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54 **Optical device for checking the cigarette tips.**

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GB-A- 2 141 229
GB-A- 2 176 598
US-A- 3 812 349
US-A- 4 165 939

73 Proprietor: **SASIB S.p.A.**
Via di Corticella, 87/89
I-40128 Bologna (IT)

72 Inventor: **Senesi, Riccardo**
Via Goldoni 2
I-40013 Castel Maggiore (Bologna) (IT)

74 Representative: **Porsia, Bruno et al**
c/o Succ. Ing. Fischetti & Weber
Via Caffaro 3/2
I-16124 Genova (IT)

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Description

The invention relates to an optical device for checking the cigarette tips as described in the preamble of the claim 1.

A device of this kind is disclosed in GB A 2 141 229. Said known device comprises conveyor means causing the cigarettes to pass after each other transversely to their longitudinal axes in front of a stationary measurement head for the fill-up degree of cigarette tips. The measurement head is provided with means to generate a scanning beam directed against the frontal surface of the tip of cigarettes and with a sensor for detecting the scanning beam reflected by the frontal surface of the tip. The sensor is sensitive to the intensity of the reflected scanning beam and is connected to a processing device capable of converting the measurement values of said sensor into "fill-up degree values" of the cigarette tip. The scanning beam and the reflected one travel freely through air respectively from the scanning beam generating means to the frontal surface of the cigarette tip and from said frontal surface to the sensor. A discarding device for the defective cigarettes is also provided, being under control of said processing device. The scanning beam can constitute a solid cylinder having a cross-sectional area which exceeds the cross sectional area of the cigarette and which is oriented axially against one end face of the cigarette, so that the latter intercepts the central portion of the solid cylinder and permits a hollow cylindrical portion of radiation to propagate itself along the exterior of the cigarette. The solid cylindrical beam may be splitted into several smaller beams. The hollow cylindrical portion of the beam is used for monitoring the exterior defects along the longitudinal extension of the cigarettes. The intercepted core or central region of the scanning beam is used for monitoring the cigarette tip, particularly the presence or absence of a filter. A sole sensor detects at one time the radiation of the core of the cylindrical beam or of the corresponding smaller beam reflected from the frontal surface of the cigarette tip.

A device according to the preamble of claim 1 is also known from the document US-A-381 2349, in which the tips of the cigarettes are examined with a laser scanning beam which is concentrated on a point of the frontal surface of the cigarette tip with a very small area relatively to said frontal surface.

Another device of this kind is known from the GB A 2 176 598. According to this patent application, the cigarettes whose ends are to be tested relatively to their degree of fill-up with tobacco are transported by a peripherally fluted drum-shaped conveyor sideways past a narrow slit-shaped ap-

erture of a stationary diaphragm. The radiation of a light source is conveyed to the slit-shaped aperture by a first bundle of fiber optics. A second bundle of fiber optics conveys the radiation reflected by the frontal surface of the cigarette end from said slit-shaped aperture to a transducer which transmits signals to an evaluating circuit. The slit-shaped aperture is surrounded by a surface which contacts the ends of the cigarettes during testing of the respective ends to ensure that such cigarette ends are located at an optimum distance from the ends of the first and second bundles in the aperture. The ends of the first and second bundles at the slit-shaped aperture are uniformly distributed so as to ensure that the radiation is directed against each portion of an end of cigarette advancing past the testing station and that reflected radiation is indicative of the characteristics of all portions of the tested end face of the cigarette advancing past the diaphragm. In processing the signals of the transducer, the evaluating circuit integrates all this signals and the integrated signals are representative of the average conditions of the entire cross section of each tested cigarette end.

The object of the invention is to provide an optical device for checking the cigarette tips, of the type described in the preamble of claim 1 which has a simple, inexpensive and extremely efficient construction and provides quite reliable measurement values for discriminating the defective cigarettes from the normal ones avoiding the evaluation errors caused by the additional dependence of the measurement values from the distance of the cigarettes from the measurement head as well as from variations in the color of tobacco, this all without providing further measurements or position controlling elements especially the ones which are at direct contact with the cigarettes.

