Sept. 8, 1970 R. MARRADI 3,527,347

CIGARETTE END INSPECTION DEVICE

Filed Feb. 13, 1968 3 Sheets-Sheet 1

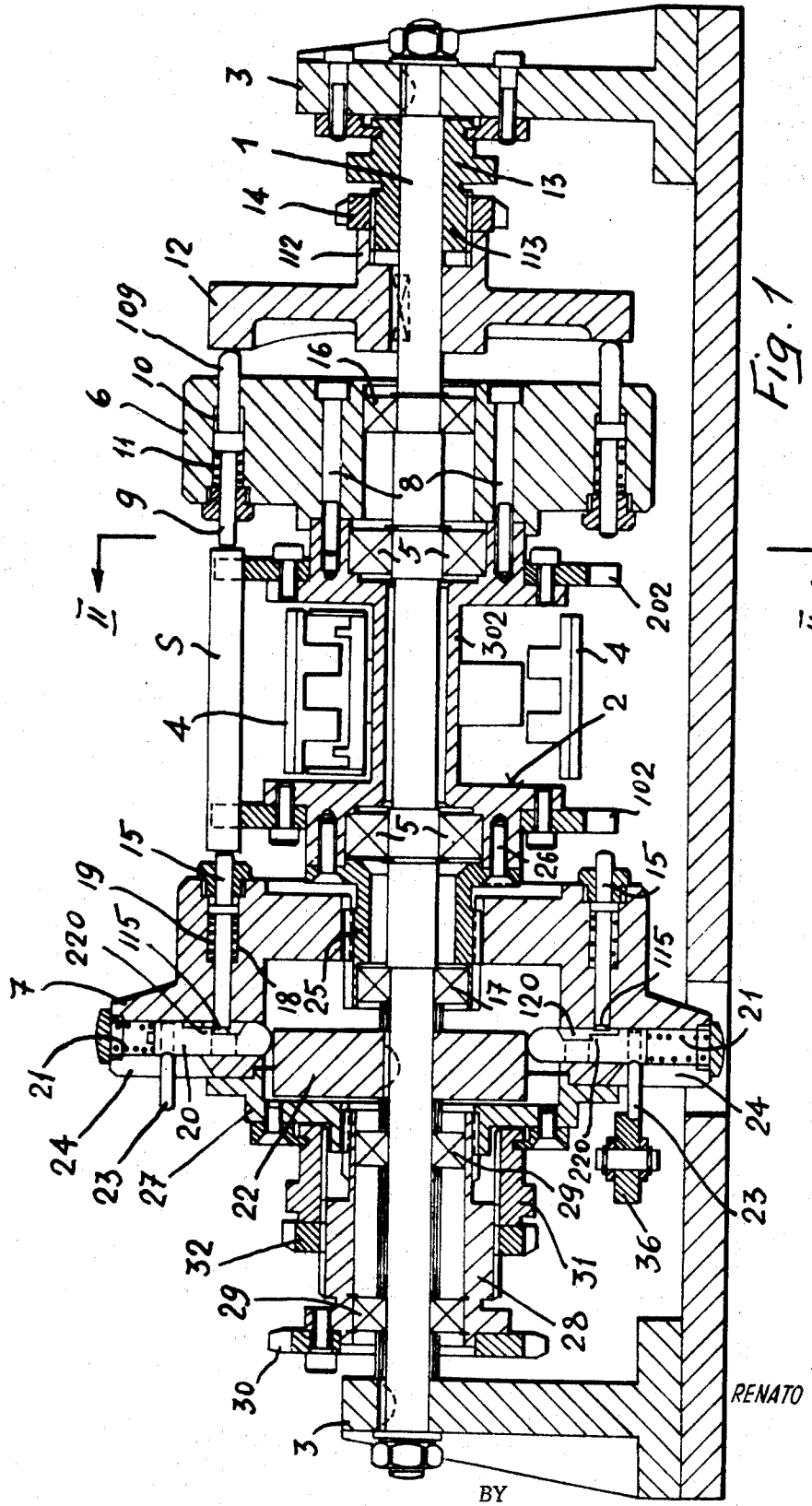


Fig. 1

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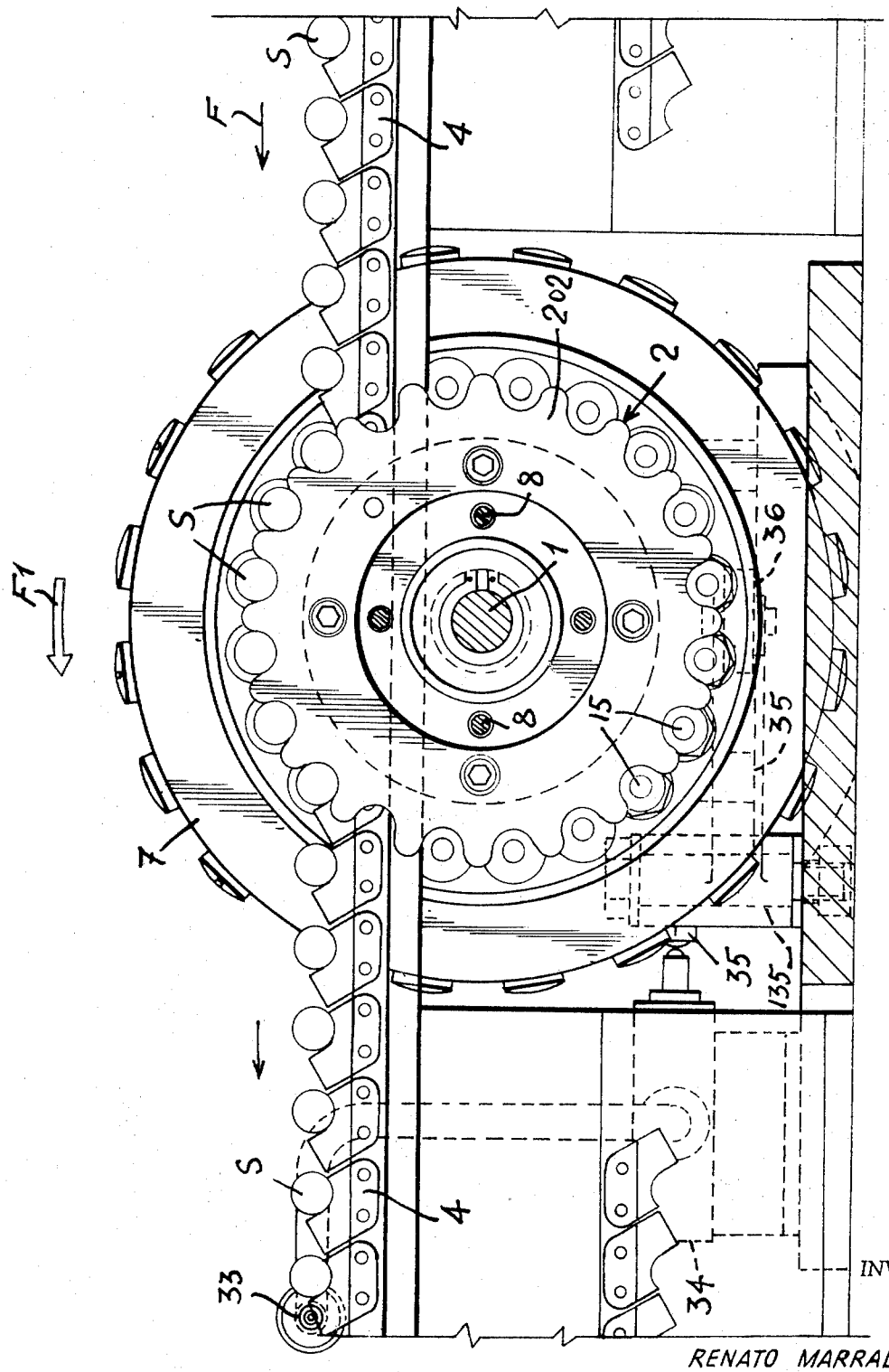


