

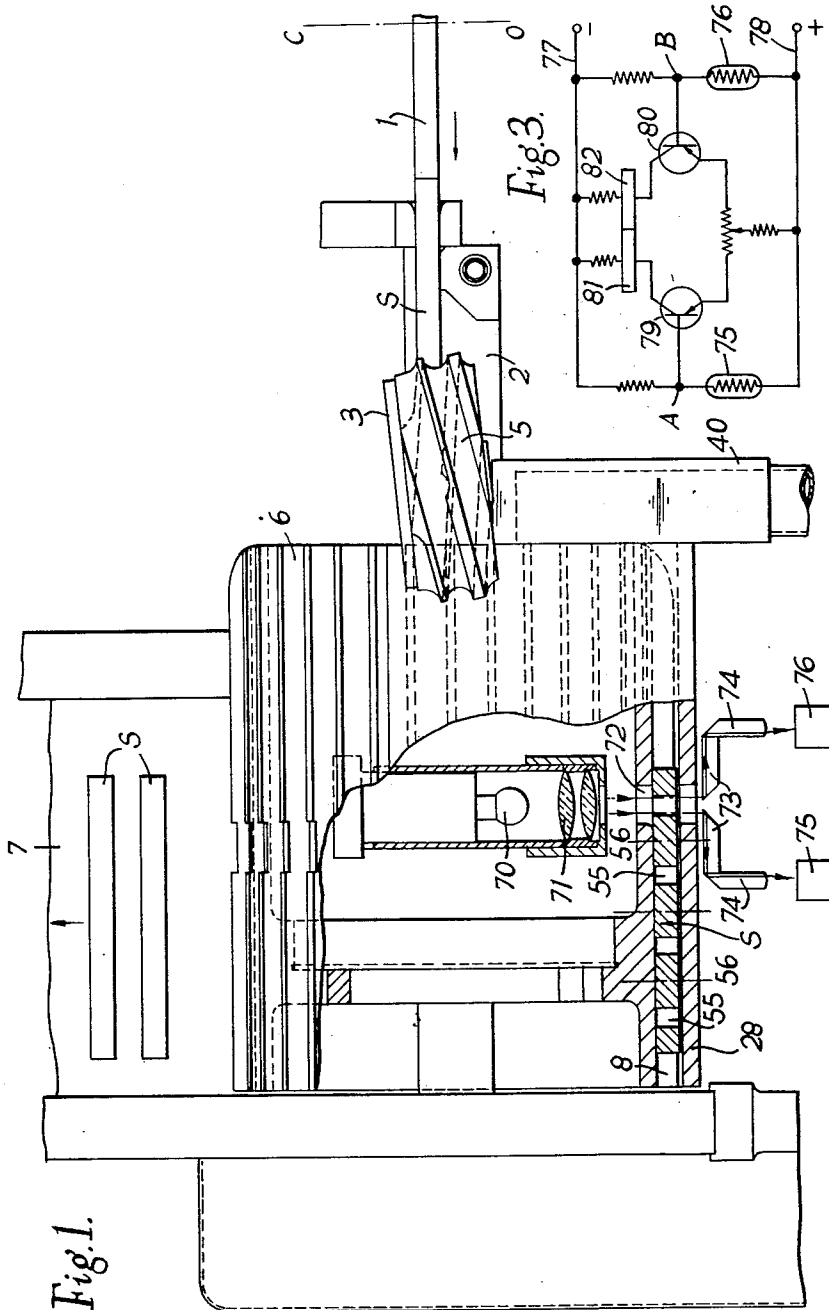
June 19, 1962

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APPARATUS FOR INSPECTING ROD-LIKE ARTICLES
HAVING TRANSPARENT OR TRANSLUCENT SPACES

