

[54] **PROCESS CONTROL SYSTEM**
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Related U.S. Application Data

[63] Continuation of Ser. No. 433,932, Feb. 19, 1969, abandoned, which is a continuation-in-part of Ser. No. 85,426, Jan. 27, 1961.
 [52] U.S. Cl. **131/21 D, 131/22, 131/84 C**
 [51] Int. Cl. **A24c 05/32**
 [58] Field of Search .. **131/21 B, 21 D, 22, 84 B, 84 C**

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[57] **ABSTRACT**

Specifically disclosed herein is a control system for a cigarette making machine in which a stream of tobacco is picked up in the peripheral groove of a rotating pickup wheel and held by suction applied through the interior of the wheel while the stream is trimmed by a rotary trimming knife to the size required to form a cigarette rod. The trimming knife occupies a fixed position at a predetermined distance from the periphery of the wheel, and the weight per unit length of the cigarette rod is controlled by automatically adjusting the spacing between a pair of wheel flanges which form the sides of the peripheral groove in the pickup wheel. The width of the groove is thus controlled in response to the signal from a beta ray gauge which measures the cigarette rod.

5 Claims, 2 Drawing Figures

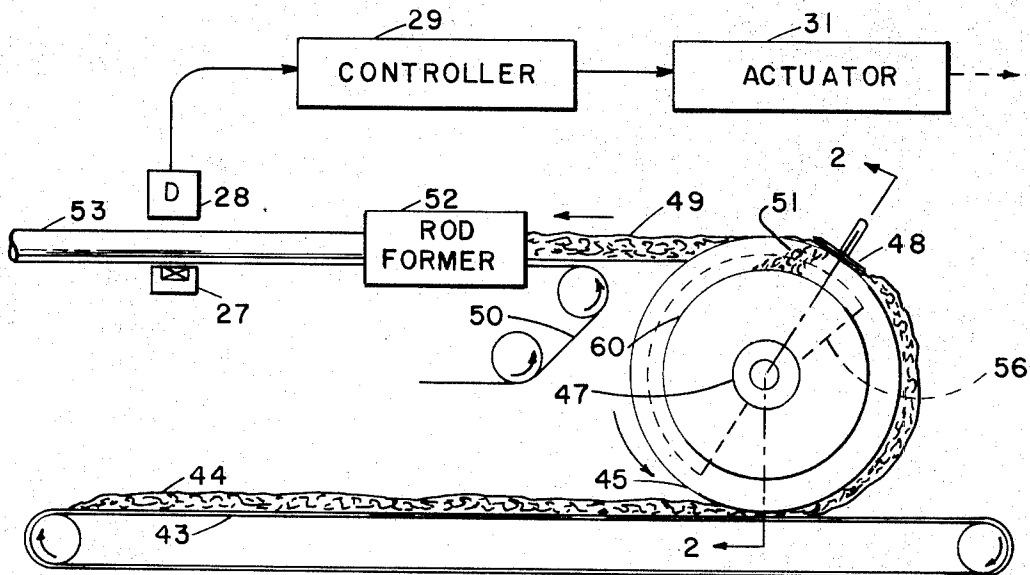


Fig. 1

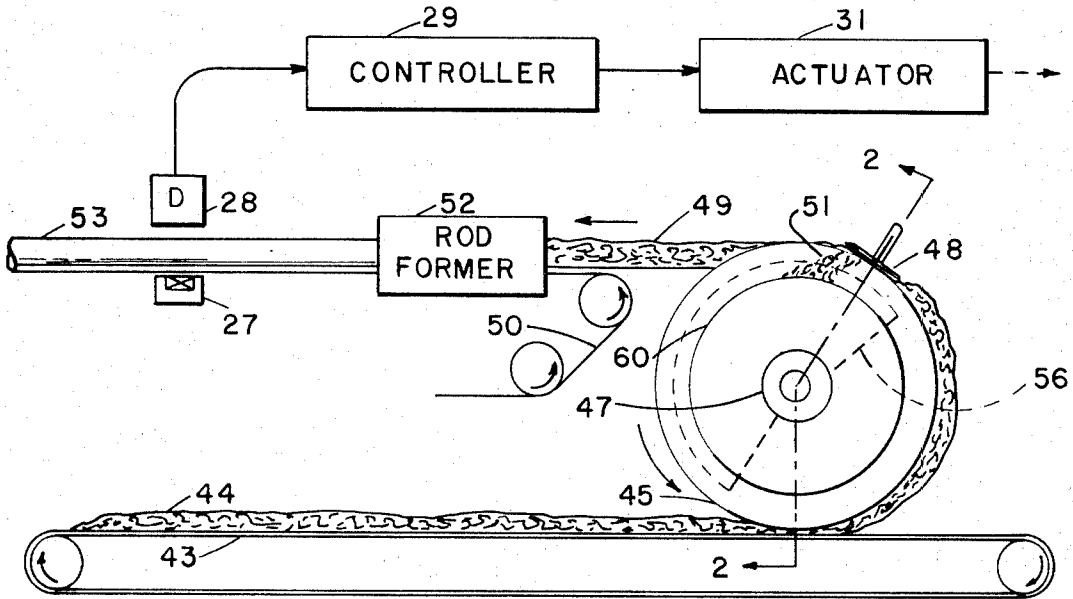
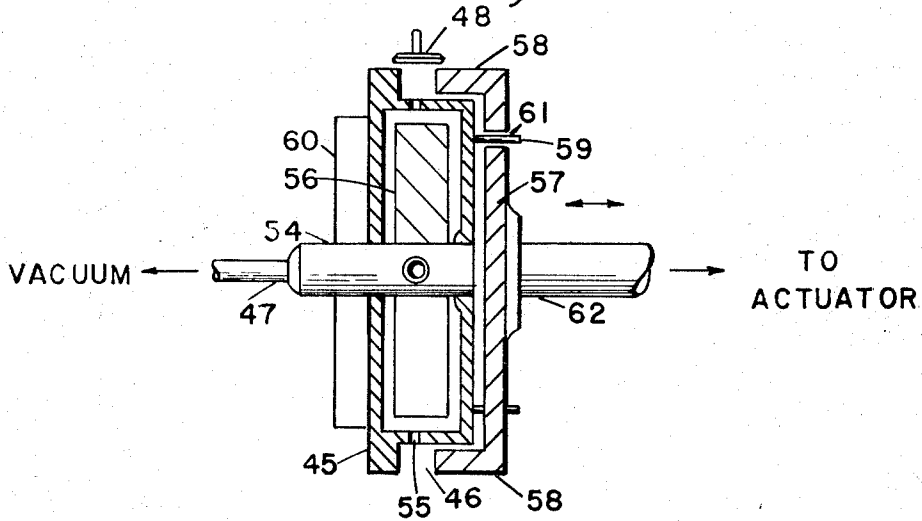


Fig. 2



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PROCESS CONTROL SYSTEM

The present application is a stream-lined continuation of application Ser. No. 433, 932, filed Feb. 19, 1965, now abandoned, which in turn, is a continuation-in-part of my copending application Ser. No. 85,426, filed Jan. 27, 1961, and accordingly the disclosure of said prior application is incorporated by reference herein.

