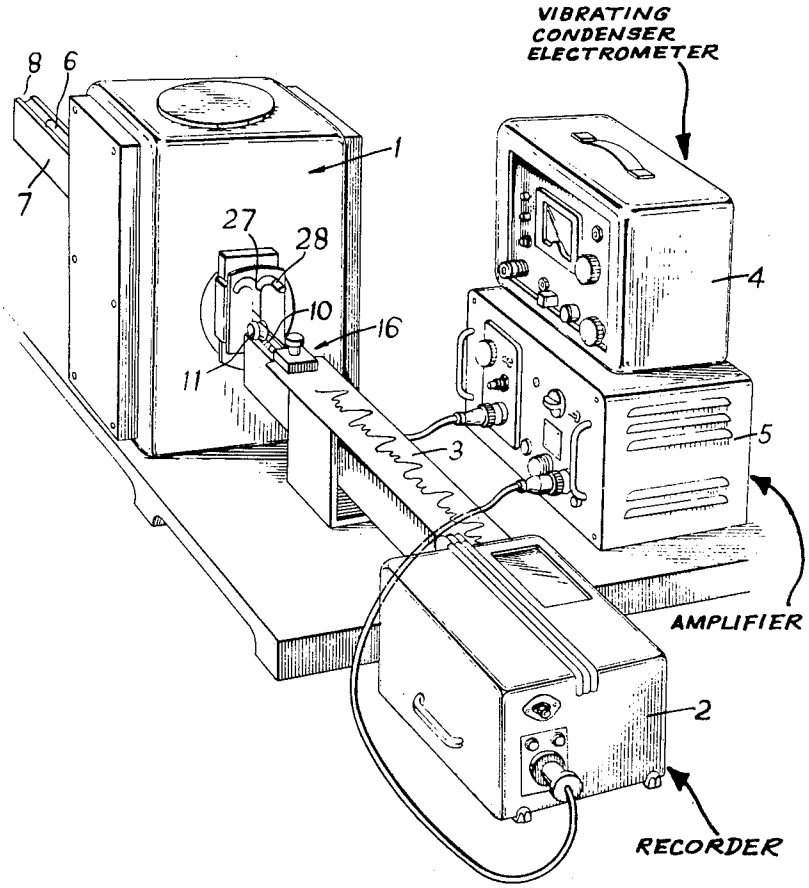
Aug. 3, 1965 G. F. W. POWELL 3,199,110

DEVICE FOR RECORDING VARIATIONS IN THE FILLING OF CIGARETTE ROD ALONG ITS LENGTH

Filed March 5, 1962 3 Sheets-Sheet 1

Fig. 1.



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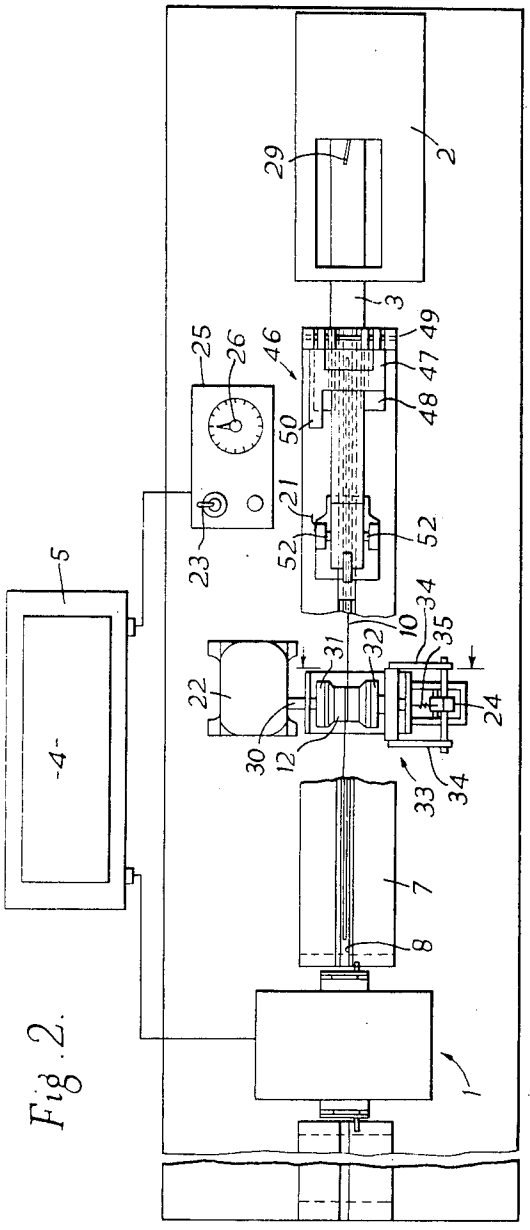

