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Optical cigarette filling control device.

An optical device (1) for controlling the filling of cigarettes (3) and presenting a sensor (12); a lens (7) with a fixed focus (9); a given focusing plane (10); and a substantially zero depth of field; the

cigarette (3) being positioned with its open end coplanar with the focusing plane (10); and the sensor (12) detecting the contrast of the image produced by the lens (7).

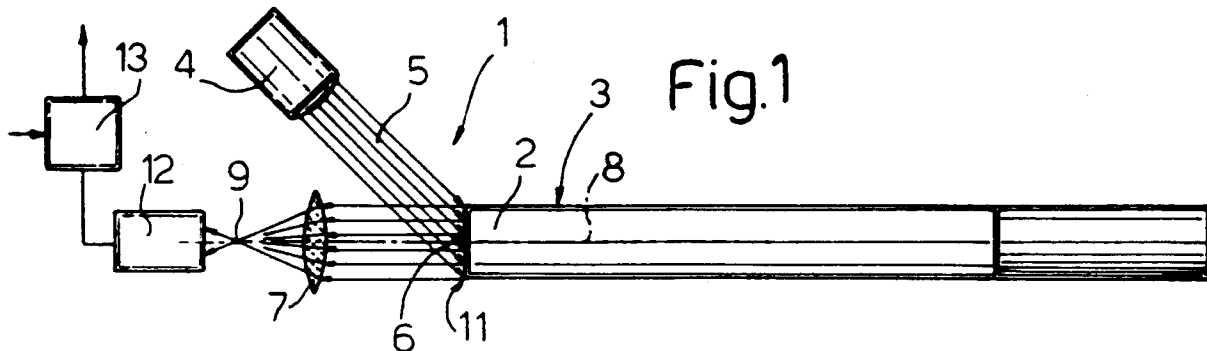


Fig. 1

EP 0 585 686 A1

The present invention relates to an optical cigarette filling control device.

In particular, the present invention relates to a control device for determining the presence or absence of tobacco at the open end of cigarettes on a cigarette manufacturing and/or filter assembly and/or packing machine.

At the output of cigarette manufacturing and/or filter assembly machines and/or at the input of cigarette packing machines, the cigarettes are normally subjected to numerous controls, one of which provides for determining the presence or absence of tobacco at the open end of the cigarettes.

In the majority of cases, this is done using an optical comparator comprising a light source for illuminating the front open-end surface of the cigarette; a detecting unit featuring a telecamera or similar optical monitoring unit for producing an image of the front open-end surface; and a comparing unit for receiving the monitored image and comparing it with a specimen image. The comparing unit normally also provides for emitting a reject signal in the event the difference between the monitored and specimen images exceeds a given limit.

In general, the difference between the two images is one of shading, which, as we know, in the case of the monitored image, varies according to the presence of gaps in the front open-end surface due to the absence of tobacco. Unfortunately, however, the shading of the monitored image has been found to depend largely not only on the presence of said gaps, but also on the colour of the tobacco employed, so that known devices of the aforementioned type involve long, high-cost setup procedures whenever a different type of tobacco is used.

It is an object of the present invention to provide a straightforward, low-cost optical device designed to overcome the aforementioned drawbacks.

According to the present invention, there is provided an optical device for controlling the filling of cigarettes, and characterized by the fact that it comprises, in combination, a sensor and fixed-focus optical means aligned in a fixed position along the optical axis of the optical means and presenting a given focusing plane and a substantially zero depth of field; the focusing plane, in use, being tangent to the end edge of the cigarette positioned substantially coaxial with said optical axis.

The above device preferably also comprises a light source for illuminating the end surface of the cigarette; said sensor being designed to receive a beam reflected by said end surface towards said optical means.

According to a preferred embodiment of the above device, said sensor is provided with comparing means for emitting a reject signal in response

to a signal emitted by the sensor and below a given threshold value.

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a preferred embodiment of the optical device according to the present invention;

Fig.2 shows a partial view of the Fig.1 device under two different operating conditions;

Fig.3 shows a performance graph of the Fig.1 device.

Number 1 in Fig.1 indicates an optical device for controlling the filling of end portion 2 of a cigarette 3. Device 1 comprises a light source 4 for emitting a beam 5 impinging on and for illuminating front end surface 6 of portion 2; and a biconvex lens 7 having an optical axis 8 and a fixed focus 9. Device 1 presents a focusing plane 10 at a given distance A from lens 7, and a substantially zero depth of field; and cigarette 3 is positioned facing lens 7, coaxial with axis 8, and in such an axial position that end edge 11 of cigarette 3 is tangent to focusing plane 10.