This invention relates generally to industrial process control systems, and more particularly it relates to arrangements for controlling the weight per unit length of a product by automatically regulating the cross-sectional size and density of a stream of material utilized in the process for making a product.

It is the principal object of the invention to provide means for controlling the cross-sectional size and density of a stream of material such as tobacco or other compressible material utilized in the formation of a continuous cigarette rod or similar product. Other objects and advantages will be apparent from the following description.

According to the invention, I provide conveyor apparatus including a rotating pick-up wheel assembly for receiving the material. The pick-up wheel assembly is constructed with a pair of flanges on its outer rim to provide a peripheral groove defined by opposed faces of the flanges. By conventional means the material received by the pick-up wheel assembly is transferred into the groove between the two flanges and preferably held therein by suction. A trimming device such as a rotary knife is positioned a predetermined distance from the periphery of the wheel for trimming off material extending from the groove beyond the plane of the knife. After the excess material is trimmed off, the amount remaining in the groove is formed into a product by conventional means. A suitable sensing device such as a beta-ray gauge then senses the weight per unit length of the product. Further according to one form of the invention there is provided a suitable regulating apparatus responsive to the sensed weight of the product for controlling the relative axial position of the wheel flanges so as to regulate the width of the peripheral groove carrying the material and thereby maintaining the weight per unit length of the product substantially constant.