3,040,179

Filed Dec. 20, 1960

2 Sheets-Sheet 1



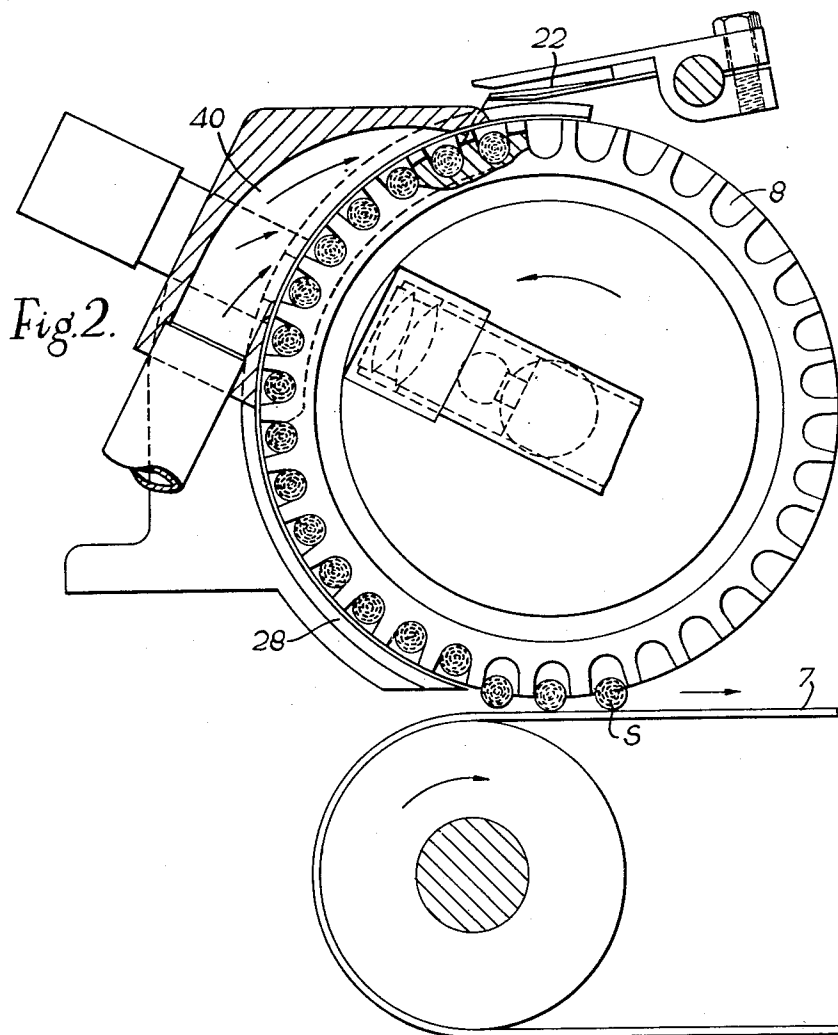
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APPARATUS FOR INSPECTING ROD-LIKE ARTICLES HAVING TRANSPARENT OR TRANSLUCENT SPACES

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2 Claims. (Cl. 250-223)

This invention concerns apparatus for inspecting rod-like articles used in the manufacture of cigarettes and having transparent or translucent spaces. Usually the rod-like articles will consist of multiple lengths of mouthpiece material from which sub-multiples are cut in the manufacture of mouthpiece cigarettes, the lengths comprising a paper tube in which short lengths of filter material, hereafter called stub material, are held and spaced apart at definite distances, thus providing empty spaces or gaps between the lengths of stub material. In the cutting operation it is important that a cut shall bisect such a space as accurately as may be possible. The same problem arises when the rod-like article comprises two pieces of cigarette rod joined by a double-length mouthpiece consisting of pieces of stub material abutting the cigarette rods and spaced from one another. Articles of the kinds outlined above will be termed rod-like articles of the kind referred to, and for convenience the said spaces will be referred to as gaps.

In the copending United States applications Serial No. 5,933 filed February 1, 1960, and Serial No. 71,661 filed November 25, 1960, apparatus is described whereby rod-like articles such as cigarettes of the said multiple lengths can be accurately positioned lengthwise in a fluted drum.

In the present case similar arrangements may be used to present the articles for inspection and the specific arrangement described below is substantially the same as the arrangement described in the copending United States application Serial No. 71,661, aforesaid, and illustrated in FIGURE 4 of the drawings accompanying said specification. The manufacture of the said multiple-lengths is conducted by a continuous rod operation, stubs being fed at spaced intervals to a paper web which is thereafter folded around the stubs and sealed and the lengths are cut from the resulting rod in the same way as cigarettes are cut from a rod on continuous-rod cigarette machines.

Owing to the method by which the multiple lengths are made there is sometimes a certain amount of drift and the stubs do not continue to occupy their proper positions with respect to an end of a multiple length. The drift is slow but cumulative and is therefore necessary to inspect the lengths to check if drift occurs beyond a permissible amount.

According to the invention there is provided apparatus for inspecting rod-like articles used in the manufacture of cigarettes and having transparent or translucent spaces, said apparatus comprising a conveyor on which the articles are conveyed laterally in aligned formation, and a photo-electric scanning device arranged to scan each article at a position where a gap occurs and arranged to give a signal when the light path is sufficiently obstructed by a piece of stub material not in its proper position within the article.

