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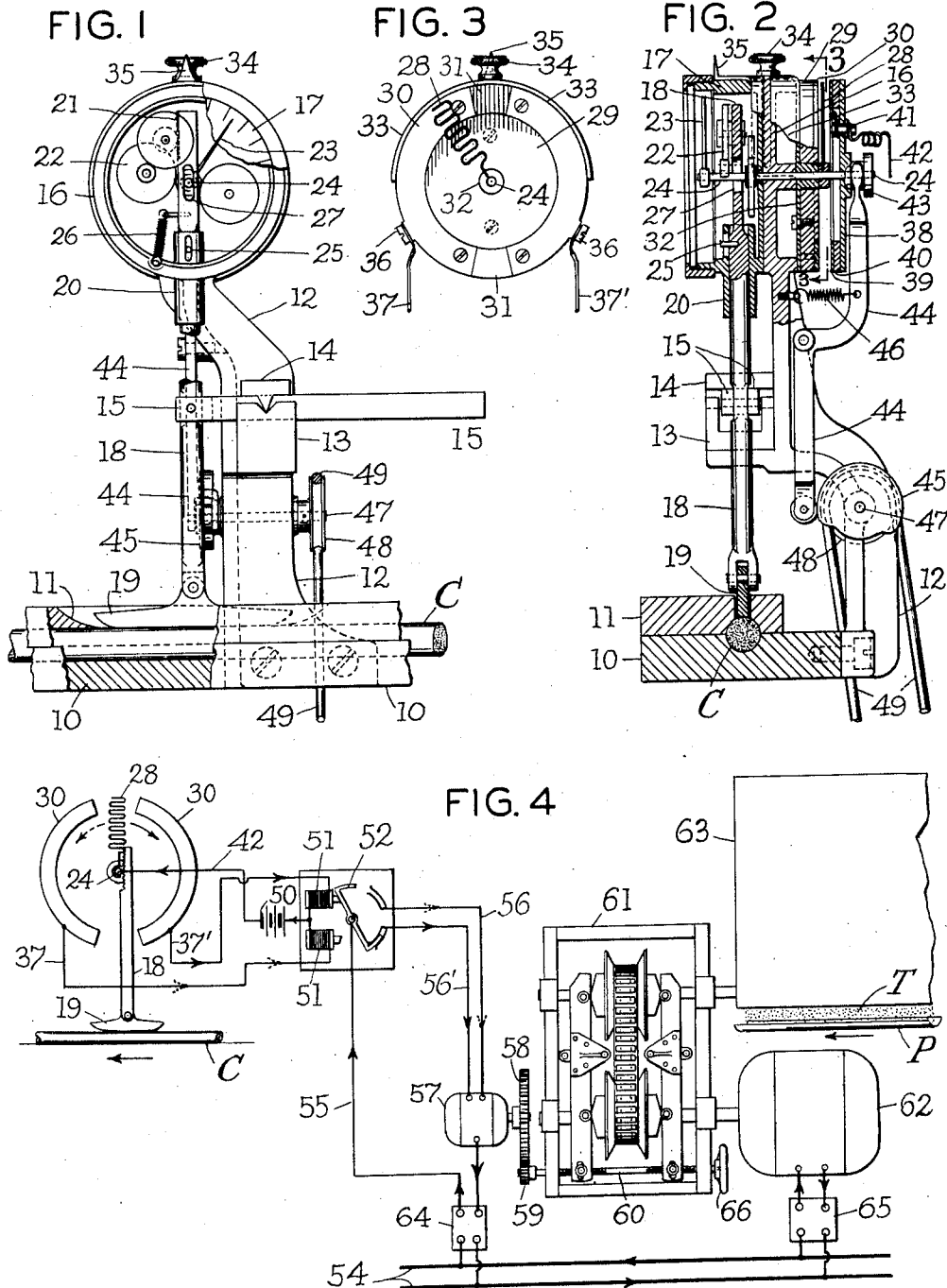
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AUTOMATIC TOBACCO FEED CONTROL

