# United States Patent [19]

**Heitmann et al.**

[11] **3,783,677**

[45] **Jan. 8, 1974**


[54] **METHOD AND APPARATUS FOR TESTING CIGARETTES OR LIKE ROD-SHAPED ARTICLES**


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[73] Assignee: **Hauni-Werke Korber & Cie KG**, Hamburg, Germany



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[52] **U.S. Cl.** ..... **73/41**

[51] **Int. Cl.** ..... **G01m 3/26**

[58] **Field of Search** ..... 73/41, 45, 45.1, 73/45.2, 49.8, 40, 37



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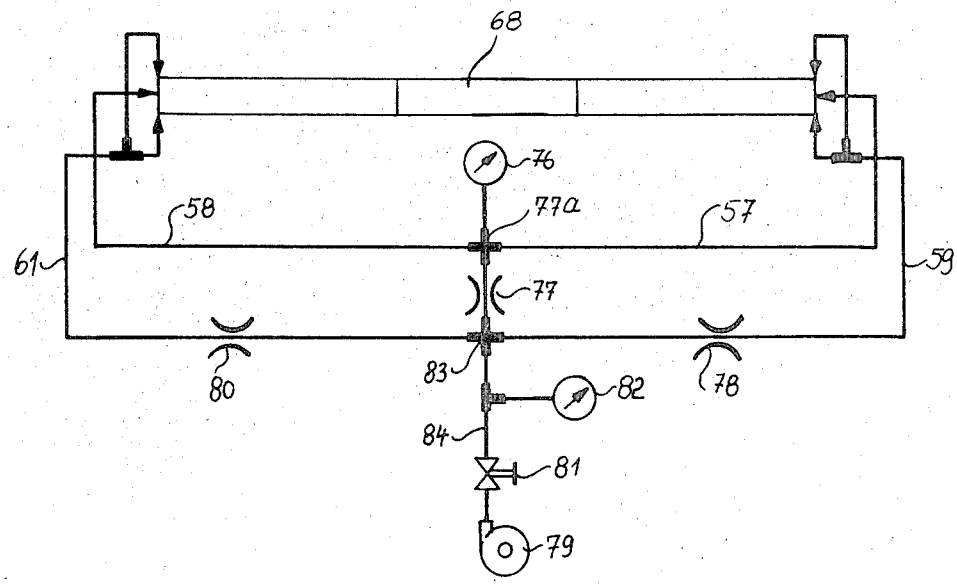
*Primary Examiner*—Richard C. Queisser
*Assistant Examiner*—Joseph W. Roskos
*Attorney*—Michael S. Striker



[57] **ABSTRACT**

Cigarettes or analogous rod-shaped articles are tested on a conveyor having flutes wherein the cigarettes move sideways between pairs of sealing elements each having an apertured sealing face and an annular nozzle. At least one sealing element of each pair is movable toward the other sealing element so that their sealing faces engage portions of or entire end surfaces of wrappers on cigarettes in the respective flutes. A testing fluid is thereupon passed through the cigarettes, either by admitting such fluid at both ends of cigarettes or by admitting the fluid at one end and allowing it to issue from the other end of each cigarette. During testing, the nozzles discharge annular streams of compressed air which impinge upon the external surfaces of wrappers in immediate or close proximity of their end surfaces to prevent uncontrolled escape of testing fluid in the event that the end surfaces of the wrappers are not located in planes which are exactly normal to the axes of the respective cigarettes. The sealing air can be discharged at right angles to the axes of the cigarettes or in directions having a first component normal to and a second component parallel with the axis of the respective cigarette.


