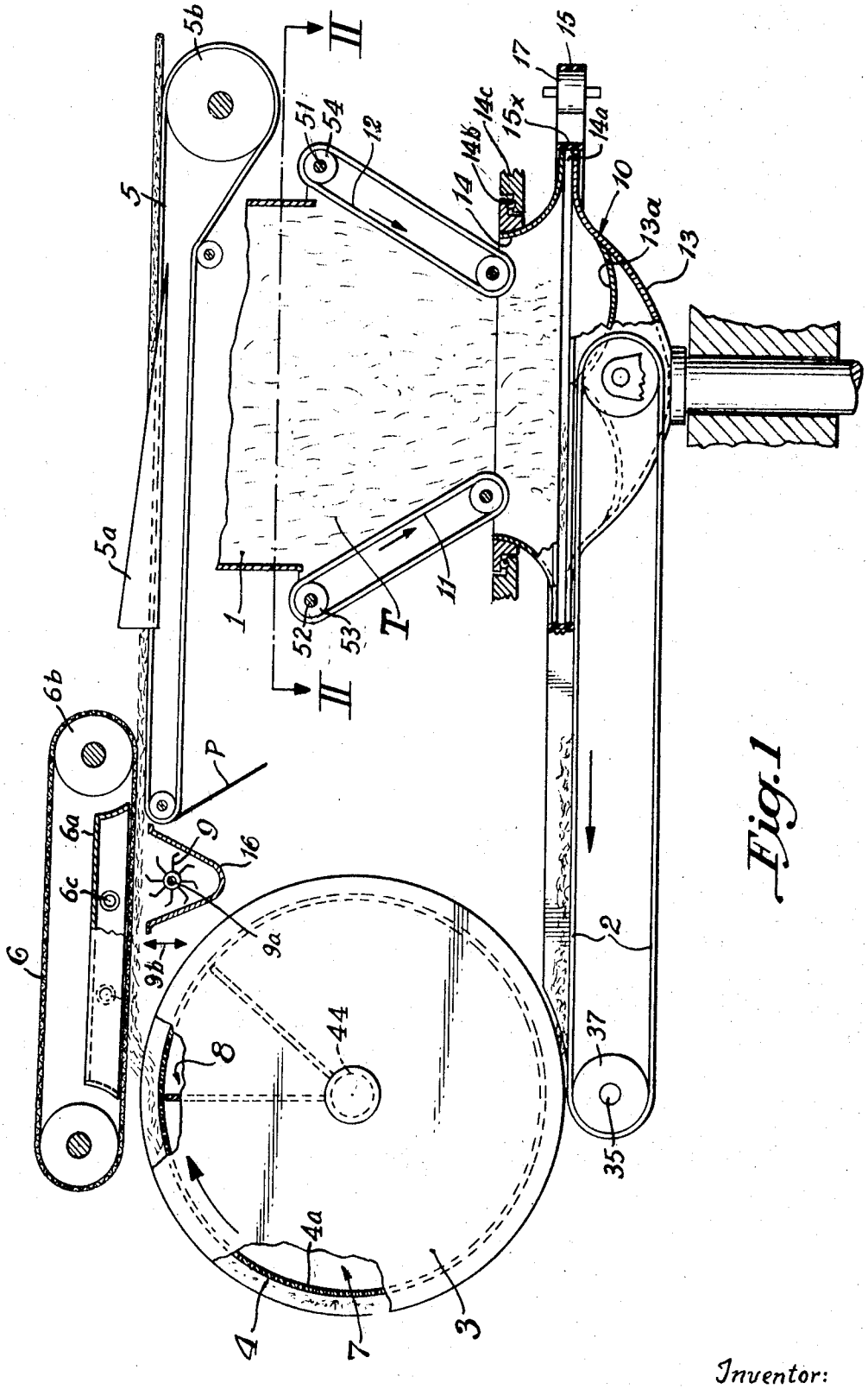


Fig. 1

Inventor:
Kurt Körber

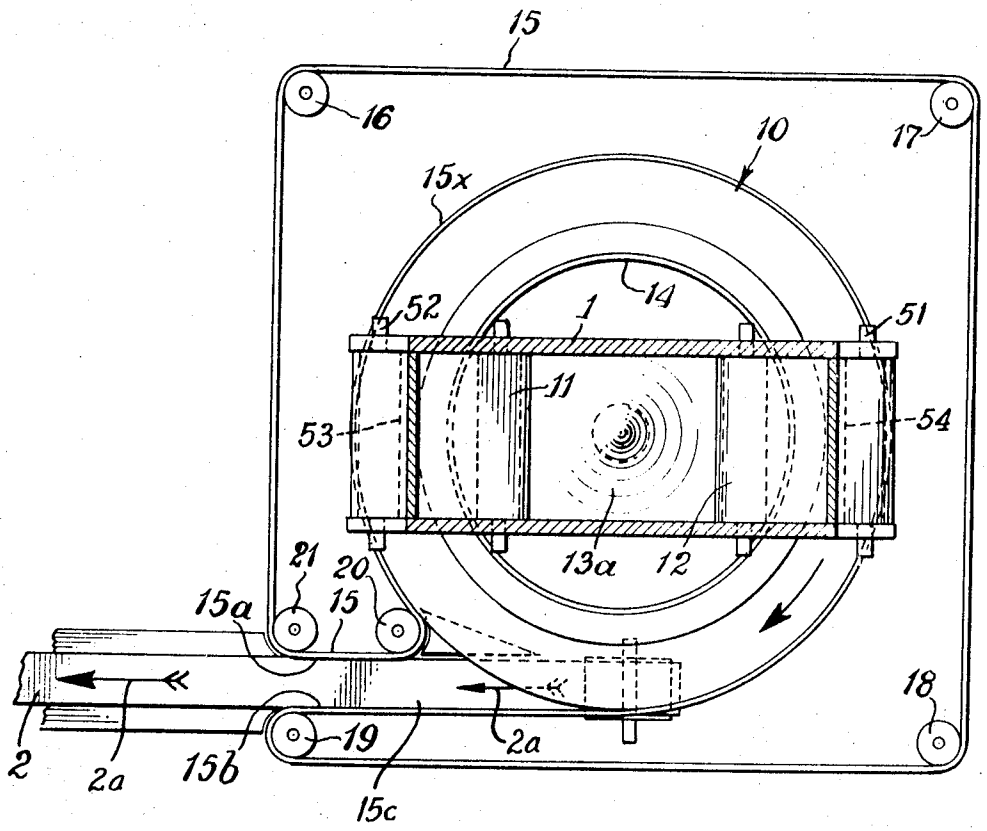


Fig. 2

Inventor:
Kurt Körber
By:
Michael S. Striker
Attorney

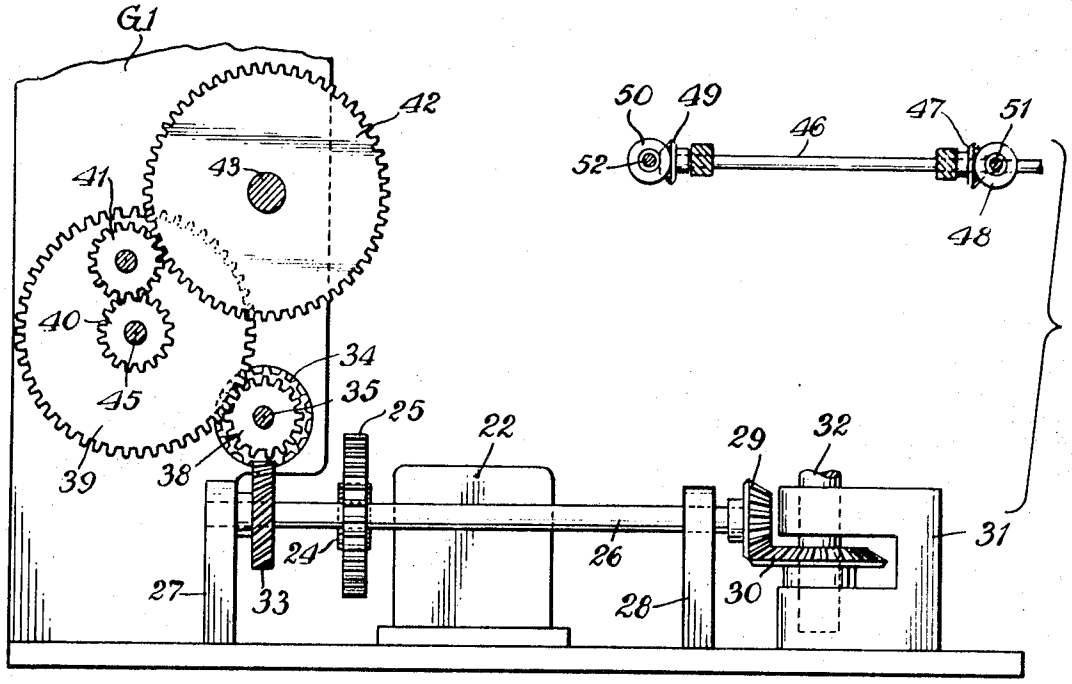


Fig. 3

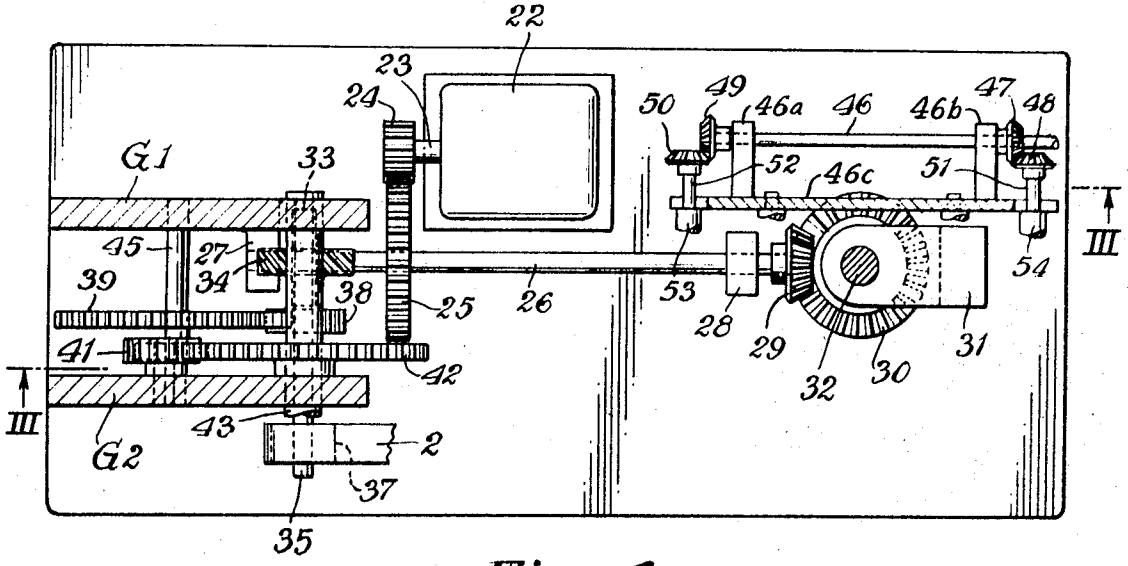


Fig. 4

Inventor:
Kurt Körber
By:
Michael S. Striker
Attorney

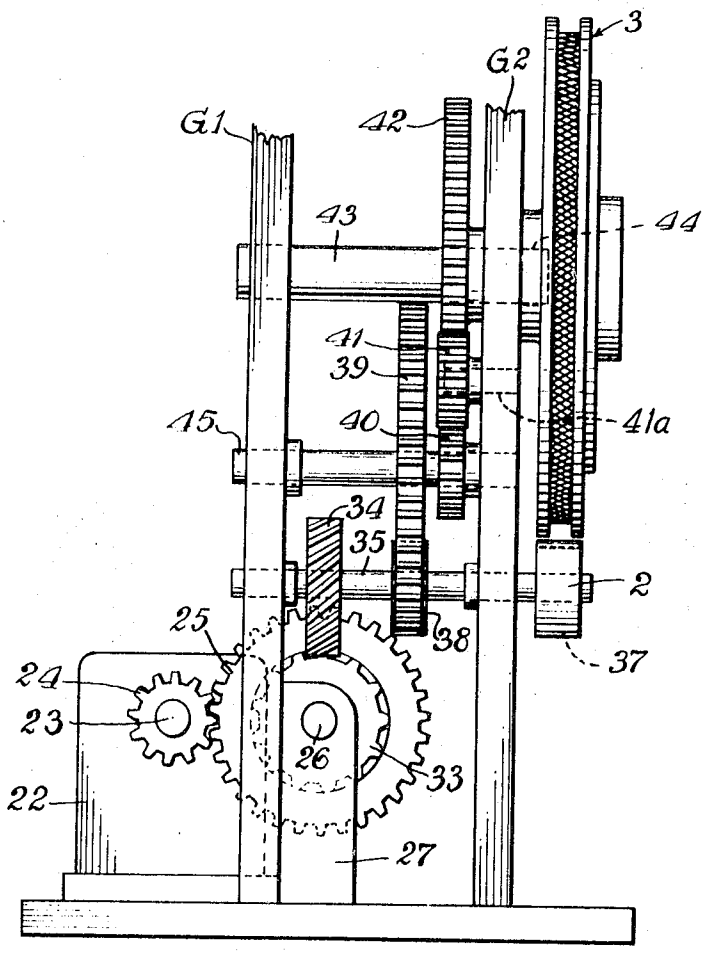


Fig. 5

Inventor:
Kurt Körber
By:
Michael S. Striker
Attorney

TOBACCO ROD FORMING MACHINE

The present invention relates to tobacco rod forming machines. This application is a continuation of my abandoned application, Ser. No. 264,145 which is a continuation-in-part of my abandoned application, Ser. No. 852,060 filed Nov. 10, 1959.

It is an important object of this invention to provide an improved conveying arrangement in a tobacco rod forming machine which may be used in the production of cigarettes and similar tobacco-containing products.