The invention achieves the aforementioned object by means of an optical checking device of the type described in the preamble of claim 1 which shows the combination of features of the characterizing part of claim 1.

According to the invention, the measurement values on the cigarette tips are mere distance-values of single points of the checked frontal surface of the cigarette tips along the path of travel of the scanning beam, the intensity of the reflected scanning beam depending upon the distance between the point of incidence of the scanning beam on said surface and the measurement head. By referring the measurement values along the tip of a cigarette to one of said measurement values, preferably the maximum measurement value, i.e. by subtracting the other measurement values from the maximum one, the evaluating errors in detecting the defective cigarettes connected both to color-

shade variations of tobacco and to the different distances of cigarettes from the measurement head can be avoided, permitting a comparison with a discriminating threshold-value which is correct at all times.

The invention relates, additionally, to further characteristics which improve further said optical device for checking the cigarette tips, and which are the subject of the other sub-claims.

The particular characteristics of the invention and the advantages resulting therefrom will appear with more details from the following description of a preferred embodiment thereof, shown by way of a non-limiting example in the accompanying drawings, wherein:

Figure 1 shows diagrammatically an optical checking device according to the invention;

Figures 2 and 3 are graphic depictions of the result of a measurement concerning defective cigarettes;

Figure 4 is a graphic depiction, similar to Figures 2 and 3, of the result of a measurement concerning a normal cigarette.

The device of Figure 1 comprises a measurement head indicated generally at 1, in front of which are passed the cigarettes 2 being transported transversely to their longitudinal axes by an associated conveyor device (not shown). The conveyor device may be of any type and, particularly, it may be constituted by the drum of a device for the application of a filter-tip to the cigarettes.

The measurement head comprises a casing 3 which accommodates a source 4 which generates a scanning beam 5, and a sensor 6 for detecting the reflected scanning beam 5'. The source 4 which generates the scanning beam 5 is oriented so that said beam 5 is aligned substantially parallelly to the longitudinal axis of a cigarette 2 and impinges against the face of the tip of the cigarette 2, that is directed towards the head, while said beam is focussed at the face of the tip of the cigarette 2 by means of a focussing lens 7. The source 4 of the scanning beam may be any suitable source for generating a concentrated light beam, for example, a laser beam or a simple beam of light. In the illustrated exemplary embodiment, the invention uses a source generating a laser beam whose frequency is comprised in the infrared spectrum. The sensor 6 is constituted by any type of photo-electric sensor suitable for the type of source being used and is so oriented as to detect a reflected scanning beam 5' which is at an angle to the incident scanning beam 5, said reflected beam being focussed on the surface of the detecting sensor 6 by means of a lens 8.

The analog electric signal generated by the detecting sensor 6 is fed to an electronic processing circuit indicated generally at 9.

The processing device 9 is formed by a micro-processor 10. The detecting sensor 6 is connected to an inlet 110 of the micro-processor 10 through an operational amplifier 11 and a successive analog/digital converter 12, while an additional inlet 210 of the micro-processor 10 has connected thereto a device for entering the gate-value 13, for example a device which is known as digit-switch. The microprocessor 10 and the analog/digital converter 12 have connected thereto a device for synchronizing the inflow of the measured signals, indicated generally at 14. This device comprises a tachometer generator 15 which is connected to the inlet of a voltage/frequency converter 16 through an operational amplifier 17. Moreover, the microprocessor 10 has connected to the outlet thereof a rejection circuit 18 which controls a solenoid valve 19 of the device for discarding the defective cigarettes (not shown in detail).