**17 Claims, 9 Drawing Figures**



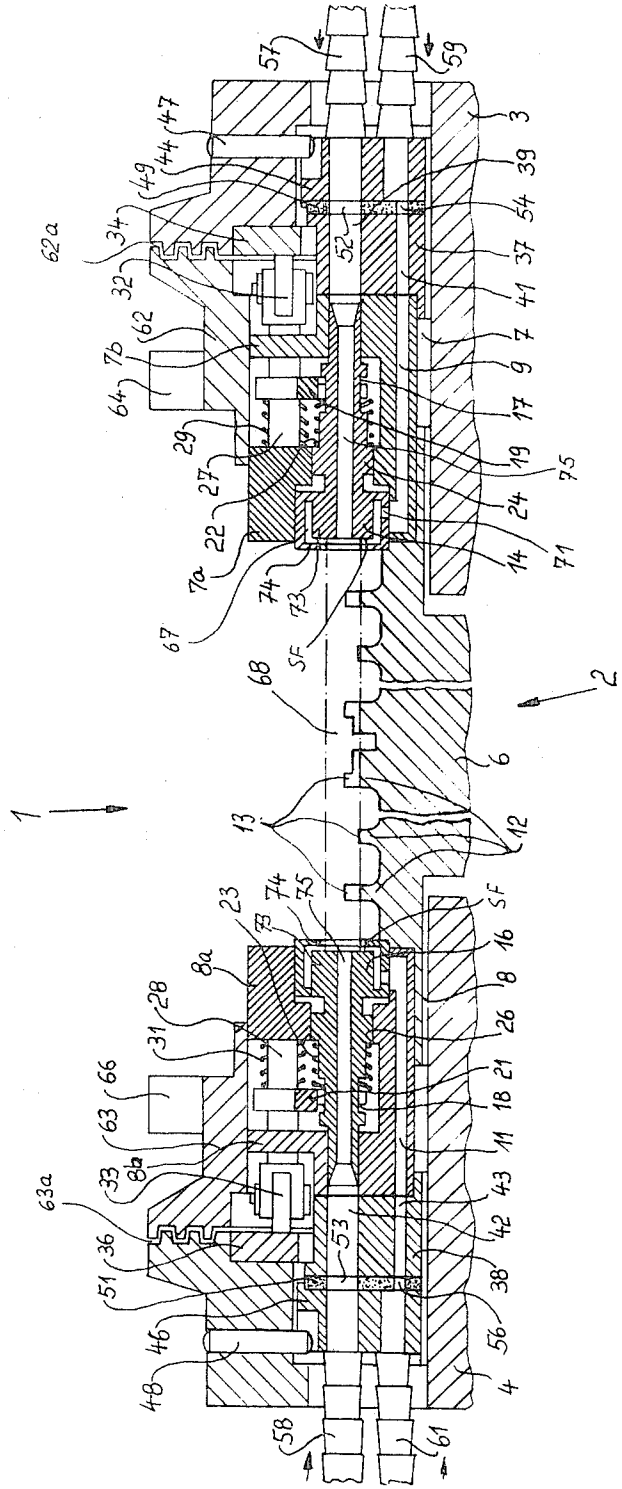

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Fig. 1

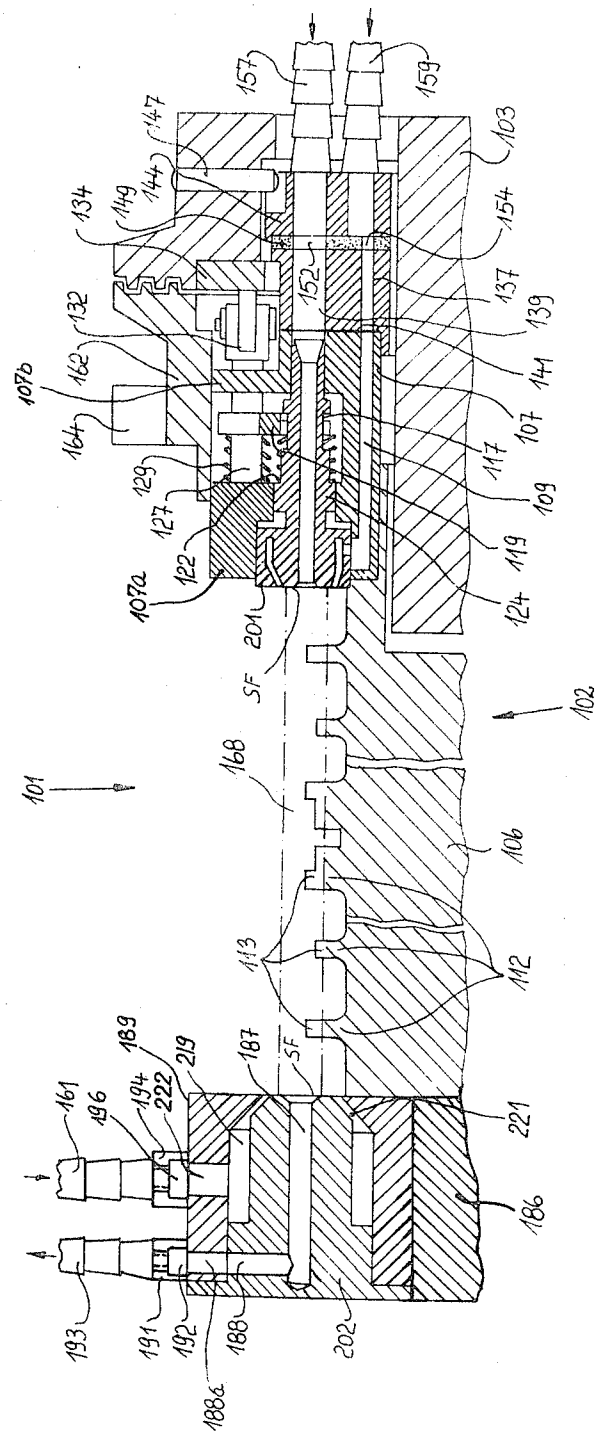
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Fig. 2