A concomitant object of the invention is to provide a machine which embodies the aforementioned arrangements and wherein shredded particles which form a continuous tobacco stream are automatically reoriented prior to transformation of such stream into a tobacco rod. Attention is directed to U.S. Pat. No. 3,313,665 to Berger for information relating to particle orientation in a machine which forms a continuous rod for shredded particles, with the assistance of pneumatic pressures.

Still another object of the invention is to provide a tobacco rod forming machine wherein the tobacco stream is conveyed in a series of paths which are arranged in such a way that the machine occupies little floor space and that all component parts of the machine are readily accessible for the purpose of inspection, replacement and/or repair.

With the above objects in view, one feature of the invention resides in the provision of a tobacco rod forming machine which comprises a tobacco distributor, rotary stream forming means comprising a central portion arranged to receive shredded tobacco from the distributor and a circumferential portion arranged to receive tobacco from such central portion by centrifugal force and to discharge tobacco tangentially whereby the tobacco forms a stream, a first conveyor arranged to receive the stream from the stream-forming means and to advance the stream endwise in a linear path at a speed which is less than the speed at which the tobacco stream is discharged by the circumferential portion of the stream-forming means, a suction conveyor arranged to receive the stream from the first conveyor and to advance the stream endwise in a second linear path while the particles which form the tobacco stream are retained by suction, a third conveyor arranged to receive the stream from the suction conveyor and to advance the stream at reduced speed endwise in a third linear path, and tobacco rod forming means adjacent to the third path for applying a strip of wrapper material around the tobacco stream.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The machine itself, however, both as to its construction and its method of operation, together with additional features and advantages thereof, will be best understood from the following detailed description of a specific embodiment with reference to the accompanying drawings, in which:

FIG. 1 is a partly elevational and partly vertical sectional view of a tobacco rod forming machine which embodies the invention, with certain parts of the machine broken away;

FIG. 2 is a horizontal section through the distributor of the tobacco rod forming machine as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is a vertical section through the drive means for the machine of FIGS. 1 and 2 substantially as seen in the direction of arrows from the line III—III of FIG. 4;

FIG. 4 is a top plan view of the drive means, further showing a portion of an endless conveyor belt which forms part of the conveying arrangement in the tobacco rod forming machine; and

FIG. 5 is an end view of the machine as seen from the left-hand side of FIG. 4.