When a cigarette 2 is passed in front of the measurement head 1, the scanning beam 5 impinges against the face of a cigarette tip and the reflected scanning beam 5' is detected by the sensor 6 wherein it generates an electric analog signal. This analog signal is transmitted through the operational amplifier 11 to the analog/digital converter 12 to be transmitted as a digital signal to the microprocessor 10. In order to obtain at all times, during the passage of a cigarette tip in front of measurement head, the same number of measurement points distributed along the path of travel of the scanning beam on the front surface of the cigarette tip, the conversion of the analog signal into a digital signal through the analog/digital converter 12 is controlled by the inflow-synchronizing device 14 for the measured values. The conversion of the analog signal is effected only when the voltage/frequency converter 16 emits an activating signal to the analog/digital converter. Thanks to the tachometer generator 15 which controls the voltage/frequency converter, the conversion frequency of the analog to digital signals, effected by the converter 12, and therefore the flow of measurement signals to the microprocessor 10, are rendered linearly dependent on the cigarette production rate and, therefore, on their speed of travel in front of the measurement head 1. Thus, the number of measurement points, i.e. the number of measurement values along the travel of the scanning beam 5 over the front face of a cigarette tip, are rendered constant and independent of the cigarette production rate. The device 14 for synchronizing the flow of measurement values, should be regulated, advantageously, so as to obtain, preferably, 60 to 80 and particularly 70, analogic/digital conversions (i.e. measurement points) each cigarette.

The microprocessor 10 will store in a programmable memory, for example, a R.A.M. (random access memory) or the like, the measurement signals which have been converted into digital signals. Thereafter, these stored signals will be processed, determining the maximum measurement value and subtracting from this maximum measurement value the values of the individual measurements. Thus, the measurement signals of the intensity of the reflected beam 5', each constituting a measurement signal of the distance of a different point on the face of the cigarette tip from the source which generates the scanning beam 5, are converted into signals each of which indicates the degree of filling up of a cigarette with respect to the edge of the cigarette tip that is directed towards the measurement head, at the point of the tip's face of the cigarette filling up that is associated with said signal and with respect to a point of the cigarette tip's face having a maximum fill-up degree. Moreover, the measurement signals thus obtained are independent of the distance of each cigarette from the measurement head, so that the measurement values thus obtained for each cigarette may be compared by the microprocessor 10, with no possibility of errors, with the entered gate-value. If a series of measurement values concerning one cigarette exhibit more than four values which exceed the gate-value, the microprocessor will consider this cigarette as defective and emits a signal to activate the solenoid valve 19 of the discarding device, where- by said cigarette will be rejected.

It is apparent that the measurement values obtained by means of said device, not only may be rendered independent of the distance of the cigarettes from the measurement head, but they are also independent of changes in the color-shades of tobacco, by virtue of the fact that the measurement is not referred to the brightness of said signal, but it is a distance measurement proper which can be carried out very rapidly, reducing the possibility of errors to negligible levels.

Figures 2 to 4 show graphical depictions of measurements concerning the filling up of the tips of three different cigarettes. The ordinate A of each diagram indicates the value of the measurement signal, while the abscissa B indicates the sequential number of the respective measurement along the path of travel of the scanning beam impinging the front face of the cigarette tip. The depicted curve, therefore, shows graphically the degree of fill-up at the various scanned spots. It is apparent that the cigarette concerned in the measurements of Figures 2 and 3 are cigarettes with defective fill-up, shown by the valleys in the respective diagram at the regions indicated generally by the arrow R1 and by the arrows R2 and R2', whilst the cigarette concerned in the measurement of Figure 4 is a

normally filled up cigarette. This is clearly shown by the substantially linear and uniform outline, parallel to the abscissa, of the diagram along the cross section of the cigarette, said outline representing a series of measurement values which are substantially identical to each other.

Of course, the invention is not limited to the embodiments described and shown herein, but many changes and modifications, especially of constructional nature may be made thereto. Thus, for example, the source 4 of the scanning beam could generate a beam of micro-waves or ultrasonic waves to be focussed at the cigarette tip's face, in combination with a corresponding sensor to detect the reflected beam. The above without departing from the basic principle set forth above and claimed hereinafter.