Fig. 2.

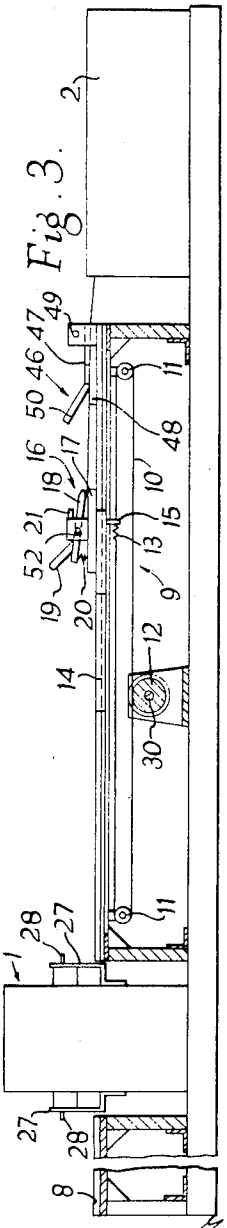

Fig. 3.

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Fig. 4.

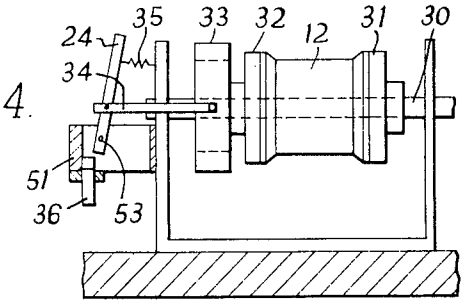
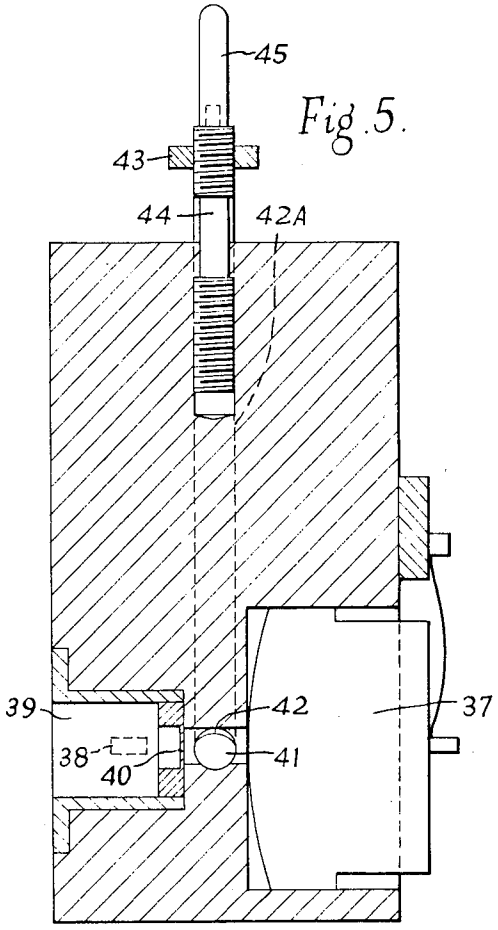


Fig. 5.