Filed Nov. 20, 1930

2 Sheets-Sheet 1



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FIG. 5

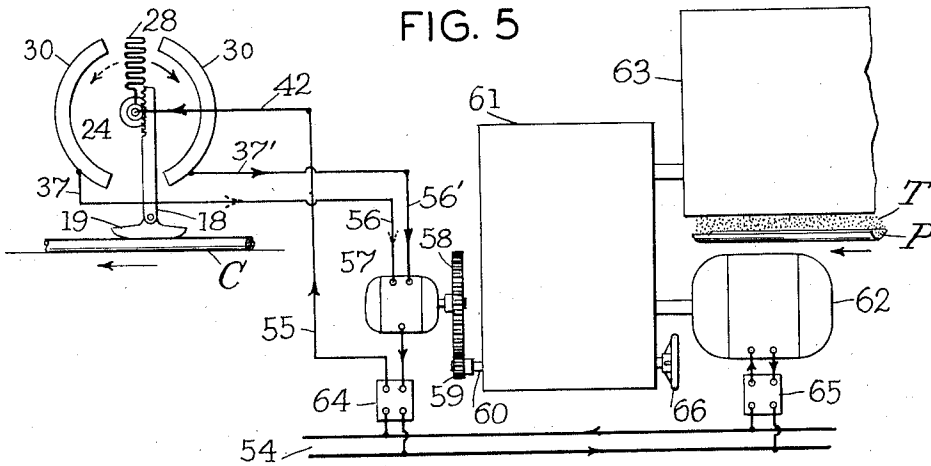


FIG. 6

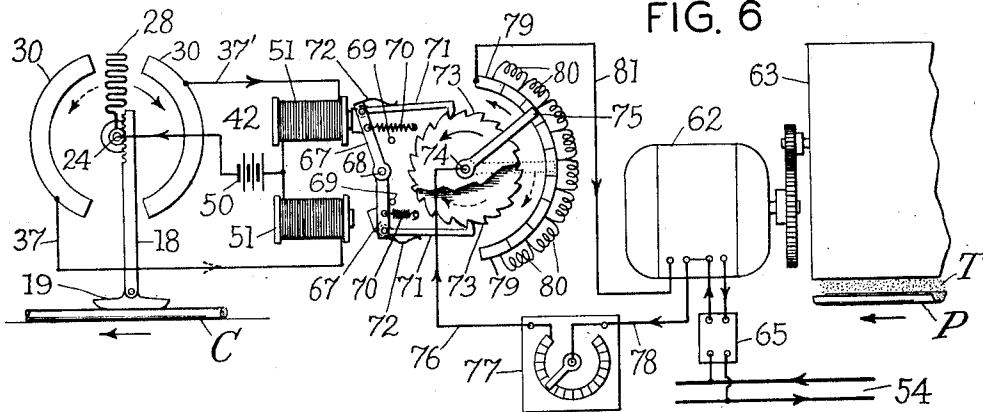
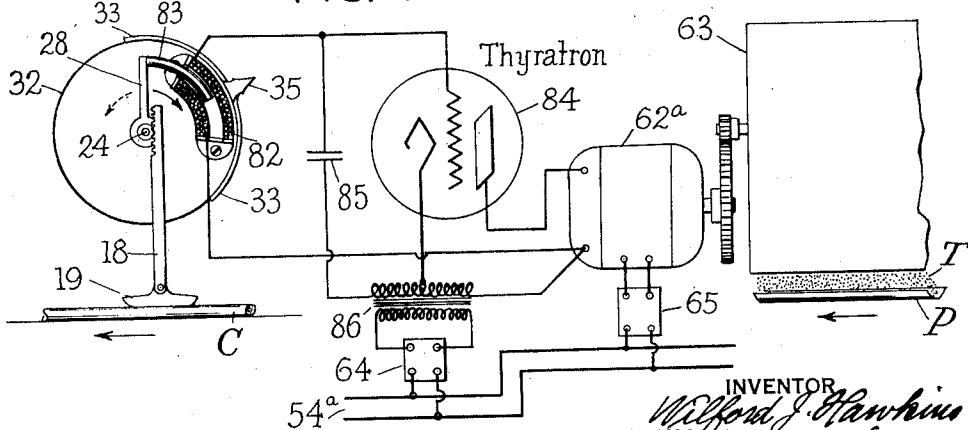


FIG. 7



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AUTOMATIC TOBACCO FEED CONTROL