Device 1 also comprises a sensor 12 located along axis 8, on the opposite side of focus 9 to lens 7, on the opposite side of lens 7 to cigarette 3, and at a given distance B from lens 7, which sensor 12 provides for detecting the contrast value of the image of surface 6 viewed through lens 7 and proportional to the filling of portion 2 of cigarette 3, and may, for example, be of the type described in USA Patent n. 5,107,337. Device 1 also comprises a comparing and control unit 13 for receiving the contrast value of the monitored image from sensor 12, comparing it with a threshold contrast value C, and emitting a reject signal in the event the incoming contrast value is below the threshold value.

In actual use, and with reference to Fig.3, when end portion 2 is full, i.e. when surface 6 is a flat surface coplanar with edge 11 and plane 10 (Fig.2a), sensor 12 detects a maximum contrast value D. Conversely, in the event of any gaps in portion 2 (Fig.2b), surface 6 is no longer coplanar with edge 11 and plane 10, in which case, by virtue of the substantially zero depth of field of device 1, the contrast values detected by sensor 12 fall alongside an increase in the depth of the gaps, as shown by curve 14, and are such as to determine the emission of a reject signal, when the depth of the gaps is such that the contrast signal falls below threshold C.

Claims

1. An optical device (1) for controlling the filling of cigarettes (3), and characterized by the fact that it comprises, in combination, a sensor (12)

and fixed-focus (9) optical means (7) aligned in a fixed position along the optical axis (8) of the optical means (7) and presenting a given focusing plane (10) and a substantially zero depth of field; the focusing plane (10), in use, being tangent to the end edge (11) of the cigarette (3) positioned substantially coaxial with said optical axis (8). 5

2. A device as claimed in Claim 1, characterized by the fact that said optical means (7) comprise at least one lens. 10
3. A device as claimed in Claim 1 or 2, characterized by the fact that it also comprises a light source (4) for illuminating the end surface (6) of said cigarette (3); said sensor (12) being designed to receive a beam reflected by said end surface (6) towards said optical means (7). 15
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4. A device as claimed in any one of the foregoing Claims, characterized by the fact that said sensor (12) is provided with comparing means (13) for emitting a reject signal in response to a signal emitted by the sensor (12) and below a given threshold value. 25