Further according to the invention there is provided apparatus for inspecting rod-like articles used in the manufacture of cigarettes and having transparent or translucent spaces, said apparatus comprising a rotatable hollow fluted drum and means for feeding successive articles into the successive flutes of the drum, the drum having a slot

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in each flute and means for aligning the articles in the flutes to bring a part of the article where a gap should occur into coincidence with said slot, a photo-electric device arranged to scan articles by light passing through said slot and arranged to give a signal when the light path is sufficiently obstructed by a piece of stub material not in its proper position within the article.

Conveniently the light source of the scanning device is within the drum and light is transmitted to a pair of photo-cells by means of prisms whose neighbouring ends are spaced apart by a distance substantially equal to that of a gap in the article. In practice the distance between the ends of the prisms is slightly less than the gap thus giving a small tolerance.

The amount of obstruction necessary for a signal to occur depends on what tolerance can be afforded as regards the position of the gaps.

Apparatus according to the invention will now be described with reference to the accompanying drawings, in which:

FIGURE 1 is a plan view partly in section;

FIGURE 2 is an end view of the fluted drum shown in FIGURE 1 and some parts associated therewith;

FIGURE 3 shows the essentials of the light-cell circuit.

Referring to the drawings, 1 is a rod which moves in the direction of the arrow and consists of pieces of stub material enclosed in a paper tube. It is cut into separate multiple lengths S on the line marked C.O. and the following rod will push a cut length along over a plate 2. Above this plate is rotatably mounted a wheel 3 having a hollow interior from which suction is exerted through perforations (not shown) in the rim of the wheel. The wheel rim has helical grooves 5 cut in it and the said perforations are in these grooves. A cut length pushed by the following rod into a groove of the wheel will be attracted to said wheel by suction, applied at the correct time, and carried along over the plate 2. The peripheral speed of the wheel exceeds the rod speed, say by 10% and in this way a cut length can be separated from the following rod.

To the left of the wheel in FIGURE 1 there is a fluted drum 6 and just below it, see FIGURE 2, is a conveyor band 7, on which the lengths are collected as shown. Stops 8 are fitted in the flutes of the drum. The lengths can come to rest against the stops and be located in the drum so that they are in laterally aligned formation and when they are deposited by the drum on to the catcher band an aligned row is formed on the band.

The drum 6 is provided with an arresting device which is arranged to engage a moving length and exert light friction on it, sufficient to arrest its axial movement in due course, the aim being to bring the lengths to rest just before they touch the stops 8.

An arresting device consists of a strip-like spring 22, FIGURE 2, bent as shown.

A length will be conveyed over the plate 2, being dragged by the wheel 3, and owing to the angular disposition of the wheel, and the helix of the groove 5 the length will be fed sideways by the wheel. The length is carried forwards laterally by the helix movement and enters a drum flute which is timed to receive a length as the wheel 3 feeds it forwards.

The axial speed of the lengths fed in this manner into the flutes and as modified by the braking force is sufficient to carry them to, say, 5 mm. from the stops 8. A concave shroud 28 is fitted as closely as possible around the drum and overhangs the end at the position near a nozzle 40, FIGURE 2. In the drawings the space between shroud and drum is exaggerated for clearness but in actual fact it is about 0.003". Air is passed through the nozzle at

sufficient pressure just to urge the lengths along the flutes and against the stops, without rebound. It will be seen that the nozzle 40 extends around the drum for a considerable angle so that the lengths are being urged towards the stops for some time. The final movement of the articles to contact the stops is caused only by the air pressure from nozzle 40.

Cut lengths received in the fluted drum 6 are carried round by the drum rotation, see arrow in FIGURE 2, and deposited on the catcher band. The shroud 28 also serves to retain the lengths in the flutes during this movement.

It will be seen that the effect caused by the nozzle 40 could be caused by an equivalent suction effect applied at the left-hand end of the flutes, FIGURE 1, or, if desired, pressure at one end and suction at the other may be used. It does not appear to be necessary to illustrate these obvious equivalents.