Fig. 2

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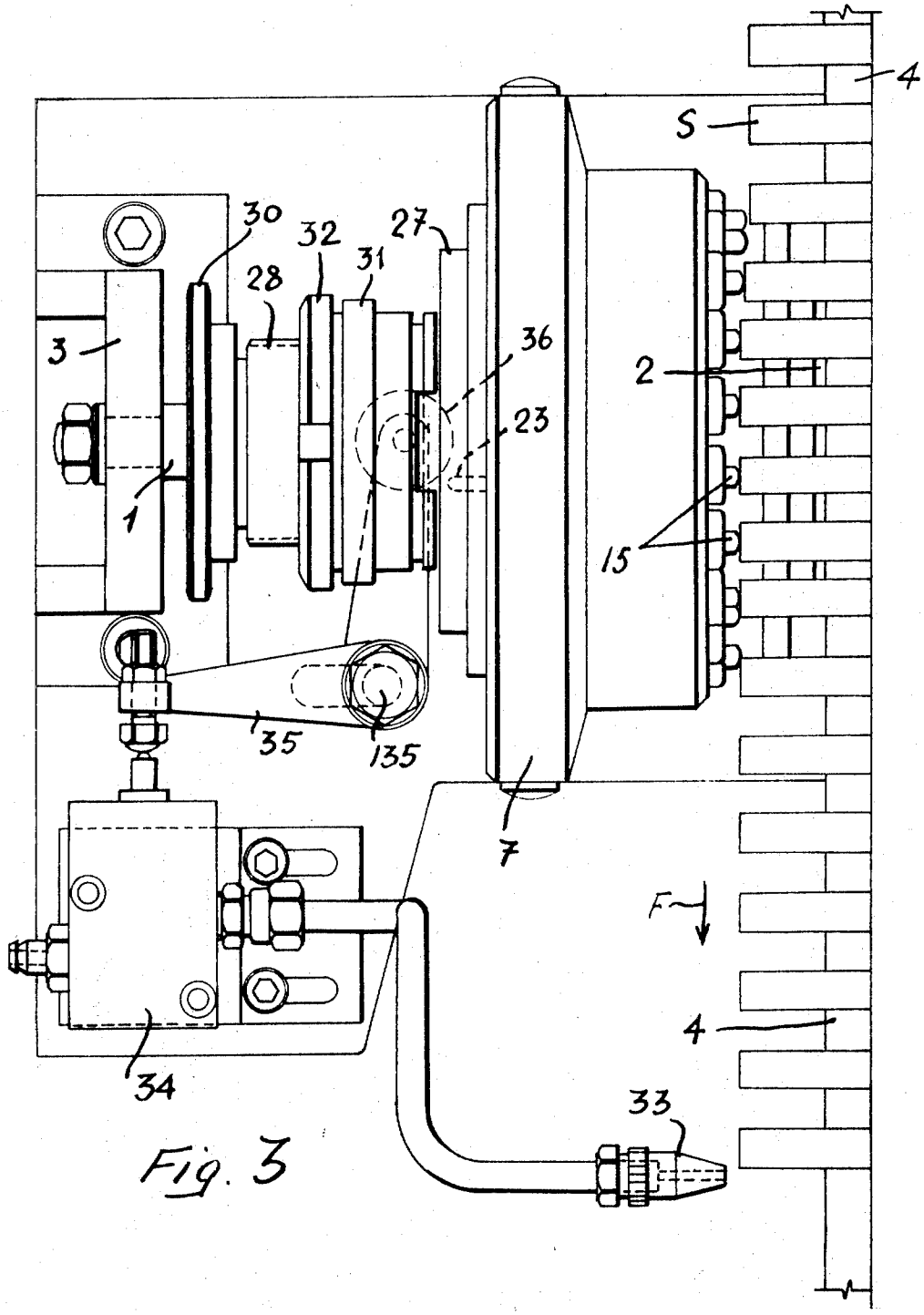


Fig. 3

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CIGARETTE END INSPECTION DEVICE

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Int. Cl. B07c 3/10
U.S. Cl. 209—79 10 Claims

ABSTRACT OF THE DISCLOSURE

An arrangement for automatically checking up the filling of cigarettes and for discarding incompletely filled cigarettes, said arrangement comprising a fluted endless conveyor for advancing the cigarettes to be checked in parallel relation, a conveyor drum provided with flutings peripherically revolving at the speed of the endless conveyor, picking up the cigarettes therefrom and carrying same along its upper section and a pair of drums provided with spring urged pins and counterpin revolving sidewise of said conveyor drum at the same speed and with said pins urged against the cigarette ends, means being provided for discarding the cigarettes which permit an excessive penetration into their ends of the said feeler pins and/or counterpins.

