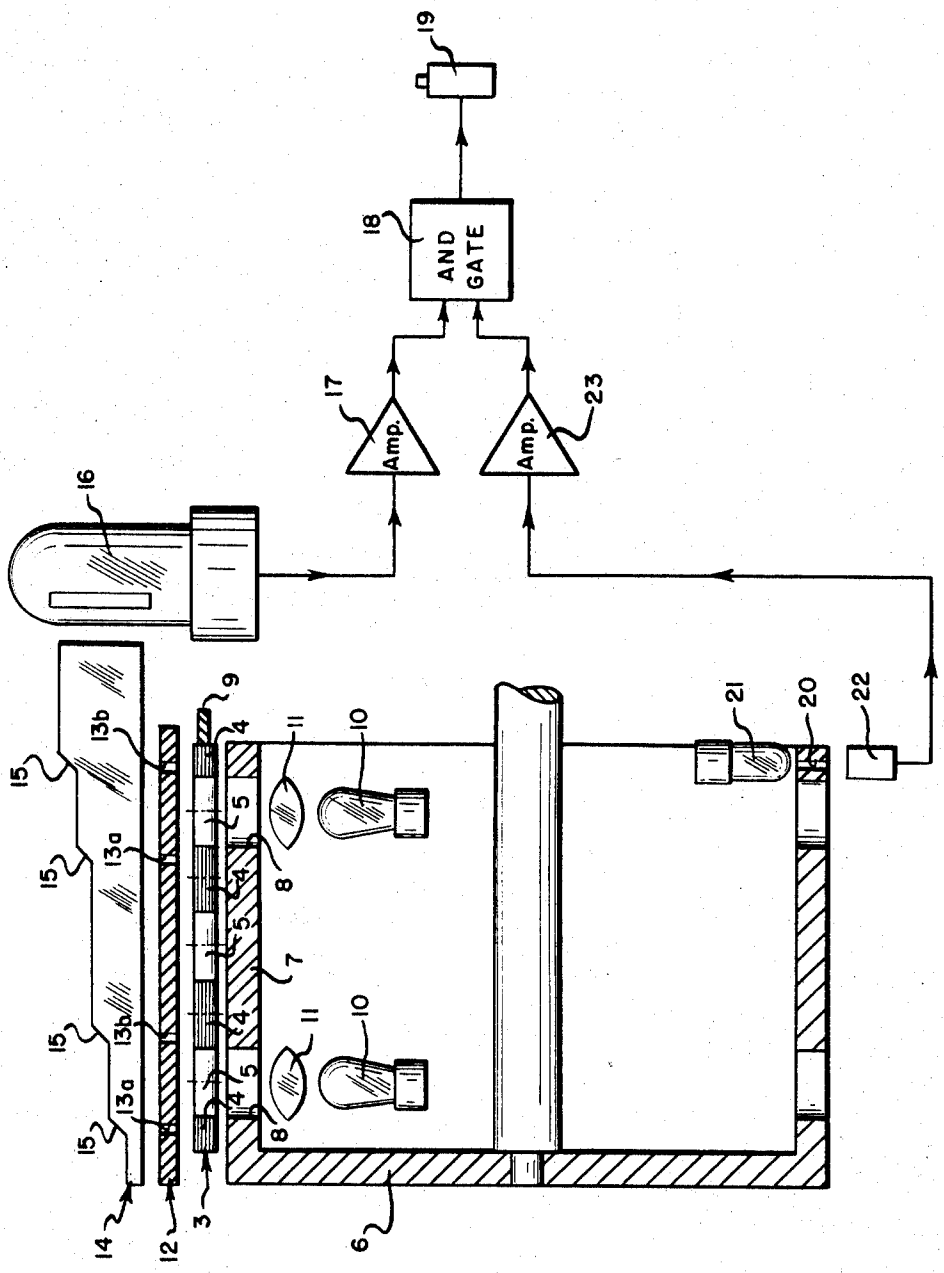
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INSPECTION DEVICE FOR COMPOSITE CIGARETTE FILTER RODS

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INSPECTION DEVICE FOR COMPOSITE CIGARETTE FILTER RODS

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ABSTRACT OF THE DISCLOSURE

An inspection device for detecting axially misplaced components of composite cigarette filter rods provides back illumination for the more translucent rod components and a tolerance mask having at least one opening so positioned that illumination of the translucent rod component is transmitted through the opening for detection whenever the translucent component is displaced axially of the rod from its proper position.

This invention relates to the production of filter cigarettes and, more particularly, to an inspection device for the end segment of a composite filter rod used in making filter cigarettes.

In the production of filter cigarettes having a composite filter or mouthpiece, that is, a filter or mouthpiece portion composed of two or more components, it is common practice to produce the filter or mouthpiece components in the form of a composite separate assembly. For example, in the production of cigarettes having both a carbon black and a cellulose component, long filter rods are prepared from alternate double length portions of each type of filter component, and the long rods are cut into shorter rods. By making these cuts through the center of identical double length components, the two ends of the resulting shorter rods consist of single lengths of the same type of component separated by double length portions of alternate component structure. Then by cutting these shorter rods into units for joining to the ends of two spaced cigarette rods, each unit consists of a central double length portion flanked at each end by a single length of the other filter component. When the resulting assembly is cut into two, each cigarette has a dual filter structure composed of two adjoining single length portions of the two types of filter structure.