Claims

1. A device for checking the cigarette tips comprising:
 - a) a stationary measurement head (1) of the fill-up degree of cigarette tips;
 - b) conveyor means causing the cigarettes (2) to pass after each other transversely to their longitudinal axes in front of the measurement head (1), with the cigarette tips to be checked facing said head (1);
 - c) said measurement head (1) being provided with means (4) to generate a scanning beam (5) directed against the frontal surface of the tip of the cigarettes (2) and with a sensor (6) for detecting the scanning beam (5') reflected by the frontal surface of the tip, said sensor (6) being sensitive to the intensity of the reflected scanning beam (5');
 - d) a processing device (9) connected to the output of the sensor (6) and capable of converting the measurement values of the sensor (6) into fill-up level values of the cigarette tip;
 - e) a discarding device (18, 19) for the defective cigarettes under control of said processing device (9);
 - f) the scanning beam (5) and the reflected scanning beam (5') travelling freely through air respectively from the scanning beam generating means (4) to the frontal surface of the cigarette tip and from said frontal surface of the cigarette tip to the sensor (6), **characterized by:**
 - g) means being provided for concentrating the scanning beam (5) on a point of the frontal surface of the cigarette tip with a very small area relatively to said frontal surface, in such a way that each measure-

- ment value of the sensor (6) relates to the level of fill-up with tobacco at a discrete point,
 h) means being provided to carry out said measurements at a succession of points along the path of travel of the scanning beam (5) on the frontal surface of the cigarette tip.
2. A device according to claim 1, characterized in that the output of the sensor (6) being connected to the processing device (9) through an inflow-rate control device (12) of the measurement signals of the sensor (6), for alternatively interrupting and enabling the transmission of the measurement signals from the sensor (6) to the processing device (9) upon control of an inflow synchronizing device (14) of the inflow-rate of the measurement signals with the production rate of the cigarettes (2), i.e. with their speed of travel in front of the measurement head (1).
3. A device according to claim 2, characterized in that the inflow synchronizing device (14) comprises a tachometer generator (15) connected through an operational amplifier (17) with a voltage/frequency converter (16) who drives the inflow-rate control device (12).
4. A device according to claim 2 or 3, characterized in that the inflow-rate control device (12) is an analog/digital converter, whose conversion control input is connected with the output of the inflow-synchronizing device (14), while its analog signal input is connected to the sensor (6) and its digital output as well as the output of the inflow synchronizing device (14), are connected to the inputs of an electronic processor (10) of the processing device (9).
5. A device according to one or more of the preceding claims, characterized in that the measurement head (1) comprises;
- a light source (4), preferably a laser beam source, particularly with frequency in the infrared spectrum, being oriented in such a way that the scanning beam (5) is parallel to the longitudinal axes of the cigarettes (2);
 - a convex focussing lens (7) arranged between the light source (4) and the cigarette tip and perpendicular to the longitudinal axes of the cigarettes (2);
 - a sensor (6) of photo-electric type, oriented in such a way to be perpendicular to a scanning beam (5') reflected at an angle to the longitudinal axis of the cigarette (2);
 - a convex focussing lens (8) of the reflected scanning beam (5') on the sensor (6) which is perpendicular to said reflected scanning beam (5').
6. A device according to one or more of the preceding claims, characterized in that a device (13) for the entry of a threshold-value is connected to the processing device (9), the processing device (9) comparing the difference between each measurement value of a succession of measurement values on a cigarette tip and the corresponding maximum measurement value of said succession with the threshold-value and emitting an activating signal of the discarding device (18, 19) when said difference exceeds the threshold-value for at least four measurement values of said succession.
7. A device according to one or more of the preceding claims, characterized in that each succession of measurement values on one cigarette tip comprises about 60 to 80, particularly 70, successive measurement values along the path of travel of the scanning beam (5) on the cigarette tip.
8. A device according to claim 1, characterized in that the scanning beam (5) generating means (4) comprises a microwave source or an ultrasonic wave source.