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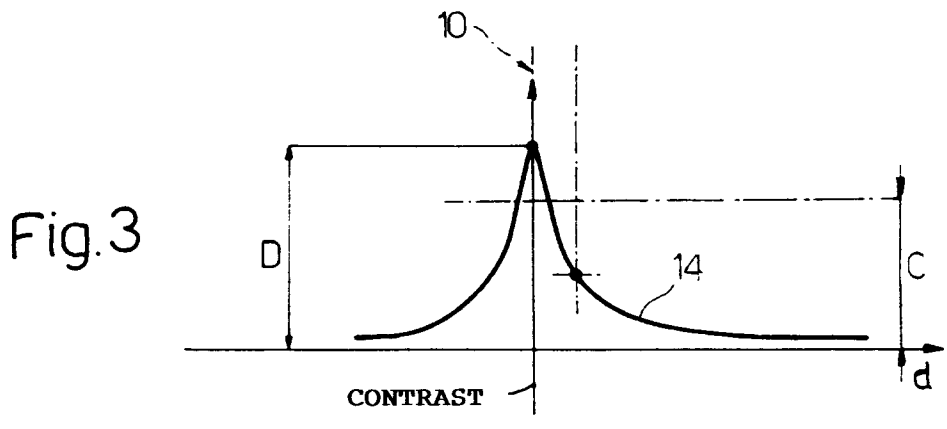
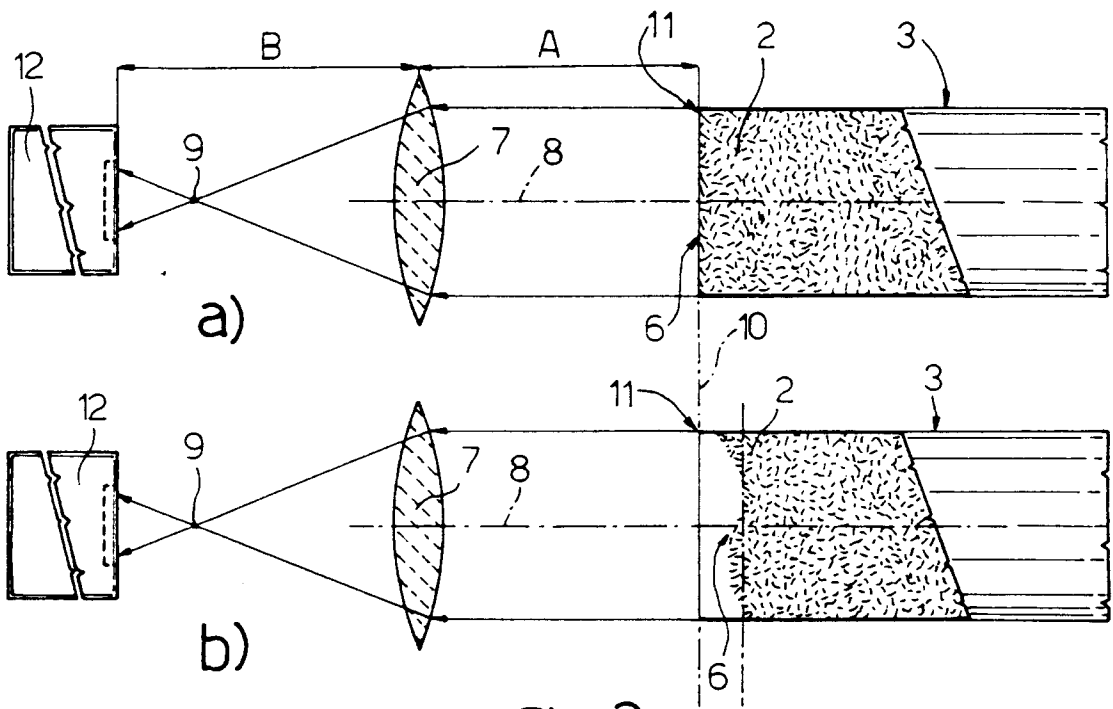
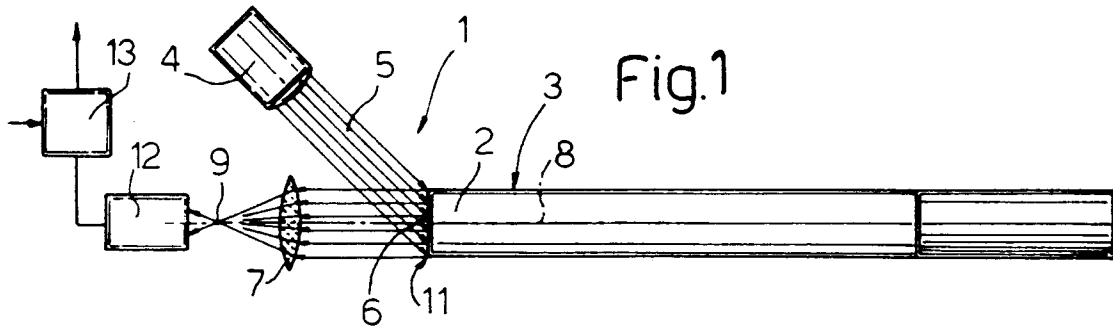
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	GB-A-1 112 687 (A. SCHMERMUND)	1-3	A24C5/34
Y	* the whole document *	4	B65B19/30

Y	US-A-5 013 905 (A. NERI)	4	
	* the whole document *		

A	US-A-3 812 349 (GUGLIOTTA ET AL)	1-4	
	* column 2, line 15 - column 4, line 16; figures *		

A	US-A-3 980 567 (F. BENINI)	1-4	
	* column 2, line 40 - column 4, line 4; figures *		

A	EP-A-0 370 231 (SASIB S.P.A.)	1-4	
	* the whole document *		

A	GB-A-2 176 598 (HAUNI-WERKE KORBER & CO. K.G.)	1-4	
	* page 3, line 6 - page 4, line 77; figures *		

A	GB-A-2 017 899 (MASCHINENFABRIK ALFRED SCHMERMUND GMBH)	1-4	
	* the whole document *		

The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		11 January 1994	Raven, P
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