This invention relates to the checking of the filling of cigarette tips or ends and aims to provide a device provided with feeler pins which are pushed coaxially against or by the cigarette ends and penetrate more or less into the cigarette ends according to their filling degree. The resistance opposed by the cigarettes to the penetration of said feeler pins, respectively the extent of the penetration of said feeler pins into the cigarette ends, supplies an indication of the filling degree of the cigarette ends and may serve for actuating a device for rejecting defective cigarettes.

The invention aims to overcome the inconveniences of other types of controlling devices of the filling of the cigarettes and particularly the very short time available for this control in other known control devices.

According to the invention, in order to extend the check time and to effect the check as if the cigarettes and the feeler pins were relatively still with respect to one another for a relatively long time, the cigarettes are caused to travel in parallel relation on conveyor means arranged between feeler means traveling in unison therewith.

According to an embodiment of the invention, the cigarettes are conveyed in part on a path having the shape of an arc of a circle and forming part of the circumference of a conveyor drum. The cigarettes are arranged in parallel relation transversely along the arc of circle, while the corresponding conveyor drum rotates between two drums provided with crowns of transverse feeler pins which, for the part corresponding to the arc of circle along which the cigarettes are conveyed on said conveyor drum, are arranged coaxially of said cigarettes along the arc of circle and move in synchronism therewith, so that both cigarettes and pins on the arc of circle appear still with respect to each other to improve the exactness and to extend the time of the check of the filling of the cigarette ends, which is particularly important on high-speed cigarette machines.

In practice, according to a preferred embodiment of the invention, the advancing of the cigarette over the arc-shaped path in correspondence with the control device can be obtained by employing a fluted drum for conveying the cigarettes, coaxially arranged between two feeler pin drums and revolving synchronously, and preferably integrally, with the same. The cigarettes to be controlled are fed by a conventional conveyor to the conveyor drum, whereupon, after having traveled for a certain length onto the same, are discharged directly or indirectly onto an endless delivery conveyor constituted by chains made up of shaped links, driven along substantially rectilinear paths, and mounted upon revolving fluted driving drums.

According to a further characteristic feature of the invention, the cigarettes to be controlled can be fed towards the control device then shifted away therefrom by means of a single chain conveyor provided with shaped links, from which the cigarettes are collected by means of the conveyor drum interposed between the two feeler pin drums, and then laid down again onto the same chain, after having traveled for a certain arc of a circle onto the conveyor drum, and having passed through the control operations along said arc of circle. In this case, the conveyor drum can be constituted by two coaxial and spaced notched discs, fixedly mounted onto the same shaft or revolving means, and between which passes the chain provided with shaped links carrying the cigarettes whose ends project out on both sides of the said chain, in the path of both fluted discs forming the conveyor drum.

These and other characteristic features of the invention and the advantages deriving from it will be apparent from the following specification of a preferred embodiment, shown by way of non-limiting example in the accompanying drawings, wherein:

FIG. 1 shows vertical axial section through a pair of feeler-pin drums and the interposed cigarette-conveyor drum, forming the cigarette filling control device according to the invention;

FIG. 2 is a vertical section, taken on line II—II of FIG. 1, and

FIG. 3 shows in plan view the left-hand half of the device shown in FIG. 1.

Referring to the figures, **1** denotes a fixed horizontal shaft, supported at its ends by a pair of supporting member **3**. In an intermediate position of said shaft **1**, a fluted conveyor drum **2** is rotatably mounted on rolling bearings **5**. Said conveyor drum **2** comprises a sleeve **302** provided with end flanges, to which a pair of spaced discs **102, 202** are fastened and having, at their periphery, aligned notches adapted to constitute a pair of supporting cradles for rod-like objects, such as the cigarettes.

The cigarettes S, whose end filling are to be checked, are fed to the conveyor drum **2** by means of an endless chain conveyor having shaped links **4**, FIG. 2. The upper substantially horizontal run of said endless chain conveyor, passes over the shaft **1** between the two spaced drum discs **102** and **202** and is continuously driven in the direction of the arrow F, in the same direction of rotation F1 of the upper half of the conveyor drum **2**. The cigarettes S being checked are supported between their ends within the shaped links of the upper run of the chain **4**, while both their ends project beyond the chain sides **4**, in the path of the two notched drum discs **102** and **202**.