Referring now in greater detail to the drawings, and first to FIG. 1, there is shown a tobacco rod forming machine which comprises a tobacco distributor 1 of known construction, first conveyor means including an endless conveyor belt 2 whose horizontal upper run receives a continuous stream of densely compacted tobacco from a tobacco stream forming arrangement 10 which will be described in connection with FIG. 2 and

a conveyor disk 3 having a circumferential tobacco receiving groove 4 which is arranged to receive the tobacco stream from the discharge end of the conveyor belt 2 and whose bottom wall 4*a* assumes the form of a perforated annulus, a suction conveyor including an endless conveyor belt 6 which is perforated and which is arranged to receive the tobacco stream from the groove 4 at the apex of the wheel 3, a further conveyor including an endless conveyor belt 5 which receives the tobacco stream by gravity from the discharge end of the suction conveyor, and a tobacco rod forming mechanism 5*a* adjacent to the linear path which is defined by the upper run of the conveyor belt 5.

The wheel 3 accommodates a stationary suction chamber 7 which extends along the inner side of the annulus 4*a* from the lower portion toward the apex of the wheel so as to hold the tobacco stream by suction against the outer side of the annulus, and a pressure chamber 8 which is adjacent to the apex of the wheel and is also located at the inner side of the annulus 4*a* to facilitate transfer of tobacco to the underside of the conveyor belt 6. This belt 6 is perforated and its horizontal lower run is located at a level above the wheel 3 so as to form a bridge between the groove 4 and one end of the conveyor belt 5. The lower run of the belt 6 is adjacent to the open underside of a suction chamber 6*a* which causes the stream of tobacco to adhere to the underside of the belt 6 and which also causes shredded particles which form the tobacco stream to become aligned at the time such particles are being transferred from the groove 4.

An equalizing device here shown as a rotary brush 9 is located beneath and adjacent to the linear path defined by the conveyor belt 6 to trim off excess tobacco from the stream and to deliver such excess tobacco into a trough 16 which returns tobacco to the distributor 1 or to another destination.

The stream forming arrangement 10 which is shown in the right-hand portion of FIG. 1 and in FIG. 2 comprises a rotary disk 13 which constitutes the central portion of the stream forming arrangement and which is located beneath the discharge opening of the distributor 1 to receive a continuous shower of shredded tobacco particles T and to hurl such particles by centrifugal force against the inner side of an endless belt 15. A substantially circular section 15*x* of this belt 15 constitutes the circumferential portion of the stream forming arrangement and this circular section 15*x* is trained around the circular edge face of the disk 13 and around the circular edge face of an annular member 14 which is located at a level above and which is spaced from the disk 13 so as to define with this disk an annular gap 14*a* bridged by the circular section 15*x* of the belt 15. The disk 13 and the annular member 14 are driven about a common vertical axis in a manner to be described in connection with FIGS. 3 to 5. Two downwardly inclined mirror symmetrical endless bands 11, 12 guide the particles T onto the upper side of the revolving disk 13 which latter comprises a cup-shaped outer or lower section and an inner or upper section 13*a* defining an annular channel or trough into which the conveyor bands 11, 12 direct the particles T. The disk 13 and the annular member 14 are driven at the same speed.

The belt 15 is disposed in a horizontal plane at the level of the gap 14*a* and is trained around a series of deflecting rolls 16, 17, 18, 19, 20 and 21.

Referring to FIGS. 3 to 5, the drive means for the disk 13, for the belt 2 and for the wheel 3 includes a variable speed transmission 22 whose output shaft 23 carries a pinion 24 mating with a gear 25 which is mounted on and is located close to one end of a main drive shaft 26 journaled in bearing blocks 27, 28. The shaft 26 carries a bevel gear 29 mating with a second bevel gear 30 mounted on a shaft 32 which is rotatable in a bearing 31 and which drives the disk 13. The disk 13 drives the belt 15 and the latter drives the annular member 14 so that the peripheral speed of the parts 13, 14 equals the speed of the belt section 15*x*. A helical gear 33 which is mounted on the main shaft 26 drives a shaft 35 through a mating helical gear 34, and this shaft 35 is rotatable in a pair of spaced upstanding walls G_1 and G_2.

One end portion of the shaft **35** carries a deflecting roll **37** which serves to drive the endless belt **2**. The shaft **35** also carries a pinion **38** which meshes with a gear **39** provided on an intermediate shaft **45**, and the gear **39** drives a shaft **43** through a gear train **40**, **41**, **42**, see FIG. **3**. The wheel **3** is mounted on an end portion **44** of and rotates with the shaft **43**. As shown in FIG. **5**, the shafts **43**, **45** are journaled in the walls G_1, G_2, and the gear **41** which transmits motion from the gear **40** to the gear **42** is mounted on a stub shaft **41***a* carried by the wall G_2.