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This invention relates to automatic tobacco feed control devices for continuous rod cigarette machine. The main object of the present device is to provide control mechanism which will increase the quantity of tobacco fed when the density of the cigarette rod is too small and decreases the rate of feed when the cigarette density is too great. To this end, it is an object of the invention to make the density or what amounts to the same thing, the feel of the cigarette rod automatically control the rate at which tobacco is fed by the feed. Thus advantage is taken of the fact taught by experience that the feel of the cigarette rod, is a sufficiently accurate indication of the density of the tobacco therein so that it is possible for the movements of a feeler of some sort pressing on the moving cigarette rod to be used to indicate the density of the tobacco or to show thereby the number of cigarettes per unit weight of tobacco formed by the machine and in addition by the movement of said feeler to control the feed so as to correct for inaccuracies in the density of the cigarette rod.

While cigarette feeds are commonly provided with mechanism for changing the rate of tobacco feeding with respect to the speed of the rod forming mechanism these devices have hitherto been manually controlled or at best have not been coordinated with the cigarette rod density. When as often happens the average number of cigarettes per ounce of tobacco changes for a considerable time as when a new batch of differently conditioned tobacco is placed in the feed or from overnight weather changes and other causes, the cigarette machines may run for considerable periods of time before the change in the average weight of the cigarettes is discovered and corrected by the operator. This results in either a loss of tobacco if the cigarettes are overweight or unmarketable cigarettes if they are too light. With the present device such a change in average weight and therefore density of the cigarettes and of the cigarette rod from which they were cut will be immediately corrected. Since this is taken from the ultimate product produced by the machine, the cigarettes themselves, this cor-

rection will necessarily result in more accurate coordination of the feed to the cigarette density than any correction made from the volume or density of the tobacco prior to cigarette rod formation.

Since the feeler movements are weak and through only a small distance it is an important object of the invention to provide amplifying or multiplying means capable of reflecting slight movements to the feeler and at the same time controlling the considerable energy needed to operate the variable speed transmission of the feed or change the speed of the feed driving motor thus, it is an object, in one form of my invention, to provide a thyatron amplifying tube to control a considerable amount of power in accordance with the movement of the feeler. Similarly in another form of my invention it is an object to operate a relay system for multiplying energy under the control of the feeder to vary the operation of the feed.

Another object of my invention is to provide a feed control device which is continuous rather than intermittent in its testing action so that the density of the rod will be continuously tested and the rate of feed regulated accordingly. Still another object of the invention is to provide a feed control in which the elapsed time between detection of improper density in the rod and change of speed of the feed is such that the detector does not again change the rate of feed until the results of one change in the rate of feed has reached the detecting element. Yet another object of the invention is to provide such a control system which will not change the feeding of tobacco for very short plus or minus inaccuracies in the density of the cigarette rod but which will quickly respond to inaccuracies lasting over any substantial length of the rod.

With these and other objects not specifically mentioned in view, the invention consists in certain constructions and combinations which will be hereinafter fully described and then specifically set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification and in which like

characters of reference indicate the same or like parts, Fig. 1 is a side elevation of the detecting or feeling element of a machine constructed in accordance with the invention;

Fig. 2 is a sectional side elevation of the construction shown in Fig. 1; Fig. 3 is a side elevation of a detail of the device shown in Fig. 1; Fig. 4 is a diagrammatic view in side elevation of the assembled control device and tobacco feed and the electrical connections involved, the latter including a magnetic switch or relay; Fig. 5 is a similar diagrammatic view in side elevation showing a modified form of the device in which the current through the variable speed operating motor is controlled directly from the detecting device; Fig. 6 is a diagrammatic view in side elevation illustrating a form of the device in which a rheostat is used to vary the current in the tobacco feed driving motor; Fig. 7 is a diagrammatic side elevation illustrating a form of the device in which a thyatron amplifying tube is employed to vary the current through the tobacco feed drive motor.

In carrying the invention into effect there is provided in combination with cigarette rod forming mechanism, a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed for automatically maintaining the density of the cigarette rod within desired limits. In the best constructions said means includes power driven devices for varying the amount of tobacco fed by said feed, a movable feeler engaging the rod and power multiplying means actuated by said feeler and controlling the action of said devices. Preferably the means for varying the amount of tobacco fed by said feed includes an electric motor and said means includes devices for governing the current in said motor.