Fig. 3

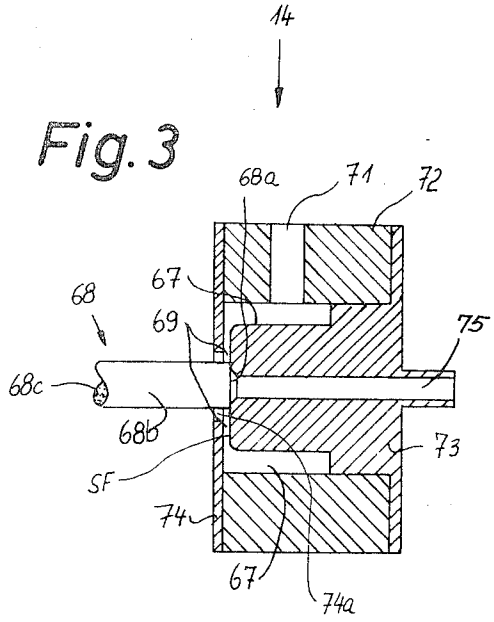
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Fig. 4

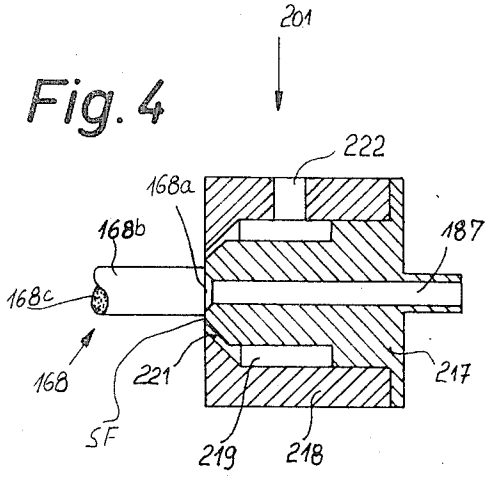
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Fig. 5

