ARRANGEMENT FOR TESTING CIGARETTES

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ABSTRACT

A rotatably mounted drum provided with a plurality of axially extending troughs having openings disposed around the circumferential surface of the drum, is disclosed.

Cigarettes are fed radially into the openings as the drum rotates. The troughs are of such a depth that the cigarettes do not project above the drum surface, consequently, as the drum rotates in contact with a movable belt extending over an arcuate portion of its circumference, the troughs are closed while covered by the belt. While the troughs are so closed, air under pressure is injected into the closed troughs and a vacuum source is applied, via an axial bore in a piston pressed against the cigarettes' end surface, to the respective cigarette. The resulting air displacement, if any, is monitored and, where it exceeds a predetermined amount, indicating that the cigarette wrapping paper is faulty — the cigarette is rejected.

12 Claims, 2 Drawing Figures
ARRANGEMENT FOR TESTING CIGARETTES

BACKGROUND OF THE INVENTION

The present invention relates to improvements in an arrangement for testing cigarettes.

In the manufacture of cigarettes, a test is normally provided in order to detect defects in the paper covering, for example flaws in the paper or defective gluing of the seam. A known arrangement for carrying out this test operation comprises a holder for each individual cigarette, this holder being so constructed that a difference in pressure can be applied between the end areas and the periphery of the cigarettes. If the airflow occurring as the result of the difference in pressure exceeds a determined value, the cigarette in question is discarded as defective.

Since during manufacture, the cigarettes are delivered to the testing station in continuously moving rows, the cigarettes must be separated, inserted into the holder, tested, and then, after elimination of defective cigarettes, deposited so as to form a continuous row once more. Difficulties arise in the introduction of the cigarettes into a testing chamber which is sealed in relation to the atmosphere and discharging them again without disturbing the continuity of the flow of cigarettes.

An apparatus for forming vacuum or pressure chambers for testing cigarettes from continuously moving rows is known which has a rotating drum, in the periphery of which there are provided axially parallel troughs to receive cigarettes which are inserted radially and removed radially again after testing, said troughs being closed, so as form chambers, during a partial rotation of the drum by means of coacting rotating elements cooperating with the drum. This known apparatus has approximately semi-cylindrical troughs while the co-acting elements provided are blocks likewise having a substantially semi-cylindrical recess. The blocks are disposed on a rotating conveyor belt and during the partial rotation of the drum, are pressed into engagement with the troughs. It is obvious that the sealing of each co-acting element against the aperturing trough is extremely difficult; even with the most accurate machining it is scarcely possible to avoid leaks. For this reason, very complicated means are provided in the known device for permitting the testing of cigarettes even with leaking test chambers.

SUMMARY OF THE INVENTION

According to the present invention, there is provided an arrangement for testing cigarettes, comprising a rotatable drum provided with a plurality of elongate troughs having respective openings extending axially in the circumferential surface of the drum, feed means for feeding cigarettes radially through the openings and into the troughs, retaining means for retaining cigarettes within said troughs during rotation of the drum, closure means extending over an arcuate path in contact with a portion of the circumferential surface of the drum for closing the troughs in that surface portion, and means for applying at least one source of fluid at other than atmospheric pressure to the thus closed troughs for testing cigarettes contained therein.

Preferably, the closure means comprises an endless flexible belt which is guided along said arcuate path, and is replaceable therein at a speed substantially equal to the circumferential speed of the drum.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be more particularly described with reference to the accompanying drawings, in which:

FIG. 1 shows, semi-diagrammatically, and end elevational view of an arrangement embodying the invention, and

FIG. 2 shows, partly in section and semi-diagrammatically, a side elevational view of the arrangement shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the arrangement comprises a drum 10 which is rotated on rotation of drive means comprising the shaft 68. The direction of rotation is counterclockwise, as indicated by the arrow. A supply drum 12, by which the cigarettes 14 are inserted into axially extending troughs 16 disposed around the circumferential surface of the drum 10, rotates in the clockwise direction. On the supply drum 12 and in the drum 10, the cigarettes 14 are held in position by vacuum means. This vacuum means is known in itself and is therefore only indicated diagrammatically in the drawings; in the drum 10 there can be seen vacuum pipes 18 which, by means of a control slot 20, are connected to a vacuum supply pipe 22 (FIG. 2). A discharge drum 24 is constructed similarly to the supply drum 12 and takes the cigarette 14 out of the troughs 16. In FIG. 2 it can be seen that each trough 16 is constructed to receive a pair of filter cigarettes, which have already been cut, with their filters 14'. The vacuum pipes 18 lead into projections 26 of U-shaped cross-section (FIG. 1), which support the end portions of the cigarettes as they lie in the troughs 16. An arcuate control slot 20 between the vacuum supply pipe 22 and the vacuum pipes 18 is indicated in FIG. 1 by broken lines.