The bands **11**, **12** are driven by the drive of the distributor **1** which includes a shaft **46** journaled in brackets **46***a*, **46***b* of a frame member **46***c* and driven by a shaft **51** through a first pair of mating bevel gears **47**, **48**. The shaft **46** drives a shaft **52** through a second pair of bevel gears **49**, **50**. The shaft **52** rotates a roller **53** (see also FIG. **1**) which drives the band **11**, and a similar roller **54** is mounted on the shaft **51** to drive the band **12**.

The roll **6***b* for the belt **6**, the roll **5***b* for the belt **5**, and the shaft **9***a* of the equalizing device **9** also derive motion from the output shaft **23**. The annular member **14** is mounted on antifriction bearings **14***b* carried by a frame member **14***c* (see FIG. **1**) and is driven by the circular section **15***x* of the belt **15**. The equalizing device **9** may be adjusted in directions at right angles to the path of tobacco along the underside of the belt **6** (arrow **9***b*), and the internal space of the suction chamber **6***a* is maintained at subatmospheric pressure by a suitable suction fan or the like, not shown, which withdraws air through suction conduits **6***c*.

Referring again to FIG. **2**, it will be noted that the belt **15** comprises a first straight section **15***b* which is tangential to the disk **13** and a second straight section **15***a* which extends between the rolls **20**, **21** in parallelism with the section **15***b* to define therewith a passage or channel **15***c* through which a stream of tobacco accumulating along the inner side of the belt section **15***x* is discharged tangentially of the gap **14***a* (arrows **2***a*) and onto the upper run of the belt **2**. The speed of the belt **2** is less than the speed of the belt section **15***x*, and the speed of the belt **5** is less than the speed of the belt **2**. It is assumed that the peripheral speed of the wheel **3** (i.e., of the annulus **4***a*) equals the speed of the belt **2**.

For example, the speed of the upper run of the belt **2** is 111 m./min and the diameter of the annulus **4***a* is selected in such a way that it is driven at 1,500 r.p.m. so as to rotate at the peripheral speed of **111** meters per minute if the machine is used for the production of cigarettes with a length of 70 mm. The belt **5** is driven at 105 meters per minute, and the speed of the belt section **15***x* is say 115–120 meters per minute. The speed of the belt **2** normally exceeds the speed of the belt **5** by 2–6 percent, and the speed of the belt **15** normally exceeds the speed of the belt **2** by 2–6 percent.

The machine of my invention operates as follows:

The particles T showered by the distributor **1** onto the upper section **13***a* of the revolving disk **13** are subjected to the action of centrifugal force and are hurled radially outwardly against the inner side of the belt section **15***x* to form a comparatively wide but rather low tobacco stream consisting of densely compacted tobacco particles. The width of this stream is measured in a horizontal plane, as viewed in FIG. **1**. The resulting stream of densely compacted tobacco particles is permitted to escape through the passage **15***c* between the belt sections **15***a*, **15***b* to travel in the horizontal portion of the linear path defined by the belt **2** and wheel **3**. Since the speed of the belt **2** is less than that of the belt **15**, the quantity of tobacco per unit length of the stream increases so that the stream of tobacco advancing along the upper run of the belt **2** contains more tobacco per unit length than the stream which is formed along the inner side of the belt section **15***x*. The speed of the belt section **15***x* exceeds the speed at which the particles T are showered onto the disk section **13***a*, and such difference in speeds causes the tobacco particles to gather and to form a narrow stream whose width is determined by the width of the gap **14***a* and whose height depends on the rate at which the distributor **1** feeds tobacco between the bands **11**, **12**.

The wheel **3** receives the tobacco stream by suction which prevails in the chamber **7**, and the annulus **4***a* advances the stream from a lower level (belt **2**) to a higher level (belt **6**). This is due to the fact that the wheel **3** is disposed in a vertical plane, i.e., the axis of the shaft **43** is horizontal, and such mounting of the wheel **3** renders it possible to arrange the various conveyors, the distributor and the tobacco rod forming mechanism **5***a* in such a way that the entire machine occupies little floor space which is always at a premium in modern tobacco manufacturing plants.