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3,199,110

Patented Aug. 3, 1965

3,199,110

DEVICE FOR RECORDING VARIATIONS IN THE FILLING OF CIGARETTE ROD ALONG ITS LENGTH

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Claims priority, application Great Britain, Mar. 7, 1961, 8,289/61

3 Claims. (Cl. 346—25)

This invention relates to a device for recording variations in the filling of cigarette rod along its length. In the manufacture of cigarettes many tests are made to check the quality and appearance of cigarettes and in particular the manufacture is rigidly controlled in an attempt to produce cigarettes of uniform weight. However, even if the cigarettes are of uniform weight there are naturally variations in the local densities along the length of the cigarette, because it is impossible to have the packing of the tobacco in the cigarette absolutely uniform. The result is that although the weight of a cigarette may be satisfactory it may lack uniformity along its length. In a case where a cigarette is very poorly filled at one part the cigarette is obviously unmarketable, but in any case a rigid routine sampling check is necessary to ensure, as far as possible, that in all cigarettes manufactured the tobacco distribution is commercially satisfactory.

Further, an investigation of the uniformity of filling of cigarette rods or of cigarettes is a valuable help in developing cigarette-making machines, as a study of the filling can sometimes lead to the discovery of defects in the design or construction of a machine. Thus a device according to the invention may be used to study a piece of rod having deliberately formed denser portions at intervals and as used in the manufacture of dense end cigarettes.

According to the present invention there is provided a device for recording variations in the filling of a piece of cigarette rod along its length, comprising a radiation gauge adapted to gauge variations in the mass of the rod along its length, a recorder having means, for example a stylus, adapted to record gauge readings on a record strip and electrically connected to the radiation gauge and means, for example a conveyor, for causing relative movement between the rod and the gauge, lengthwise of the rod and simultaneously causing relative movement between the recorder and the record strip at the same speed. In this way a record is the same length as the rod which may be laid against it for showing variations in the filling of the rod and the location of such variations.

As will be readily understood a cigarette is a piece of cigarette rod of a certain length and therefore the device set forth in the preceding paragraph can be used to record variations in the filling of one or more cigarettes. This way of using the device can show the variation occurring along a portion of a continuous rod provided that cigarettes cut from the rod moved through the device in abutting relationship in the order in which they were present in the continuous cigarette rod before it was severed.

The conveyor may comprise a clamp which can be fixed to the leading end of the record strip to ensure that it travels at the same speed as the rod or cigarette, the clamp having fixed thereto a pusher, e.g. a rod which propels the rod or cigarette through the radiation gauge. Normally a number of cigarettes are gauged in one operation in which case the conveyor moves said number as a column of abutting cigarettes.

The conveyor may comprise a taut wire or like flexible element passing around pulleys at each end of the conveyor track and also round a driving roller and the clamp may be fixed to the wire. The pusher rod fixed to the

clamp serves to propel the rod or the cigarettes along a grooved track and is long enough to carry it or them completely through the radiation gauge. The driving roller may be driven by an electric motor with a hand-operated clutch interposed, whereby the conveyor is driven at such times as the operator chooses.

The invention will be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view showing the device and certain other apparatus necessary to operate the radiation gauge,

FIGURE 2 is a plan view of the device,

FIGURE 3 is a central section of FIGURE 2,

FIGURE 4 shows details of a clutch used to drive a conveyor, and

FIGURE 5 is a section of the interior of the radiation gauge.

Referring to the drawings, the perspective view in FIGURE 1 differs slightly from the other figures as it is a view which merely illustrates the main features of the invention, but the differences are only in shape and not in substance, so the same references are used for similar parts throughout the drawings. The radiation gauge and the electrical devices employed are all well-known marketed items and their main features are noted below. Referring first to FIGURE 1, **1** is a radiation gauge and **2** a recorder which makes marks on a web **3**, as indicated in the view, according to variations in the local mass of a cigarette passing through the radiation gauge. In this example a number of cigarettes are being tested. The gauge **1** is an ordinary radiation gauge using Strontium 90 source and an ionization chamber, while the recorder **2** comprises a moving coil carrying a stylus, or pen, to mark the web **3** and swing in the field of a permanent magnet. The web **3** is drawn from a roll of paper inside the recorder casing.