It is necessary, in the aforementioned series of operations, to make the cuts dividing the long filter rod into shorter lengths with sufficient accuracy as to divide the double length portions at the cut into two single length portions of equal size. If the cut is not made in the center of a double length portion, one of the resulting single portions will be unduly small and may fall out. Accordingly, it is important to be able to monitor the accuracy of the cutting operation, and this result is achieved, pursuant to the present invention, by an inspection device which can instantly detect a shifting toward either end of the cut rods of the position of the more translucent of the two filter components.

The inspection device of our invention is adapted to check the position in a composite filter rod of one portion which is more translucent than the alternate portion. This device comprises a carrier for the rods adapted to move the rods individually through an inspection zone in a direction normal to their axes, and positioning means for fixing each composite filter rod in a referenced inspection position on the carrier. An aperature is provided in the carrier in alignment with the correct position of the more translucent portion of each rod in its referenced

position in the inspection zone. A light source is arranged for its light to be directed through the apertures onto said more translucent portion of the rod, and a tolerance mask is positioned on the opposite side of the rod from the light source and is provided with an opening located lengthwise of the filter rod beyond the correct position of the more translucent portion of the rod. A light-sensitive element is positioned to receive any light transmitted through the opening in the tolerance mask, and a timing element is provided which is adapted to actuate a rod-rejecting element when a rod which permits light to pass through the tolerance mask is aligned with rejecting element.

These and other novel features of the invention will be more readily understood by reference to the accompanying drawing in which the single figure is a combined schematic and cross-sectional view of our inspection device.

Each composite filter rod 3, composed of alternate relatively opaque components 4 and relatively translucent components 5, is carried through the inspection device of the invention by means of rotatable drum 6 of conventional design having transverse peripheral grooves adapted to support each rod in axial alignment with the axis of the drum. The base 7 of each groove is provided with at least one, and preferably two, slots 8 so positioned that when a filter rod is in endwise abutment with a placement stop 9 at one edge of the drum periphery, the slot or slots are aligned with the proper position of one, or two, of the more translucent components 5 of the filter. At a position within the drum corresponding to the inspection station, there is located a light source 10 and a condenser lens 11 arranged to direct light through each slot 8 as it enters the station.

On the outside of the drum beyond the peripheral grooves, but parallel thereto, there is positioned a tolerance mask 12. The mask is provided with a pair of tolerance apertures 13*a* and 13*b* positioned beyond the extremities of a translucent filter component aligned with each drum slot 8. A reflective lens 14 is positioned outboard of the tolerance mask and is positioned with oblique reflective surfaces 15 aligned with each aperture 13*a* and 13*b* in the mask. The reflective surfaces are such as to direct any light passing through an aperture in the mask toward a phototube 16. The output of the phototube is delivered to an amplifier 17 and the output from the amplifier is supplied to an AND gate 18 the functioning of which operates a reject valve 19. The reject valve may be of any conventional type, such as a compressed air valve, which will effect ejection of the defective filter rod from its groove in the drum.

A defective composite filter rod is one in which one single-length end component (the relatively opaque component 4 in the drawing) is longer or shorter than it should be. In either event, the axial position of the remaining double-length components of the rod, including the relatively translucent components 5, will be shifted toward end of the rod. When such a shift occurs, light diffusing through the translucent filter component is moved toward one of the tolerance apertures 13*a* or 13*b* in the mask 12, and when this axial shift is of sufficient magnitude to be considered objectionable for cigarette manufacture, the position of the tolerance apertures in the mask will be such as to transmit to a cooperating reflective surface 15 of the lens 14 and thence to the phototube.

It will be readily appreciated that the fiilter rods being inspected are moving with the periphery of the drum and that the ejection device, when operated, must be timed to operate only when the filter rod to be ejected is aligned with the ejection device. Accordingly, a portion of the drum diametrically opposite each rod-carrying groove is

provided with an aperture **20** through which light from a reference lamp **21** can pass to a reference light pickup unit **22** such, for example, as another phototube. The output from the reference pickup unit **22** is transmitted to a second (reference) amplifier **23**, and the output of this amplifier is fed to the AND gate **18**. When the detection signal from a defective filter rod and the reference signal coexist, the AND gate operated and causes the reject valve **19** to eject the defective filter rod.

We claim:

1. An inspection device for composite cigarette filter rods each composed of an axial series of alternately different portions one of which is more translucent than its axially adjacent portion, said device comprising a carrier for the rods adapted to move the rods individually through an inspection zone in a direction normal to their axes, positioning means for fixing each filter rod in a referenced inspection position on the carrier, the carrier being provided with an aperture aligned with the correct position of at least one of the more translucent portions of each rod in its referenced position in the inspection zone, a light source arranged for its light to be directed through the aperture onto said more translucent portion of the rod, a tolerance mask positioned on the opposite

side of the rod from the light source and provided with an opening located lengthwise of the filter rod axially beyond the correct position of the more translucent portion of the rod, a light-sensitive element positioned to receive any light transmitted through the opening in the tolerance mask, a rod rejecting element, and a timing element adapted to actuate the rod-rejecting element when a rod which permits light to pass through the tolerance mask is aligned with the rejecting element.

2. An inspection device according to claim **1** in which the timing element is adapted to be actuated when a rod which permits light to pass through the tolerance mask is aligned with the rejecting element, and which further includes means for actuating the rod-rejecting element when the time of light transmission through the tolerance mask coincides with actuation of the timing element.

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