Patentansprüche

1. Vorrichtung zum Überprüfen von Zigarettenspitzen mit:
- a) einem stationären Messkopf (1) für den Auffüllungsgrad der Zigarettenspitzen,
 - b) einer Transporteinrichtung welche bewirkt, daß die Zigarettenspitzen nacheinander quer zu ihrer Längsachse vor dem Messkopf (1) vorbeilaufen, wobei die zu überprüfenden Zigarettenspitzen dem Kopf (1) zugewandt sind, wobei
 - c) der Messkopf (1) mit Einrichtungen (4) versehen ist, um einen Abtaststrahl (5) zu erzeugen, der auf die Stirnfläche der Spitze der Zigarettenspitzen (2) gerichtet ist, sowie mit einem Sensor (6) versehen ist, um den Abtaststrahl (5'), der von der Stirnfläche der Spitze reflektiert wird, zu erfassen, wobei der Sensor (6) auf die Intensität des reflektierten Abtaststrahles (5') empfindlich reagiert,
 - d) einer Verarbeitungseinheit (9), die mit dem Ausgang des Sensors (6) verbunden und in der Lage ist, die Messwerte des

- Sensors (6) in Füllniveauwerte der Zigarettenspitze umzusetzen,
- e) mit einer Aussondereinrichtung (18, 19) für die entsprechend der Kontrolle der Verarbeitungseinrichtung (9) fehlerhaften Zigaretten, wobei
- f) der Abtaststrahl (5) und der reflektierte Abtaststrahl (5') jeweils von der den Abtaststrahl erzeugenden Einrichtung (4) zu der Stirnfläche der Zigarettenspitzen bzw. von der Stirnfläche der Zigarettenspitze zu dem Sensor (6) frei durch Luft hindurchlaufen, **gekennzeichnet durch:**
- g) Einrichtungen, die vorgesehen sind für die Konzentration des Abtaststrahls (5) auf einen Punkt der Stirnfläche der Zigarettenspitze mit einer im Vergleich zu der Stirnfläche sehr kleinen Fläche, derart, daß jeder Messwert des Sensors (6) sich auf das Füllniveau mit Tabak an einem separaten Punkt zieht,
- h) und Einrichtungen, die vorgesehen sind, um die Messung an einer Folge von Punkten entlang des Durchlaufweges des Abtaststrahls (5) auf der Stirnfläche der Zigarettenspitze durchzuführen.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** der Ausgang des Sensors (6) mit der Verarbeitungseinrichtung (9) über eine Steuereinrichtung (12) der Einströmrates der Messsignale des Sensors (6) verbunden ist, um abwechselnd den Durchtritt der Messsignale von dem Sensor (6) zu der Verarbeitungseinrichtung (9) unter der Steuerung einer Einströmungssynchronisierungseinrichtung (14) für die Einströmrates der Messsignale mit der Produktionsrate der Zigaretten (2) zu unterbrechen und freizugeben, das heißt mit der Durchlaufgeschwindigkeit der Zigarette vor dem Messkopf (1).
3. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, daß** die Einströmungssynchronisierungseinrichtung (14) einen Tachogenerator (15) aufweist, der über einen Operationsverstärker (17) mit einem Spannungs/Frequenzwandler (16) verbunden ist, welcher die Steuereinrichtung (12) für die Einströmrates treibt.
4. Vorrichtung nach Anspruch 2 oder 3, **dadurch gekennzeichnet, daß** die Steuerungseinrichtung (12) für die Einströmungsrates ein Analog/Digitalwandler ist, dessen Steuereingabe für die Wandlung mit dem Ausgang der Synchronisierungseinrichtung (14) für das Einströmen verbunden ist, während sein Analogsignalein-
- gang mit dem Sensor (6) verbunden und sein digitaler Ausgang ebenfalls wie der Ausgang der Einströmsynchronisierungseinrichtung (14) mit den Eingängen eines elektronischen Prozessors (10) der Verarbeitungseinheit (9) verbunden ist.
5. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, daß** der Messkopf (1) aufweist:
- eine Lichtquelle (4), vorzugsweise eine Laserstrahlquelle, insbesondere mit einer Frequenz im Infrarotspektrum und so ausgerichtet, daß der Abtaststrahl (5) parallel zu der Längsachse der Zigaretten (2) verläuft,
 - eine konvexe Fokussierlinse (7), welche zwischen der Lichtquelle (4) und der Zigarettenspitze und senkrecht zu der Längsachse der Zigaretten (2) angeordnet ist,
 - einen Sensor (6) vom fotoelektrischen Typ, der derart angeordnet ist, daß er senkrecht zu einem Abtaststrahl (5') liegt, welcher unter einem Winkel zur Längsachse der Zigarette (2) reflektiert wird,
 - eine konvexe Fokussierlinse (8) für den auf den Sensor (6) reflektierten Abtaststrahl (5'), welche senkrecht zu dem reflektierten Abtaststrahl (5') liegt.
6. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, daß** eine Einrichtung (13) für die Eingabe eines Grenzwertes mit der Verarbeitungseinrichtung (9) verbunden ist, wobei die Verarbeitungseinrichtung (9) den Unterschied zwischen jedem Messwert einer Folge von Messwerten auf einer Zigarettenspitze und dem entsprechenden Maximalmesswert der Folge mit dem Grenzwert vergleicht und ein Aktivierungssignal für die Aussondereinrichtung (18, 19) ausgibt, wenn diese Differenz den Grenzwert für zumindest zwei Messwerte der Folge überschreitet.
7. Vorrichtung nach einem oder mehreren der vorstehenden Ansprüche, **dadurch gekennzeichnet, daß** jede Folge von Messwerten an einer Zigarettenspitze etwa 60 bis 80, insbesondere 70 aufeinanderfolgende Messwerte entlang des Durchlaufweges des Abtaststrahles (5) auf der Zigarettenspitze aufweist.
8. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** die Erzeugungseinrichtung (4) für den Abtaststrahl (5) eine Mikrowellenquelle oder eine Ultraschallquelle aufweist.