The precise electrical circuit for operating the radiation gauge is not material to the invention, but for the purpose of explanation it may be taken to be substantially similar to the apparatus shown in United States patent specification No. 2,832,352, at the upper part of FIGURE 12 up to the output from the cathode follower **70**. The only substantial difference is that instead of having a balancing chamber, a counter voltage is applied in the manner described in column 13, line 71 to line 3, column 14, of this specification. In FIGURE 1, **4** is a vibrating condenser electrometer corresponding substantially in function to the electrometer shown in the aforesaid specification, and **5** contains the amplifying and auxiliary apparatus necessary for operation of the radiation gauge and comprising a drift-corrected D.C. amplifier and a cathode follower, and its output is fed to the moving coil of the recorder. A wooden support **7** provides a conveyor track having a groove **8** as can be seen in the upper left-hand corner of the perspective view. The remaining parts of the apparatus are best shown in the other figures to which reference will now be made. The time constant of the detecting circuit including the scanning unit and ionization chamber and electrometer is 10 milliseconds. The time constant of the recorder **2** is 3 milliseconds.

The cigarettes **6** are moved along the trough **8** and through the radiation gauge by means of a conveyor generally indicated at **9** and consisting of a wire **10** which passes around pulleys **11** and is looped around a driving roller **12**. A spring **13** is interposed in the wire to tension it and a peg **15** is attached to the wire and to a pusher device **14** which is fixed to a clamp, generally indicated by the reference **16**. The clamp comprises a base plate **17** and a clamping plate **18** which is pivoted as shown in FIGURE 3 at **52** and can be opened by pressing on a lever **19** against the action of a spring **20**. In this way the leading end of the web **3** can be fixed to the

clamp. As the pusher is fixed to the clamp it will be seen that the web and cigarettes placed in the grooves move at the same speed, which in this case is 2.8 cm. per second. The clamp further comprises an abutment **21** whose purpose will be described later.

The conveyor is driven by an electric motor **22**, FIGURE 2, which is started and stopped by a switch **23** and a hand-operated clutch lever **24** is provided which works a clutch shown in FIGURE 4 and will be described later. The switch **23** is mounted in a box **25** which has a dial fixed to its upper surface and an indicating pointer which can be located against marks on the dial by a hand knob **26**. In the interior of the box is a battery and a potentiometer adjustable by the knob **26** for supplying the counter voltage to offset the voltage generated by the current in the ionisation chamber of the radiation gauge **1** due to the radiation which passes through the cigarettes. The intensity of the counter voltage is adjusted by rotation of the knob **26**.

When cigarettes are not being fed through the radiation gauge it is shielded by shields **27** which as can be seen in FIGURE 1 have handles **28** whereby a shield may be dropped into or removed from the shielding position.

In operation of the device, so far described, a number of cigarettes are put in abutting relationship in the groove **8**, the clamp **16** being at the extreme right-hand end of its movement and gripping the web **3**. The operator then manipulates the clutch lever **24** to cause the conveyor to drive and the cigarettes are pushed through the radiation gauge **1** while at the same time the web **3** is being held by the clamp and the measurement of mass detected by the radiation gauge causes the pointer **29** of the recorder to mark the web more or less in the manner roughly indicated in the perspective view, FIGURE 1. The pointer is a stylus or pen of any suitable kind as used for marking record sheets and tapes. As mentioned above the pusher **14** is long enough to carry the whole of the cigarettes right through the radiation gauge and at the end of the conveyor movement the length of web marked by the pointer **29** corresponds to the total length of the line of abutting cigarettes. Thus it will be clear that the web bearing the record may be torn off from the following web and laid against the cigarettes in the same order in which they were passed through the device and in this way the variations in filling along the length of each separate cigarette may be readily seen from the sinuosity of the record. As will be readily understood this apparatus is for laboratory use in the general testing of the quality of cigarettes made in the particular factory.

The construction of the driving roller **12** and its associated parts are best seen in FIGURE 4. The roller **12** is mounted on a spindle **30** coupled to the motor shaft and is held between a disc **31** fixed to the spindle and a similar disc **32** which is slidable on the spindle. A clutch operating member **33** is constituted by a ballrace, the inner race of which can press on the disc **32**. As the clutch member **33** is moved to and fro along the shaft **30** it will press the face of the disc **32** against the flat face of the roller **12** or release the pressure, according to the position of the clutch operating member **33**. The member is moved to and fro by a pair of links **34** which are attached to the outer race of the ballrace constituting the clutch operating member. These links are pivoted to the clutch operating lever **24** which is pivotally mounted at **53** on a bracket **51** and is normally held in clutch-engaging positions by a spring **35**. When it is desired to break the clutch engagement the lever **24** is pulled to the left in FIGURE 4 and a slidable abutment **36** is pushed up to prevent the clutch handle from moving to the clutch engaging position.