The various means referred to may be varied widely in construction within the scope of the claims, for the particular device selected to illustrate the invention is but one of many possible concrete embodiments of the same. The invention therefore is not to be restricted to the precise details of the structure shown and described.

Referring to Figs. 1, 2 and 3 of the drawings, C is the finished cigarette rod as it passes between the guide bars 10 and 11 which hold down its freshly sealed seam and lead it to the cutoff. To the bar 10 is attached a pedestal 12 which carries a bearing 13 for the knife edge pivot 14 of the balance arm 15 and also forms the supporting frame 16 for the dial indicator 17 and its electrical attachments. From the end of balance arm 15, which is suitably weighted at its opposite end to produce the proper pressure on the cigarette rod, is pivotally suspended a rod 18 carrying a feeler element such as the

shoe 19 which enters into a slot cut into guide bar 11 and rests on the cigarette rod. This feeler will flatten or indent the rod more or less as the density of the rod decreases or increases. The upper part of feeler rod 18 passes through the guide 20 of the dial indicator 17 and, by means of rack teeth 21 cut on its flattened end portion, actuates a gear train 22 which turns the pointer 23 of the indicator, mounted on shaft 24. The rod 18 is prevented from turning in guide 20 by a pin 25 and is held in tension against the cigarette rod by a spring 26. A vertical slot 27 extending some distance above and below the dial center, is cut into the flattened portion of rod 18 to permit the passing of shaft 24.

To the indicator shaft 24 is fixedly attached a flexible contact arm 28 formed of wire with many convolutions which partakes of the movements of shaft 24 and swings freely a little distance from an insulating disk 29 having two contact segments 30 forming parts of a concentric ring separated by insulating spacer 31 flush with the segments and somewhat greater in width than the contact arm 28. A pointer 23 may be provided if desired on the shaft 24. The disk 29 is attached to a base 32 loosely mounted on the shaft 24 and having the arcuate side wings 33, fitting around the support frame 16, by means of which the disk 29 can be set in any desired position by the clamp screw 34, the relation between the position of disk 29 and the dial of indicator 17 being given by pointer 35 extending from the center of the side wings 33. Thus the zero setting of the segments 30 and insulating space 31 can be varied to suit conditions. Each of the segments 30 has a connection 36 from which wires 37 and 37' lead in one form of the device to a magnetic switch.

On the end of shaft 24 is slidable a clamping disk 38 carrying the continuous contact ring 39 insulated from it by the annular insulating block 40. The contact ring 39 is connected to the insulated terminal 41 in disk 38 from which terminal a wire 42 leads to the aforesaid magnetic switch. The disk 38 has a trunnioned or grooved hub 43 and has an axial reciprocating motion imparted to it by the engagement of a shifting lever 44 fulcrumed in pedestal 12 and actuated by a cam 45.

In the neutral position of the shifting lever, flexible contact arm 28 is free but, in the dwell position of cam 45, the spring 46 pulls the lever 44 with sufficient force to bend the contact arm 28 into contact with the segment disk 29, thereby closing the circuit from wire 42 to one of the wires 37, 37' if the contact arm 28 is out of its neutral position between the segments 30. The cam 45 is mounted on shaft 47 supported by pedestal 12 and is driven at the proper speed by the

pulley 48 connected by belt 49 with the cigarette machine drive.

This proper speed is preferably such that the time between feed setting contacts is equal to or somewhat greater than the time required for a change in the speed of the tobacco feed to manifest itself in a corrected density of the cigarette rod at the point under the feeler shoe 19. Thus by the time a second contact is made the correction if sufficient, will return the contact arm 28 to its non operating setting adjacent insulator 31.

The operation of the device is as follows: The dial of the indicator 17 having been graduated so as to give proper density readings for the particular cigarette machine to be controlled, (if it is desired to have visual indication of the rod density), the segment disk 29 is turned until the pointer 35 registers with the desired density mark on the instrument scale and is set in this position by means of the clamp screw 34. The device thus being set, the flexible pointer 28, as long as the cigarette rod produced is of the proper tobacco density, will remain in the neutral position between the segments 30 so that, whenever the cam 45 permits the spring 46 to act, it will be pressed against the insulating spacer 31, and nothing will happen. But, when the density of the rod varies, the feeler shoe 19 through rod 18 and gear train 22, will turn the shaft 24, the position of the pointer 23 indicating the amount of the increased or decreased density, and the arm 28, being moved out of its neutral position, is then opposite one of the segments 30. Therefore, the action of cam 45 will now cause the contact ring 39 to press the conducting pointer 28 into contact with that segment, thereby establishing electrical connection between the wire 42 and one of the wires 37, 37'.