The invention will now be illustrated and described with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic elevational view of part of a cigarette-making machine incorporating the invention.

FIG. 2 is a section on the line 2—2 of FIG. 1.

With reference now to the drawings, a well-known type of commercial cigarette-making machine, specifically a machine which is referred to as the Hauni Garant cigarette-making machine is shown in diagrammatic form in FIG. 1. The general arrangement of the Hauni machine provides a tobacco feed belt 43 which carries a stream of tobacco 44 under a rotating pick-up wheel 45. The wheel 45 has a peripheral groove 46. The bottom of groove 46 is perforated as at 55 and communicates with the interior of the wheel 45. A slight vacuum is drawn by connecting a suitable pump to a pipe 47 communicating with the interior of the wheel. The vacuum is effective to pick up the tobacco 44 in the groove 46 and carry it upwardly on the wheel 45 to a position adjacent a cutting wheel or trimming

knife 48. The tobacco stream is divided by the cutting wheel into a uniform cross-section portion 49 and a returned excess portion 51. The uniform cross-section stream 49 is fed to a rod former 52 for encasing the tobacco in a cigarette paper 50 to form a cigarette rod 53. In the conventional Hauni machine, the position of the trimming knife or cutting wheel 48 is manually adjustable to control the cross-sectional size of the stream 49.

In accordance with the present invention, the conventional machine is modified. In the machine as modified, the adjustment of both the density of the tobacco in stream 49 and the cross-sectional size thereof is accomplished without changing the position of the knife 48. The knife occupies a fixed position spaced from the periphery of the wheel 45. The pick-up wheel 45 rotates about a stationary hub 54. Likewise a return wheel 60, which returns the excess stream 51 of tobacco in the conventional manner, rotates about the same stationary hub 54. Hub 54 supports the rotating parts and provides a communicating passageway from the pipe 47 to the interior of the wheel 45. The communicating passageways between the interior of the wheel 45 and the bottom of the peripheral groove 46 are indicated at 55. The hub 54 has a sector-shaped extension 56 to render the vacuum within the wheel 45 ineffective over that portion of the peripheral groove 46 adjacent the arcuate boundary of the sector 56. Thus the tobacco 44 is not influenced by the vacuum when it arrives at the cutting station of knife 48.

According to FIGS. 1 and 2 the density of the tobacco at the knife 48 and the cross-sectional size of the stream 49 are determined by the horizontal position of an axially movable wheel 57. There is provided on wheel 57 a continuous flanged rim 58 with the end face thereof forming one sidewall of the peripheral groove 46. The flange wheel 57 is mounted for rotation with the wheel 45 by a plurality of pins 59 projecting from the surface of the wheel 45. The pins 59 make a sliding fit with holes 61 in the wheel 57. The wheel 57 is connected by a shaft 62 to an actuator 31 capable of moving the assembly toward or away from the wheel 45, as indicated by the double-headed arrow in FIG. 2.

The operation of the actuator 31 is controlled by the suitable controller 29 which is responsive to a signal indicative of the mass per unit length of the cigarette rod 53. The operation of such systems is conventional, and reference can be made to U.S. Pat. No. 2,955,206 for a description of a suitable gauge and control system. For illustrative purposes, there is shown in FIG. 1 a beta ray source 27 and a radiation detector 28 located on opposite sides of the cigarette rod 53.

In the operation of the system, the stream 44 of tobacco delivered by conveyor belt 43 to the pick-up wheel 45 is in excess of that required to form a cigarette rod. The tobacco stream 44 is pressed into the groove 46 and held therein by suction. It is then carried upwardly and around the pick-up wheel by the vacuum pulled through pipe 47 and through perforations 55.