The conveyor drum **2** and the endless chain conveyor **4** are driven in timed relation so that, when the cigarettes S are adjacent to the ascending side of the conveyor drum **2**, they are picked up successively from the chain **4** by two aligned flutings of the two drum discs **102, 202** which engage the cigarettes near their ends and are then conveyed along a path in the shape of an arc of a circle, corresponding to the upper section of the conveyor drum **2**. When however the cigarettes S come to be on the descending drum side level with the right-hand extension of the upper run of the conveyor **4**, they are taken by

the corresponding link of said chain conveyor **4** and are moved towards the discharge end of the same conveyor.

On either side of the conveyor drum **2**, a cigarettte end filling-checking drum **6** and **7**—which shall be called feeler—pin drum and feeler—counterpin drum, respectively, are rotatably mounted on bearings **16**, **17** and coupled to the conveyor drum **2** so as to revolve therewith. One of these pin drums, for example drum **6** on the right-hand side in FIG. 1, is fastened as by screws **8** to the sleeve **302** of the conveyor drum **2** and presents a crown of feeler pins **9**, mounted parallel to the axis of the feeler pin drum **6** and co-axial with a pair of cigarette supporting notches **102**, **202** in the discs of the conveyor drum **2** and therefore also co-axially of the cigarettes S supported thereby. Each feeler pin **9** is provided in a position intermediate its ends with a collar axially slidable within one of a crown of cylindrical bores **10** of the drum **6** and projects with its rear end **109** through a bore of the bottom of said cylinder **10**, while its opposite end extends through a bore of a threaded plug towards drum **2**. A gauged pressure spring **11**, housed within the cylindrical bore of each feeler pin **9**, between the said pin collar and said threaded plug urges the respective pin **9** away from the conveyor drum **2** (that is, on the right-hand side in FIG. 1), almost withdrawing within drum **6** the front end of the feeler pin **9**, i.e. the end pointing towards the said conveyor drum, and causing the opposite end, or rear end, **109**, to bear against a front cam **12** keyed onto the shaft **1** and which can be axially adjusted onto shaft **1** by means of a sleeve **13** which is rotatably but not axially slidably mounted onto the axle **1** and has a threaded part **113** which is screwed into screw-tapped hub **112** of cam **12**. The latter is axially slidable but non-rotatably mounted onto shaft **1**, for example by means of a key, and is secured in the adjusted position by means of nut **14**.

The check-up drum **7**, arranged on the opposite side of the conveyor drum **2** presents a crown of feeler counterpins **15**, similar to the pins **9**, that is parallel to the axis of rotation of the pin drum **7** and therefore of shaft **1**, each being coaxially arranged with respect to a pair of notches of the conveyor drum **2** and therefore coaxially arranged with respect to a feeler pin **9** of the opposite feeler pin drum **6**. The feeler counterpins **15** are also provided with a collar, intermediate their ends, slidably guided within cylindrical bores or cylinders of the drum **7** and are urged by gauged springs **19**, inserted between the bottoms of the cylinders **18** and the pin collars towards the conveyor drum **2** (on the right-hand side in FIG. 1), by passing through a bore of a perforated screw plug closing the bore **18** and extending with their front ends out of the drum **7**. The opposite or rear end **115** of each feeler counterpin **15** extends through a bore of cylinder **18** out of drum **7** and co-acts with a radial piston or slide **20** slidably mounted within the shell of a bell-shaped part of pin drum **7**. Each of these pistons **20** is urged in radial direction towards the shaft **1** and bears, by means of its rounded inner end, against a cam **22** fitted onto the same shaft **1** within the recess of the bell-shaped part of drum **7**.

Each slide **20** presents, on its side turned towards the corresponding feeler counterpin **15**, a recess **120** having an outer tooth-shaped edge **220**. The rear end of each feeler counterpin **15** presents button-like inversed frusto-conical end **115**, adapted to be engaged and clutched by the tooth edge **220** of the corresponding slide **20**. Each slide **20** furthermore carries a pin **23** which is parallel to the axis of rotation of the drum **7** and projects out of the latter on the side opposite to the conveyor drum **2**, through a radial slit **24**.