It will be understood that the movement of the arm 28 relative to the movement of the feeler shoe, and the widths of the insulating spacer 31 are selected so that normal small variations in density, for example those which result in less than one cigarette per ounce of tobacco over or under the desired mean, will have no effect on the feed. Any abnormal change over this predetermined limit will result however in operation of the control mechanism, unless the abnormal density is only momentary in which case the inertia of the control mechanism and feed prevents any controlling action.

As seen in the diagram, Fig. 4, the contact, between the wires 37 or 37' and 42 closes the circuit of a battery 50 through one or the other of the electromagnets 51 of a magnetic switch 52, thereby sending the current, entering from the line circuit 54 through wire 55, by either of the wires 56, 56' into the reversible control motor 57, which is thus turned in one direction or the reverse, accord-

ing to which of its two windings is energized by the switch 52. The motor 57 being connected by the gears 58 and 59 with the regulating screw 60 of the variable speed transmission 61 such as the Reeves drive fully described in the patent to J. A. Stein, 1,810,932, for cigarette machine drive, granted June 23, 1931, through which the motor 62 drives the tobacco feed 63, the turning of motor 57 in one direction will increase, and in the other direction will decrease, the feeding rate of the tobacco T into a rod forming paper trough P by a definite amount, determined by the speed and path of cam 45 which determines the time during which the contact through arm 28 is made.

As long as the density of the rod C remains excessive or deficient, each successive turn of the cam 45 will adjust the tobacco feed by a like amount, until the pointer 28 has returned to its neutral position, when the action of the cam will have no further effect upon the control motor 57 and the tobacco feed will remain undisturbed.

In this manner, variations in the physical condition of the tobacco and other uncontrollable variables affecting the density of the cigarette rod are automatically compensated for, and a uniform product of predetermined density will result from the use of this device.

The switch 64 in the feed circuit of control motor 57 serves to disconnect the feed controlling device when the machine is not running for production, since, in setting up the machine it is preferable to only feed the main motor 62 by closing switch 65 and to make the original speed adjustment by means of the handwheel 66.

In the diagram, Fig. 4, the schematically shown magnetic switch or relay 52 is actuated by a separate circuit from a battery 50, this arrangement being preferable on account of the necessarily low voltage and moderate current in the contact arm circuit.

If desired however, in another form of my invention the wire 42 may be directly connected by wire 55 to one of the supply wires 54, and the wires 37, 37' through the respective wire 56, 56' and the motor windings, to the other supply wires 54. In the latter case, the control motor current from the supply circuit passes through the indicating device, and the contacts made therein send this current directly into the "forward" or "reverse" of a small motor 57, according to the position of the flexible pointer 28, the magnetic switch 52 and its actuating solenoids 51 then becoming unnecessary, as shown in Fig. 5.

Another modification by the use of which the variable speed drive 61 and its control motor 57 may be eliminated, is shown diagrammatically in Fig. 6. Here, each of the electromagnets 51 actuates a separate arm 67 loosely fulcrumed on a shaft 68 and normally