When the tobacco stream enters the groove **4**, its cross-sectional dimension exceeds the cross-sectional dimension of the ultimate product and, as a rule, the exposed side of the tobacco stream (which faces radially outwardly and away from the perforated annulus **4***a*) is formed with raised and depressed portions whose presence is due to the fact that a distributor cannot always deliver tobacco at a uniform rate so that the cross-sectional dimension of the tobacco stream is not entirely uniform. Any excess tobacco which must be removed to transform the tobacco stream into a stream of constant cross section is trimmed off by the rotary equalizing device **9** so that the stream is fully equalized prior to reaching the discharge end of the belt **6**. Such equalized stream then enters the linear path defined by the upper run of the belt **5** and is compacted in known manner prior to being wrapped into a strip of paper P or other wrapper material which is supplied between the upper run of the belt **5** and the underside of the equalized tobacco stream. The quantity of tobacco per unit length of the tobacco stream increases at the time the tobacco stream enters the path defined by the belt **5** because the speed of this belt is normally less than the speed of the annulus **4***a*.

It will be noted that the lower run of the belt **6** is somewhat spaced from the groove **4** so that the particles of shredded tobacco leaving the groove in response to suction prevailing in the chamber **6***a* must actually travel in unsupported condition to cover the distance between the apex of the wheel **3** and the underside of the belt **6** whereby the particles are automatically reoriented to form a tobacco stream wherein the particles assume the form of substantially parallel tobacco strands. The density of such streams is much more uniform than the density of streams wherein the tobacco particles are distributed at random and, once the thus formed stream passes along the equalizing device **9**, it is transformed into a tobacco filler stream of constant density and of uniform cross-sectional dimension, both requisites of a satisfactory tobacco rod for high-quality cigarettes or similar tobacco-containing products. It will be noted that the system of conveyors **2–3**, **6** and **5** renders it possible to reorient the particles of shredded tobacco in a fully automatic way while the particles travel from the distributor **1** to the rod forming mechanism **5***a*, and that such reorientation of tobacco particles is due to the provision of a suction conveyor (**6**) which is spaced from and which bridges the gap between a pair of conveyors. The gap between the underside of the belt **6** and the apex of the wheel **3** should be wide enough to allow for automatic alignment of tobacco particles which are drawn by suction and whose transfer may be assisted by jets of air discharged from the chamber **8** through the perforated annulus **4***a*. At least in some instances, the chamber **8** may be maintained at atmospheric pressure so that the particles of tobacco travelling in the groove **4** will be transferred solely in response to suction prevailing in the chamber **6***a*.

What is claimed as new and desired to be secured by Letters Patent is:

1. An automatic machine for producing a cigarette rod, comprising a hopper for shredded tobacco; a guide having an open top and an open bottom; a substantially horizontal narrow elongated tape running adjacent to the bottom of said guide; a device for removing tobacco from said hopper and showering it through said guide, such tobacco being received by said tape so that the tape receives and forwards a continuous stream containing a surplus of tobacco over that in said cigarette rod; a hollow suction wheel having a foraminous peripheral wall and two flanges forming a narrow trough

therebetween for receiving the stream from said tape and a source of suction for holding the tobacco stream in said trough while the tobacco stream travels with said suction wheel, the width of said trough being a small fraction of the radius of said suction wheel and said suction wheel being rotatable about a substantially horizontal axis, said trough having a delivery zone in substantial vertical alignment with said axis and circumferentially spaced from the zone at which said trough is adapted to receive the stream from said tape; a rod forming mechanism comprising a substantially horizontally extending conveyor located downstream of said suction wheel for receiving the tobacco stream, and means for enclosing the tobacco stream in a wrapper tape to form said cigarette rod; and a trimming device located between said first mentioned tape and said rod forming mechanism for removing the surplus from the stream before the stream is enclosed in the wrapper tape.

2. A machine as set forth in claim 1, wherein said trimming device is located at a level above said axis.

3. A machine as set forth in claim 1, wherein said collecting tape comprises a run which receives tobacco and extends substantially tangentially of said suction wheel.

* * * * *