Drum **7** is axially slidable, but non-rotatably mounted, onto a sleeve **25** which is fastened by means of screws **26** to the conveyor drum **2** and is rotatably mounted on shaft **1**, with the interposition of bearing **17**. On the opposite side, the bell-shaped part of the drum **7** is closed

by means of a disc **27** which is fastened to the same drum **7** and is slidably but non-rotatably mounted in axial directions onto a sleeve **28** which is rotatably mounted on shaft **1** by means of bearings **29** and is driven in any suitable manner, for example by means of a sprocket wheel **30** and chain (not shown). The conveyor drum **2** therefore is rotatingly coupled with both co-axial drums **6** and **7**, all these three drums **2**, **6** and **7** revolving together in the direction of arrow F1, being driven by sprocket wheel **30** through sleeve **28** and the disc **27**. Furthermore, drum **7** can be axially adjusted with respect to the conveyor drum **2**. To this purpose, with the control drum **7**, and in particular with the disc **27** which closes its bell-shaped part, it engages in a rotatable but not axially slidable manner, an adjusting sleeve **31** screwed onto threaded outer part of the sleeve **28**. By turning such an adjusting sleeve **31**, the control drum **7** is axially shifted, by sliding upon the sleeves **25** and **28** and can be secured in the adjusted position by means of a locking nut **32**.

In a determined position, downstream of the conveyor drum **2**, in correspondence of the endless conveyor chain **4** a blowing nozzle **33** is provided, which is transversally directed towards the endless conveyor chain **4** and is connected to a source of compressed air by means of a valve **34**, which is usually closed and may be opened by means of a lever **35** which is pivoted at **135** and carries a roller **36** co-acting with the pins **23** of the radial pistons **20** of drum **7**.

The operation of the afore-described device is as follows:

In correspondence of the lower section of the revolving conveyor drum **2**, the front ends of the feeler pins **9**, carried by drum **6** and pointing towards the conveyor drum **2**, are withdrawn at the utmost into the respective pin drum **6**, while the front ends of the corresponding feeler counterpins carried by drum **7** project at the utmost towards conveyor drum **2**, as shown in the lower part of FIG. 1.

In correspondence of the arc travelled by the cigarettes S on the top part of the conveyor drum **2**, each feeler pin **9** carried by drum **6** is pushed by the cam **12**, against the action of spring **11**, into contact with the facing end of a cigarette S, carried by a pair of notches of conveyor drum and pushes the said cigarettes into contact with the opposite feeler counterpin **15** of drum **7**, thus axially clamping same between pin **9** and counterpin **15**. If the filling degree of both ends of the cigarette **2** is sufficient, the rounded end of pin **9** and of the counterpin **15** penetrate only slightly into the said cigarette. Whereupon, the shifting of pin **9** towards the counterpin **15**, by means of cam **12**, being continued, the resistance of the spring **19** acting upon the counterpin **15** is overcome so that said counterpin is shifted towards slide **20**. This happens if the filling of both ends of the cigarette S is sufficiently firm. In the meantime, the slide **20** has been shifted outwardly, in radial direction, against the action of spring **21** to a position in which its lateral recess **120** comes to be shifted in front of the corresponding counterpin **15**, so that the button-shaped rear end **115** of said counterpin penetrates into the slide recess **120**. When, by continuing the rotation of cam **22**, slide **20** is again urged inwardly in radial direction by its spring **21**, but the said inward shifting is prevented by the counterpin **15** which has penetrated into the slide recess **120** and by the tooth edge **220** which is engaged by the button-like tooth **115** of the counterpin **15**, as shown in the upper part of FIG. 1.

All the above-described operations are performed in the upper section of the conveyor drum **2** carrying the cigarettes S. slightly ahead of the point in which the cigarettes are laid down from the conveyor drum **2** onto the conveyor chain **4**, the feeler pin **9** is withdrawn from the cigarette S by the spring **11**, while the counterpin **15** remains in its former position, due to its hooking by the slide **20**. Therefore, slide **20** is maintained by feeler

counterpin **115** is its radial outward position, as long as its pin **23** does not contact the roller **36** of the lever **35** which controls the valve **34** for feeding compressed air to nozzle **33**. In this position of slide **20**, its pin does not interfere with the roller **36** of the lever so that it passes beyond the said roller **36** without touching it and therefore without shifting the lever **35**. The valve **34** remains closed and no jet of air is blown from the nozzle **33**. The whole is so constructed, that the slide corresponding to a cigarette S, which is checked in the afore-mentioned manner on the conveyor drum **2**, passes in correspondence of roller **36** of the lever **35** at the moment that the said cigarette S is on the conveyor **4** in front of the blow nozzle **33**. When the shifting of lever **35** by means of the pin **23** of the piston is ceased, and therefore the opening of the valve **34** with the consequent air jet through the nozzle **33** is stopped, the next occurring cigarette, having a sufficient filling at its ends, will remain on the chain **4** and continues to travel thereon.