held against a stop 69 by a spring 70. On the free end of each of the arms 67 is pivoted a pawl 71 held by a spring 72 against a ratchet 73. One of these ratchets is right handed 5 and the other left handed, and both are mounted on a shaft 74 in such a manner, by means of oppositely acting ball clutches or similar well known means between each ratchet disk and the shaft 24 such that each 10 causes the shaft 74 to turn with it in its pawl-actuated direction as shown by the respective arrows, but permits free motion of the shaft in the opposite direction. On shaft 74 is fixedly mounted the switch lever 75 which 15 is connected by wire 76 with a rheostat 77, connected by wire 78 to one field terminal of the drive motor 62 and which plays over the contacts 79, having between them resistances 80 and being connected by wire 81 to the other 20 field terminal of motor 62. The field circuit of this motor, which in this case is a D. C. shunt motor, thus comprises the manually operated field rheostat 77 and, in series with it, the automatic auxiliary rheostat 80. Its 25 armature is fed through switch 65 from the line 54 which, if no D. C. line is available, may be derived from a rectifier operating on an A. C. line. The speed of motor 62 being adjusted by means of main rheostat 77 so that 30 the proper tobacco density in the cigarette rod C is obtained with contact arm 75 in its central position, (see dotted line), showing on contact arc 79, the action of the electromagnets 51 on the arms 67 will automatically 35 add or cut out field resistance and thus decrease or increase the speed of motor 62 when the feeler 19 indicates excessive or deficient tobacco density. At each contact of contact arm 28, due to the action of cam 45, the lever 40 75 will move one step, in one direction or the other according to the position of the contact arm 28 relative to the segments 30, until the arm has returned to its neutral position when no current will flow through electro- 45 magnets 51 upon depression of contact arm 28, and the lever 75 will remain in its last corrected position until, upon further variation of the tobacco density, the contact arm 28 is again moved out of its neutral position on 50 disk 29 by the feeler 19.

Still another modification is indicated in Fig. 7. In this case, the step by step motion of the speed control is departed from, and the entire amplitudes of the feeler shoe move- 55 ments are by a suitable device converted into electrical current variations each of which, through a suitable relay, adjusts the speed of the tobacco feed motor in one single setting, by the total amount required to correct the 60 faulty density. The electrical converting device may be a stationary solenoid 82 surrounding a movable iron core 83, which latter in this case is attached to the movable arm 28 or directly to the feeler shoe rod 18, and 65 the relay may consist of a suitable thermionic

tube 84 such as a thyatron, the input grid circuit of which contains the aforesaid solenoid 82 and the variable output or plate circuit of which feeds either the armature or the field winding of a variable speed alternat- 70 ing current drive motor 62a with alternating current from the transformer 86 coming from the A. C. supply circuit 54a.

A condenser 85 is connected between the transformer and the grid of the thyatron. 75 The circuit just described is essentially that at Fig. 31, page 394 of the July article below mentioned, with a different input current control element.

The thyatron tube which is a thermionic 80 tube of the hot cathode type such as that fully disclosed in the General Electric Review for April 1929, page 219 and for July 1929, page 390. This type of thermionic tube is peculiarly suited to the present use be- 85 cause of its ability to control a relatively large output or plate current as the result of slight changes in a very small input or grid current.

The construction of the feeler apparatus in 90 this form differs from that shown in Figs. 1, 2 and 3 in that the settable winged base 32 carries the solenoid 82 which serves as a variable inductance instead of the contact seg- 95 ments 30, while the contact making disk 38 and its actuating shift lever 44 and cam 45 are omitted. The solenoid core 83 is attached to arm 28 which is made rigid, and its weight is counteracted by properly balancing the 100 arm 15 by means of suitable counterweights. Instead of the solenoid shown in Fig. 7, some other delicate current varying device may be employed and in place of the thyatron tube, some other known form of current amplifying or relaying mechanism may be used. 105

What is claimed is:

1. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and 110 actuated by variations in its density to control the operation of the feed.

2. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said 115 mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said means including power driven devices for varying the amount of tobacco fed by said feed, a mov- 120 able feeler engaging the rod, and power multiplying means actuated by said feeler and controlling the action of said devices.

3. In a cigarette machine, the combina- 125 tion with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed 130 having a variable speed drive including an

electric motor, and said means including devices for governing the current in said motor.

4. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including an electric main driving motor, and said means including devices for varying the field current in said motor.

5. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including a source of power for driving said feed, a variable speed transmission connecting said source to the feed, mechanism associated with said transmission to vary its driving ratio, said means including a feeler engaging the rod and operating connections between said feeler and mechanism.

6. The combination with a cigarette machine having mechanism for varying the density of the cigarette rod formed by said machine, of a feeder engaging the rod and actuated by variations in its density and operating connections between said feeler and said varying mechanism to increase the density of the rod when the density of the rod is below a predetermined density and to decrease the density of the rod when said density is above a predetermined density.