The interior of the radiation gauge can be understood from FIGURE 5 where **37** is an ionization chamber, **38** is a radio-active source suitably housed in a block **39**, so as to radiate through a window **40** and through the

cigarette rod which would be at the position marked **41** so that the rays passing through the tobacco mass enter the chamber **37** and cause the stylus of the recorder to swing in a manner corresponding to the local mass of the cigarette. The length of the cigarette rod which is instantaneously exposed to the rays is 3 mm. In order to prevent air gaps and to control the cigarettes accurately there is an upper guide **42** of arcuate section which can be moved up or down to a limited extent to adjust it to the proper position for dealing with cigarettes of a specific diameter. The guide **42** is attached to a pair of rods, one of which is shown at **42A**, which are fixed at the ends of the plate **43** which extends some distance in either direction at right angles to the plane of the paper. At the middle of the plate there is a differential screw arrangement **44** which can be rotated by a handle **45** so that the movements of the guide **42** can be made with the utmost accuracy.

A further feature of the invention is a light clamping arrangement **46** which holds the web in position as shown in FIGURE 3 and enables an operator to tear off one web and yet have the following web in proper position to avoid any threading operation. The clamp consists of a pair of plates **47** and **48** which hold the web, the upper plate **47** being pivoted at **49** and being bent upwards so as to provide an operating lever **50**. Recorded web may be torn off along the edge of plate **47**. When the clamp **16** is moved to its extreme position at the right in FIGURE 3 the abutment **21** previously mentioned presses against the operating lever **50** and raises it so that the web is free of the clamping effect at **46**. The lever **19** of the clamp **16** can then be pressed to enable the clamp to engage a new part of the web for the next recording operation.

After a record has been made the operator stops the pusher movement by manipulating the clutch and he can then draw the clamp and pusher back to the initial position, and put a further batch of cigarettes in the grooved channel for another recording.

What I claim as my invention and desire to secure by Letters Patent is:

1. A device for recording variations in the filling of a cigarette along its length, comprising a radiation gauge adapted to gauge variations in the mass of the cigarette along its length, a recorder having a stylus adapted to record gauge readings on a record strip and electrically connected to be responsive to the output of the radiation gauge so that the stylus movements correspond to fluctuations of the gauge output and a conveyor for moving the rod through the gauge and simultaneously moving the record strip at the same speed through the recorder, a clamp movable with the conveyor and arranged to grip an end of the record strip so that the strip travels at the same speed as the cigarette, and a pusher attached to the clamp and positioned to propel the cigarette through the gauge.

2. A device as claimed in claim **1** comprising a grooved track arranged to support the piece of rod, an endless conveyor comprising a flexible element, a pusher attached to the conveyor and positioned to propel the rod along said grooved track and through the gauge, pulleys for supporting the endless conveyor and a driving pulley around which the flexible element is looped for driven engagement therewith and means for rotating the driving pulley and comprising a clutch with manually operated devices for engaging and disengaging said clutch.

3. A device as claimed in claim **1** comprising a stationary clamping arrangement through which the strip is passed before the strip end engages the movable clamp, said arrangement comprising a fixed plate and a pivoted clamping plate cooperating with the fixed plate to grip the web sufficiently to hold it in position and having an edge against which the strip may be torn, a lever on the pivoted plate and an abutment on the movable clamp arranged to move the lever to raise the pivoted plate

when the movable clamp is brought into position to grip the web.

References Cited by the Examiner

UNITED STATES PATENTS

1,783,093	11/30	Molins	346—25
2,938,521	5/60	Lanore	131—84
2,984,352	5/61	Gilman	131—21 X

FOREIGN PATENTS

110,673	11/61	Pakistan.

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