Another pipe, which will be referred to as the testing pipe 30, has its mouth at the bottom of each of the troughs 16. It can be connected to a vacuum pump, to a pressure pipe 32, a flow measuring device, or the like, through another arcuate control slot 32 and a testing supply pipe 34. The type of testing applied in each individual case is not an essential feature of the invention; an arrangement embodying the invention is suited to many different known methods of testing.

The arcuate control slot 32 for the elongate passages or test pipes 30 extends over a shorter portion of the circumference of the drum 10 than the arcuate control slot 20 for the vacuum pipes 18. The control slot 32 extends over an arcuate portion of the circumferential path traced by the troughs 16 as the drum 10 rotates and, while the troughs 16 are traversing this portion, they are closed by the overlapping belt 38. The portion of the belt 38 which extends around the circumferential surface of the drum 10 between pressure rollers 42 and 44 presses against the smooth surface of the drum 10 and provides a substantially air-tight seal for the troughs 16 while they are overlapped by the belt.

In FIG. 1 it can clearly be seen that the cigarettes lying on the projections 26 do not project beyond the periphery of the drum, so that the troughs 16 are in the form of elongated depressions in the outer circumferential surface of the drum 10, which is otherwise completely smooth. On the peripheral or rotational region between the supply drum 12 and the discharge drum 24 a smooth flat belt 38, which is driven by frictional contact with the circumferential surface of the drum 10, cooperates with the pattern of interconnected webs 36 which extend between the troughs 16. A guide roller 40 and the two pressure rollers 42 and 44 are provided for the purpose of guiding the belt 38. The belt extends in the axial direction (FIG. 2) beyond the ends of the troughs 16 and also bears against the webs 36 in the region of the end surfaces of the drum 16. The belt is made of an elastomer such as is normally used for sealing purposes.

In the particular embodiment illustrated in the accompanying drawings, the length of each of the troughs 16 in the axial direction is slightly greater than that of two cigarettes to be tested. In order to build up a difference in pressure between the interior of the cigarette and the test chambers provided by the closed troughs 16, a cylindrical bore 46, which emerges flush with the U-shaped trough in the adjacent projection 26, is provided in the end portion of the drum 10 lying opposite the control slots 20 and 32 for each trough 16. An axially slideable piston 48 is inserted in the bore 46, its end face contacting the end surface of the adjacent cigarette, as shown in FIG. 2. In this manner, the cigarettes lying in each of the
troughs 16 are clamped between the respective one of the pistons 48 and the opposite end wall of the respective trough 16, so that the interior of the cigarette is isolated in respect of pressure from the remainder of the test chamber provided by the closed trough. The piston 48, which is in the embodiment illustrated in the accompanying drawings is in the form of a cap of elastomer material mounted on a piston rod 52, has a bore 50 which extends axially through the piston 48 and the piston rod 52 and is adapted to be connected to a difference testing pipe 54. The airflow is consequently measured between the difference testing pipe 54 and the test pipe 34. The pressure or vacuum source pressure gage, flow meters, etc. are not illustrated in the drawing since these are not features of the invention, per se.

The axial displacement of the piston 48 into the "testing position" illustrated in FIG. 2 is effected against the force of a spring 56, which is compressed by a collar 58 mounted on the piston rod 52 when axial displacement of the piston 48 takes place. This spring force is overcome by means of a pneumatic pressure which acts on the opposite side of the collar 58 and which is supplied through a branch pipe 60 and a control slot 62, the latter being shown in broken lines in FIG. 1. Like the control slot 20, the control slot 62 extends over the portion of the periphery of the drum from the inlet for the cigarettes 14 to the outlet for the cigarettes; the length of the accurate control slot 64 (see FIG. 1) for the difference testing pipe 54 on the other hand corresponds to the length of the control slot 52 for the test supply pipe 34.

The piston rod 52 extends beyond the end face of the drum 10 into an annular collar 66. The annular collar 66 may either be attached to an end surface of the drum 10 or be integral with the drum. The collar 66 receives the piston rod 52, springs 56, collars 58, and branch pipes 60 of all the troughs and accordingly rotates with the drum 10. In addition, the two annular control collars 70 and 72 associated with the drum 10 are rotatably mounted on the shaft 68 of the device, these collars 70 and 72 accommodate the control slots 62 and 64 in the collar 70 and the control slots 20 and 32 in the collar 72, respectively. The control collars 70 and 72 remain stationary relative to the drum 10 as the shaft 68 rotates.