7. The combination with a cigarette machine having mechanism for varying the density of the cigarette rod formed by said machine, of a feeler engaging the rod and actuated by variations in its density and operating connections between said feeler and said varying mechanism to increase the density of the rod when the density of the rod is below a predetermined density and to decrease the density of the rod when said density is above a predetermined density, said means including electrically operated speed varying devices and current varying means actuated by said feeler for changing the current in the electric circuit of said devices.

8. The combination with a cigarette machine having mechanism for varying the density of the cigarette rod formed by said machine, of a feeler engaging the rod and actuated by variations in its density and operating connections between said feeler and said varying mechanism to increase the density of the rod when the density of the rod is below a predetermined density and to decrease the density of the rod when said density is above a predetermined density, said cigarette machine including a rod forming mechanism and a tobacco feed mechanism for supplying tobacco to said mechanism, and a

Reeves drive controlled by said connections for driving one of said mechanisms from the other and for varying the relative speeds thereof.

9. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed having means for varying the quantity of tobacco fed without changing the speed of the cigarette machine, including a reversible motor operating when driven in one direction to increase the rate of feed and when driven in the other direction to decrease the rate of speed, two electric circuits one controlling the operation of the motor in one direction and the other controlling the operation of the motor in the other direction and a switch actuated by the rod engaging means for disconnecting one circuit and connecting the other in response to changes in density of the cigarette rod.

10. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including means for varying the quantity of tobacco fed irrespective of the speed of the cigarette machine, said means including a reversible motor connected to said means to decrease the tobacco fed when operated in one direction, to increase the quantity of tobacco fed when operated in the other direction, a motor reversing switch connected to said motor and actuated by said rod engaging means.

11. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including means for varying the quantity of tobacco fed without changing the speed of the cigarette machine, said means including a reversible motor connected to said means to decrease the tobacco fed when operated in one direction and to increase the quantity of tobacco fed when operated in the other direction, and mechanism for reversing said motor controlled by said rod engaging means.

12. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including an electric motor drive, a rheostat in the motor circuit thereof and rheostat op-

erating means actuated by said rod engaging means.

13. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said feed including an electric motor drive, a rheostat in the motor circuit thereof and rheostat operating means actuated by said rod engaging means, said rheostat operating means comprising an arm operated by said rod engaging means, means to one side of a zero position of said arm for periodically closing a circuit through the arm to produce a predetermined change in resistance of said rheostat, and means to the other side of the zero position of said arm to produce an opposite predetermined change in the resistance of said rheostat to increase or decrease the motor current in accordance with decreases or increases in density of the cigarette rod.

14. In a cigarette machine the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said tobacco feed including a driving motor, an electric circuit connected to the motor and adapted to change its speed when the current is changed, a thyatron tube having its plate circuit in series with said motor circuit, devices for varying the current in the grid circuit of said tube, said devices being operatively connected to said feeler to vary the grid current in response to variations in density of the rod.

15. In a cigarette machine the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said tobacco feed including a driving motor, an electric circuit connected to the motor and adapted to change its speed when the current is changed, a thyatron tube having its plate circuit in series with said motor circuit, a variable inductance in the grid circuit of said tube for variable operation thereby, said inductance being operatively connected to said feeler to vary its inductance in response to variations in density of the rod.

16. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said means including devices for preventing controlling action when the variations in density are within predetermined limits.

17. In a cigarette machine, the combination with cigarette rod forming mechanism, of a tobacco feed for supplying tobacco to said mechanism, and means engaging the rod and actuated by variations in its density to control the operation of the feed, said means including devices for limiting its controlling action to predetermined periods of time separated by intervals equal to or greater than the time required for said means to bring about a change in density of the rod.

18. In a tube forming and filling machine, the combination with a feed for supplying the filling material, of an element engaging the filled tube and actuated by variations in its density, and means coacting with said element and said feed to control the operation of the feed as a result of variations in density of the tube filling.

19. The method of coordinating the rate of feed of an electric motor controlled tobacco feed with the density of the tobacco in the rod formed by a cigarette machine to which said feed supplies tobacco, which consists in pressing a movable feeler against the rod formed in the machine, varying an electric current in accordance with the movements of said feeler, controlling a larger electric current from the variations in the first mentioned current and driving the motor from the larger current.

In testimony whereof, we have signed our names to this specification.

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