The trimming knife 48 is located at a fixed distance from the periphery of the pick-up wheel, and trims off irregularities in the stream which extend radially outwardly of the plane of the knife. The trimmed tobacco stream 49 passes into the rod former 52, and the trimmings or excess portion separated by the knife is

returned around the wheel 60 to mingle with the incoming tobacco stream. The transfer of said excess portion from wheel 60 to incoming stream 44 is effected by a conventional arrangement including a picker wheel of conventional form or the like.

In the conventional manner, the rod former 52 wraps paper 50 around the tobacco stream to form the rod 53 which is measured by the beta-ray gauging system 27 and 28.

In response to the signal output of the beta-ray gauge, controller 29 compares the actual mass per unit length of the rod with a desired value for said mass per unit length, and when a deviation exists controller 29 sends a signal to actuator 31. Actuator 31 thereupon causes shaft 62 to move either to the left or to the right as shown in FIG. 2, thereby varying the width of the peripheral groove 46 between the flanged wheels 45 and 58. The arrangement is such that if the weight per unit length of the rod 53 passing under the detector 28 falls below the standard weight, the control system acts to cause the actuator to increase the width of the peripheral groove 46 and allow a tobacco stream portion of larger cross-sectional area to pass under the trimming knife. If the mass per unit length of the rod 53 exceeds the standard value, conversely the actuator is caused to decrease the width of the peripheral groove and allow a stream of smaller cross-sectional area to pass under the knife.

While the invention has been herein shown and described as being embodied in specific apparatus, such showing and description is meant to be illustrative only and not restrictive, since obviously many modifications to the described apparatus and various outwardly differently embodiments can be made within the scope of the invention as is set forth in the appended claims.

What is claimed is:

- 1. In a processing apparatus utilizing compressible material,
 - a conveyor for said material,
 - a rotating pick-up wheel having a peripheral groove, means for transferring the material delivered by said conveyor into said groove,
 - trimming means positioned a predetermined distance from the periphery of said wheel for trimming off material extending from said groove beyond said predetermined distance,
 - means for feeding the trimmed material to form a product,
 - means for sensing the weight per unit length of said product, and
 - means responsive to said sensed weight per unit

length for controlling the width of said groove to maintain said weight per unit length substantially constant.

- 2. Apparatus as in claim 1 wherein said pick-up wheel comprises
 - a pair of flanged wheels joined for rotation as a unit, at least one of said wheels being axially movable to provide an adjustable width peripheral groove defined by the opposed faces of said flanges, and wherein said controlling means is adapted to effect axial movement of said one wheel.
- 3. A cigarette-making machine comprising a tobacco stream conveyor,
 - a rotating pick-up wheel assembly having a pair of flanged wheels joined for rotation as a unit and axially movable to provide an adjustable width peripheral groove defined by opposed faces of said flanges,
 - means for transferring the tobacco delivered by said conveyor into said groove,
 - a trimming knife positioned a predetermined distance from the periphery of said wheel for trimming off tobacco extending from said groove beyond said distance,
 - means for forming a cigarette rod from the trimmed tobacco in said groove,
 - means for sensing the weight per unit length of said cigarette rod, and
 - means responsive to the sensed weight of said rod for controlling the relative axial positions of said flanged wheels to maintain said weight constant.
- 4. Apparatus according to claim 3 in which said means for sensing the weight per unit length of said cigarette rod comprises a beta-ray gauge.
- 5. In a cigarette manufacturing machine, a suction wheel, having a hollow central shaft defining its central axis and a peripheral groove permeable to air for conveying tobacco through which suction is applied from the interior of said wheel, said peripheral groove having at least one side defined by an annular edge, an annular flange element, said annular edge being carried by said flange element, a supporting element integral and rotatable with said suction wheel, said flange element being mounted on said support element and axially slidable thereon relative to said wheel, means for detecting variations in the weight of cigarettes produced by said machine and for creating a signal indicative thereof, motor means responsive to said signal, and means coupling said flange element to said motor means thereby to shift said annular edge axially of said wheel so as to vary the width of said peripheral groove in response to said signal.

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