The arrangement which has been described, operates as follows:

On the rotation of the drum 10 the latter first receives the cigarettes 14 from the supply drum 12; in the troughs 16 the cigarettes 14 are sucked on to the projections 26 by vacuum means and, at the same time, clamped fast by the axial movement of the piston 48. As the drum 10 rotates further, the troughs 16 are sealed in relation to the atmosphere by means of the belt 38 and the cigarettes are subjected to testing. It is obvious that the control slots are only indicated diagrammatically in the drawings; provision is naturally made for each cigarette to be tested separately. The test chamber, (that is to say the eight troughs 16 closed by the belt 38) open again after partial rotation of the drum 10, since the belt uncovers the troughs 16 again. At this point there may be provided a device for removing defective cigarettes, which however is not illustrated in the drawings; these cigarettes may however also be discarded by simply not applying the suction of the discharge drum 24 to any cigarettes found to be defective, so that the defective cigarettes drop under the apparatus opposite the guide roller 40. The control means for the interlocking of the operations are known from the appropriate technique and therefore need not be discussed here in detail.

What is claimed is:

1. An arrangement for testing cigarettes comprising in combination:
   a rotatably mounted drum;
   drive means to rotate said drum;
   a plurality of elongate troughs having respective openings extending axially in the circumferential surface of said drum;
   feed means to feed cigarettes radially into said troughs through said openings;
   retaining means to retain cigarettes in said troughs on rotation of said drum;
   an endless flexible belt extending over an arcuate path next adjacent a predetermined portion of said circumferential drum surface to close each of said troughs for a predetermined fraction of each revolution performed by said drum;
   mounting means to mount and maintain said endless flexible belt and replace by frictional contact with said circumferential surface to cause said belt to be displaced at a speed substantially equal to the circumferential speed of said drum;
   at least one source of fluid at other than atmospheric pressure and;
   means to apply said at least one source to said thus closed troughs, whereby cigarettes contained therein may be tested.

2. An arrangement as defined in claim 1 wherein said flexible belt is supported by at least two freely rotatable guide wheels between which said endless belt extends in contact with the circumferential surface of said drum.

3. An arrangement as defined in claim 1, wherein the interior or of each said trough is provided with an arcuate seating for accommodating the circumferential surface of a cigarette, and the center of curvature of said seating is radially spaced from said drum surface by an amount which is at least equal to the radius of curvature of said seating.

4. An arrangement as defined in claim 1, wherein the interior or of each said trough is provided with at least two support members projecting within said trough to define respective arcuate seatings for accommodating the circumferential surface of a cigarette, and the center of curvature of each said seating is radially spaced from the circumferential drum surface by an amount which is at least equal to the radius of curvature of said seating.

5. An arrangement as defined in claim 4 wherein the support members are each provided with a passage or passages therein which communicate with a source of vacuum pressure for retaining cigarettes in said troughs on rotation of said drum.

6. An arrangement as defined in claim 1, further comprising a stationary member having a surface abutting one end surface of said rotatable mounted drum, a plurality of first passages in said drum which establish intercommunication between the closed troughs and a first arcuate control channel in said abutting surface of said stationary member.

7. An arrangement as defined in claim 6 wherein each of said first passages comprises an elongate passage extending axially in the interior of said drum from said one end surface thereof.

8. An arrangement as defined in claim 1, further comprising a plurality of cylindrical bores in an end portion of said drum, each bore being axially aligned with a corresponding one of said elongate troughs and being provided with a piston which is selectively displaceably therealong for contacting an end surface of a cigarette in the respective trough.

9. An arrangement as defined in claim 8 wherein the piston is provided with an axial bore therein for establishing intercommunication between said trough and a suction or pressure source.

10. An arrangement as defined in claim 9 wherein said piston is axially displaceable along the respective bore against a return spring in response to hydraulic pressure fluid.

11. An arrangement as defined in claim 10 comprising an annular member attached to an end surface of said drum to rotate therewith, said annular member being provided with a plurality of further cylindrical bores corresponding to and axially aligned with respective ones of said first mentioned cylindrical bores in the adjacent end portion of said drum, said pistons being axially slideable along mutually aligned pairs of first and further cylindrical bores, and said axial bore in said piston communicating with said suction or pressure source via a further arcuate control channel in an abutting surface of a further stationary member.
12. An arrangement as defined in claim 11 wherein said hydraulic pressure fluid is applied via still further passages in the annular or cylindrical member and via a still further arcuate control channel in said surface of said further stationary member.