After having passed the roller **36** of the lever **35**, slide **20** is radially pushed outwardly by cam **22** against the action of the spring **21**, thus disengaging its tooth **220** from the button-like end **115** of the respective counterpin **15** and releasing the latter. The counterpin **15** is thereafter brought by the respective spring **19** again in its starting position, thus again projecting to the greatest extent out of drum **7**, towards the conveyor drum **2**, while the slide **20** is maintained in its position by cam **22**, in which position its lateral recess **120** is in line with the same counterpin **15**. Under these conditions, the pin **9** and counterpin **15**, as well as the corresponding slide **20** are again at the beginning of the upper section of the conveyor drum **2**, that is, at the beginning of the arc of circle travelled by the cigarettes S, ready to repeat the aforementioned cycle.

At any instant that the filling of one or of both ends of a cigarette S does not present the required consistency, which would oppose a resistance greater than the force of the spring **19**, the feeler pin **9** and/or the respective feeler counterpin **15** penetrate into the cigarette S at the moment that the pin **9** is being shifted by the cam **12**, and the counterpin **15** is not axially shifted. Therefore, when the cam **22** leaves the respective slide **20** free to move inwardly in radial direction under the action of the spring **21**, said slide is not retained and hooked by the counterpin **15**, as in the preceding case, but is pushed into its utmost inwardly withdrawn position, as shown in the lower part of FIG. 1. In this position of slide **20**, its abutment pin **23** interferes with the roller **36** of the lever **35**. Consequently, after having laid the defective cigarette down from the conveyor drum **2** onto the chain conveyor **4**, and at the moment in which this cigarette passes in front of the blow nozzle **33**, the pin **23** projecting sidewise of the slide **20** abuts against the roller **36** of the lever **35** to swing same so as to open for a short time the valve **34**, and cause a jet of air to be blown out of nozzle **33**, towards the defective cigarette which is blown axially out of the conveyor.

From the foregoing it is apparent that the checking of the filling of the cigarette ends is performed while the cigarettes are moved along a path having the form of an arc of a circle, corresponding to the upper section of a conveyor drum **2**, between a first point, in which the cigarettes are picked up from an endless conveyor and a second point in which the cigarettes are laid down onto the same or a second endless conveyor. Furthermore, the checking of the cigarette ends along this arc of circle is effected as if the cigarettes were on a still drum by mounting said conveyor drum **2** between two co-axial check-up drums running at the same speed as drum **2** and provided with feeler pins **9** and counterpins **15**, respectively. The checking of the cigarettes is therefore effected as if the said cigarettes S and the feeler pin drums **6**, **7** were all still even if, in practice, all co-axial drums revolve at a high speed.

The afore-specified control device can be adjusted for different lengths of cigarettes S, by axially shifting, on the right or on the left, the control drum **7** by means of the threaded sleeve **32**. It is also possible to adjust the extent of penetration of the feeler pins **9**, respectively of the counterpins **15**, into the cigarette ends, by axially shifting the cam **12**, on the right or on the left, by means of the threaded sleeves **13**, **113**.

Of course the invention is not restricted to the embodiment as afore-described and shown, but can be widely varied and modified, above all in construction, particularly as regards the construction of the control drums and of the conveyor drum, and the means for rejecting the defective cigarettes, as well as the means for feeding the cigarettes to be checked to the conveyor drum and for discharging and leading the cigarettes away from the latter. Thus for example, instead of a single endless conveyor **4**, two successive conveyors may be provided, one at the ascending section of the conveyor drum **2** for feeding the cigarettes to said drum **2** and the other at the descending drum section, for discharging the checked cigarettes. Furthermore the cigarettes can be fed to the conveyor drum **2** by means of a revolving conveyor provided with troughs and thereafter laid by the conveyor drum onto a subsequent revolving discharging drum, which can also effect the discharging of defective cigarettes.