Revendications

1. Un dispositif pour contrôler les bouts de cigarettes comprenant :
 - a) une tête de mesure fixe (1) destinée à mesurer le degré de remplissage de bouts de cigarettes ;
 - b) des moyens convoyeurs qui font passer les cigarettes (2) les unes après les autres devant la tête de mesure (1), transversalement à leurs axes longitudinaux, avec les bouts de cigarettes à contrôler faisant face à la tête (1);
 - c) la tête de mesure (1) étant munie de moyens (4) destinés à produire un faisceau de balayage (5) dirigé contre la surface frontale du bout des cigarettes (2), et d'un capteur (6) pour détecter le faisceau de balayage (5') qui est réfléchi par la surface frontale du bout, ce capteur (6) étant sensible à l'intensité du faisceau de balayage réfléchi (5');
 - d) un dispositif de traitement (9) connecté à la sortie du capteur (6) et capable de convertir les valeurs de mesure du capteur (6) en valeurs de niveau de remplissage du bout de cigarette ;
 - e) un dispositif de rejet (18, 19) pour les cigarettes défectueuses, sous la commande du dispositif de traitement (9) ;
 - f) le faisceau de balayage (5) et le faisceau de balayage réfléchi (5') se propageant librement dans l'air respectivement depuis les moyens de génération de faisceau de balayage (4) jusqu'à la surface frontale du bout de cigarette, et depuis la surface frontale du bout de cigarette jusqu'au capteur (6), caractérisé par
 - g) le fait que des moyens sont incorporés pour concentrer le faisceau de balayage (5) sur un point de la surface frontale du bout de cigarette, avec une aire très petite par rapport à celle de la surface frontale, d'une manière telle que chaque valeur de mesure du capteur (6) concerne le niveau de remplissage avec du tabac à un point discret, et
 - h) le fait que des moyens sont incorporés pour accomplir la mesure précitée à une succession de points le long du chemin de déplacement du faisceau de balayage (5) sur la surface frontale du bout de cigarette.
2. Un dispositif selon la revendication 1, caractérisé en ce que la sortie du capteur (6) est connectée au dispositif de traitement (9) par l'intermédiaire d'un dispositif de commande de cadence d'entrée (12) des signaux de mesure du capteur (6), qui est destiné à interrompre et à permettre alternativement la transmission des signaux de mesure du capteur (6) vers le dispositif de traitement (9), sous la commande d'un dispositif de synchronisation d'entrée (14) qui est destiné à synchroniser la cadence d'entrée des signaux de mesure avec la cadence de fabrication des cigarettes (2), c'est-à-dire avec leur vitesse de déplacement devant la tête de mesure (1).
3. Un dispositif selon la revendication 2, caractérisé en ce que le dispositif de synchronisation d'entrée (14) comprend une génératrice tachymétrique (15) connectée par l'intermédiaire d'un amplificateur opérationnel (17) à un convertisseur tension/fréquence (16) qui attaque le dispositif de commande de cadence d'entrée (12).
4. Un dispositif selon la revendication 2 ou 3, caractérisé en ce que le dispositif de commande de cadence d'entrée (12) est un convertisseur analogique/numérique dont l'entrée de commande de conversion est connectée à la sortie du dispositif de synchronisation d'entrée (14), tandis que son entrée de signal analogique est connectée au capteur (6) et sa sortie numérique, ainsi que la sortie du dispositif de synchronisation d'entrée (14), sont connectées aux entrées d'un processeur électronique (10) du dispositif de traitement (9).
5. Un dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que la tête de mesure (1) comprend :
 - une source de lumière (4), de préférence une source de faisceau laser, en particulier avec une fréquence dans le spectre infrarouge, qui est orientée d'une manière telle que le faisceau de balayage (5) soit parallèle aux axes longitudinaux des cigarettes (2) ;
 - une lentille de focalisation convexe (7) disposée entre la source de lumière (4) et les bouts de cigarettes et perpendiculaire aux axes longitudinaux des cigarettes (2) ;
 - un capteur (6) de type photoélectrique, orienté de manière à être perpendiculaire à un faisceau de balayage (5') qui est réfléchi sous un certain angle par rapport à l'axe longitudinal de la cigarette (2) ;
 - une lentille de focalisation convexe (8) pour le faisceau de balayage réfléchi (5') sur le capteur (6), qui est perpendiculaire au faisceau de balayage réfléchi (5').

6. Un dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce qu'un dispositif (13) pour l'entrée d'une valeur de seuil est connecté au dispositif de traitement (9), le dispositif de traitement (9) comparant avec la valeur de seuil la différence entre chaque valeur de mesure d'une succession de valeurs de mesure sur un bout de cigarette, et la valeur de mesure maximale correspondante de cette succession, et émettant un signal d'activation du dispositif de rejet (18, 19) lorsque la différence dépasse la valeur de seuil pour au moins quatre valeurs de mesure de la succession.
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7. Un dispositif selon une ou plusieurs des revendications précédentes, caractérisé en ce que chaque succession de valeurs de mesure sur un bout de cigarette comprend environ 60 à 80, en particulier 70, valeurs de mesure successives le long du chemin de déplacement du faisceau de balayage (5) sur le bout de cigarette.
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8. Un dispositif selon la revendication 1, caractérisé en ce que les moyens de génération (4) du faisceau de balayage (5) comprennent une source de micro-ondes ou une source d'ondes ultrasonores.
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Fig. 1