The stub lengths S are shown in section in FIGURE 1 and have gaps at 55 with lengths of filter material, or stubs, between the gaps. Eventually the lengths S are divided into three parts on the lines 56, each part providing two mouthpiece stubs, said parts being bisected after assembly with pieces of cigarette rod. It is very desirable that these divisions shall be made as accurately as possible because at the final division the open spaces provided by bisecting a gap occur at ends of finished cigarettes and any irregularity is noticeable and objectionable. It is therefore essential to get the best possible alignment on the band as the stubs are conveyed by it to cutting devices, or they could be delivered to a second drum for cutting. The apparatus so far described ensures this alignment but as previously mentioned the position of pieces of stub material in the paper tube may change or drift. This is probably because although the pieces are deposited on the paper web in proper timed relationship with respect to the paper speed, to get the desired spacing, there may be a microscopic loss of spacing due to the inertia of the pieces, or the paper speed which is imparted by friction of a tape may slightly change. However that may be it is found that drift does occur and it is desirable that the operator shall be apprised of this without delay.

For this purpose there is provided a photo-electric scanner comprising a lamp 70 fixed in a hollow space formed inside the drum and having a condenser 71 to provide a focused light beam. Each flute of the drum has a slot 72 formed in it, symmetrical about the optical axis of the condenser and the stops 8 are so positioned that a properly disposed gap 55 is similarly symmetrical. Prisms 73 and 74 transmit the light to photo-cells 75 and 76, prisms being necessary because the gap is too narrow to allow two cells to be accommodated side by side to receive the beam. If drift has occurred beyond a slight tolerance one of the cells will receive less light and the other will receive the full light and thus a signal may be made by means of the circuit shown in FIGURE 3.

In FIGURE 3 the light cells 75 and 76 are of the photo-conductive type, connected across supply lines 77 and 78. If both cells receive the same illumination nothing happens, as the bridge shown is balanced, but if one cell receives less light than the other its resistance will change and the voltage at point A or B, as the case may be, will alter and a neighbouring transistor 79 or 80 respectively, will pass current through its associated relay coil 81 or 82. The relay is a centre-stable one with two windings, so that one pair of contacts or the other will be made according to which coil passes the greater current. Thus a warning signal may be obtained which will indicate in which direction the gap has moved. The light cells above mentioned are preferred because they are substantially indif-

ferent to any temperature changes likely to occur in this service.

In a more advanced construction the energised relay may be used to control apparatus to advance or retard the feeding of the pieces of stub material or possibly to advance or retard the paper web or advance or retard the cut-off. In practice at present, the cut-off is altered manually when the signal calls for it.

While the use above described is the principal use for which the apparatus is intended it will be seen that the ideas embodied could be used to inspect an assemblage consisting of two pieces of cigarette rod having stub material at their ends, said stubs being spaced from one another and a paper tip holding the assemblage together. The gap between the stubs could be inspected in the manner described and the resulting signal (if any) used to adjust the assemblage with respect to a cutting knife.

The functioning of the scanner depends on a critical balance between two photo-cells and ageing of the lamp, or a change in the supply voltage, for example, mains voltage, will affect the brilliance of the lamp. This will cause the resistance of the cells to alter but to a slightly different extent, so that the balance is lost. To avoid this defect the lamp may be supplied from a further transistor amplifier which is in turn driven from the common emitter resistor of the transistors 79 and 80. Thus if the voltage on the cells 75 and 76 changes for any reason the lamp current is automatically adjusted in such a way as to oppose the change.

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

1. Apparatus for inspecting rodlike articles in the manufacture of cigarettes and having transparent or translucent spaces, comprising a rotatable hollow fluted drum, means for feeding successive articles lengthwise into the successive flutes of the drum, the drum having a slot in each flute, means for aligning an article in the flute to bring a part of the article where a space should occur into coincidence with said slot, a photoelectric device arranged to scan articles by light passing through said slot and arranged to give a signal when the light path is sufficiently obstructed by an article when a space is improperly located therein, said device comprising a single light source within the hollow drum, a pair of prisms whose adjacent ends are spaced apart by a distance substantially equal to that of a space in an article, said prisms being located outside of the drum and in the neighborhood of the passing slots as the drum rotates, and a photocell associated with each prism to receive light transmitted from the light source; a bridge circuit having one of said photocells in each of opposed arms of the bridge, a relay having two windings each of which is activated in response to the output of a corresponding photocell so that a difference between the light impinging on the two cells and the consequent difference in output will cause the relay to be energized.

2. Apparatus according to claim 1, in which said relay is of the center stable type with contacts at each side of the center whereby a signal due to the making of the relay contacts will also indicate in which direction the space within the article has moved.

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