What I claim is:

1. A device for automatically determining the amount of filling in the ends of cigarettes comprising an endless conveyor provided with transversal flutings to hold and convey said cigarettes in a parallel row, the width of the conveyor being less than the length of the cigarettes to enable both ends of each cigarette to project out of said conveyor; a conveyor drum provided with a pair of spaced notched discs, a disc being mounted on each side of said conveyor in the path of the projecting ends of said cigarettes carried by said conveyor; a pair of drums each provided with a crown of feeler pins slidable parallel to the drum axis, a drum being arranged at each side of said conveyor drum, means for rotating said conveyor drum and pair of drums in synchronism whereby said feeler pins are urged axially towards the ends of the cigarettes carried by the intermediately arranged conveyor drum, so as to travel in unison therewith, and means operated by said feeler pins for discarding a cigarette whenever one of said pins penetrates into the end of said cigarette in excess of a predetermined amount, thus detecting an incomplete filling.

2. The combination of claim **1** wherein the transversally fluted endless conveyor travels beyond said conveyor drum by passing between said notched discs and takes up from said discs the cigarettes supported thereby and having traveled along an upper path in form of an arc of circle, said cigarettes are laid down, from said conveyor drum onto said endless conveyor at a point beyond said conveyor drum, and wherein said means for discarding the cigarettes having incompletely filled ends comprises a nozzle for blowing air against the incompletely filled cigarette, positioned beyond said feeler pin drums, and valve means coupled to said feeler pins to feed compressed air through said nozzle each time an incompletely filled cigarette is detected.

3. The combination of claim **2** wherein the discarding means for the rejection of defective cigarettes comprises a nozzle transversally oriented relative to the path travelled by the cigarettes and which can be coupled to a source of compressed air by means of a valve normally closed and which is selectively opened by a rocking lever adapted to be engaged and shifted by an abutment member of the slide.

4. The combination of claim **1** wherein said feeler pins are axially pushed, by a fixed cam and against the action of springs, towards the conveyor drum along the arc of a circle run by the cigarettes on said drum.

5. The combination of claim **4** wherein the cam cou-

pled to the feeler pins of the pin drum is axially adjustable to vary the extent of penetration into the cigarette ends, and/or the opposite control drum carrying the feeler counterpins is axially adjustable to adjust to various lengths of the cigarettes to be checked.

6. The combination of claim 4 wherein the pair of drums mounted co-axially of the conveyor drum and rotatably-coupled thereto on opposite sides presents a crown of opposed feeler-pins and counterpins aligned parallel to the axis of rotation of said conveyor drum and co-axial to the flutings of the same, said counterpins coupled to be more or less axially displaced against the action of gauged springs through the action of corresponding feeler pins through an interposed cigarette, depending upon the penetration of the feeler pin and/or the feeler counterpins into the ends of the cigarette.

7. The combination of claim 6 comprising a slide coupled to each feeler counterpin mounted on the counterpin drum and controlled by cams and springs and also controlled by the counterpin to be brought to an active position to actuate the cigarette discarding means to expel a defective cigarette.

8. The combination of claim 4 comprising control means activated by said feeler counterpin and coupled to the endless conveyor past said conveyor drum to reject defective cigarettes.

9. The combination of claim 8 wherein a slide is slidably mounted to each feeler counterpin in the control drum and provided with an outer abutment which coacts with a discarding means and arranged in a fixed position outwardly of the control drum to actuate the discarding means for the rejection of cigarettes, said slide coupled selectively to a fixed cam and a spring to assume alternately an active position in which its abutment engages and actuates the discarding means for cigarette rejection, and an inactive position, in which the abutment does not engage and therefore does not actuate the discarding means for cigarette rejection.

10. The combination of claim 9 wherein each feeler counterpin is coupled to a small piston and a holding and hooking means which, any time the counterpin detects a cigarette having a conventional filling at its ends, the counterpin withholds the slide in its inactive position and is hooked by the same to prevent the counterpin from shifting, and in the instance where a cigarette is defective, the slide is free to move into its active position.

References Cited

UNITED STATES PATENTS

1,977,239	10/1934	Molins	209—79
2,246,107	6/1941	Ruau	209—79
2,284,117	5/1942	Best	209—79 X
3,237,764	3/1966	Kochalski	73—81 X

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