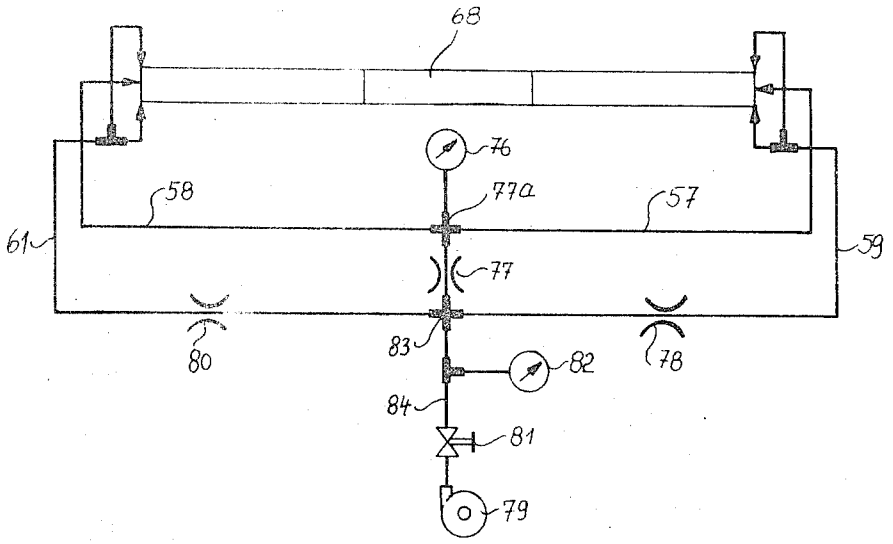
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Fig. 6

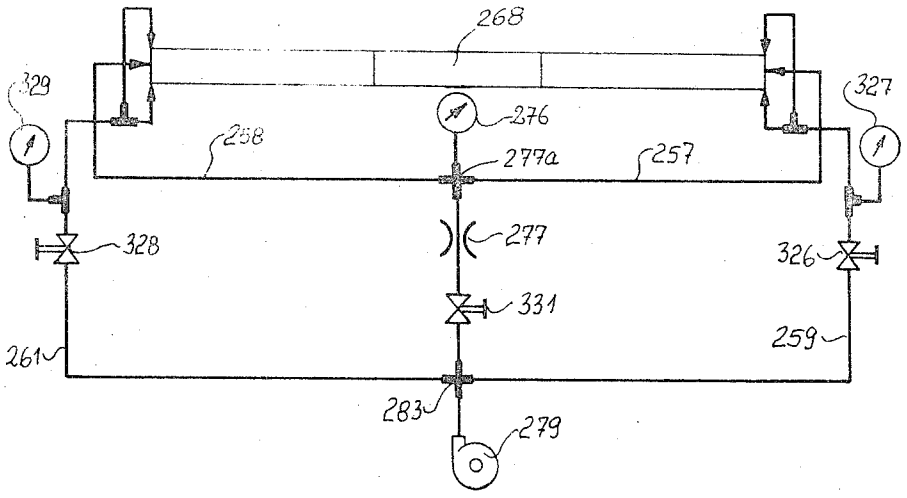
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Fig. 7

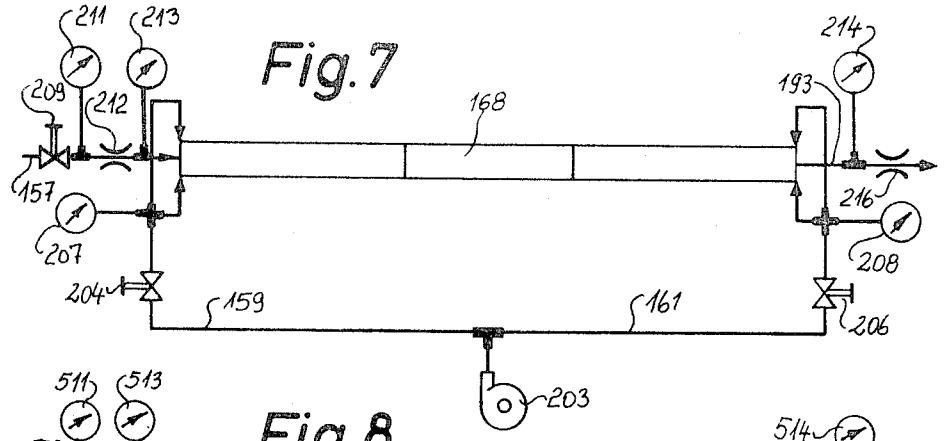



Fig. 8

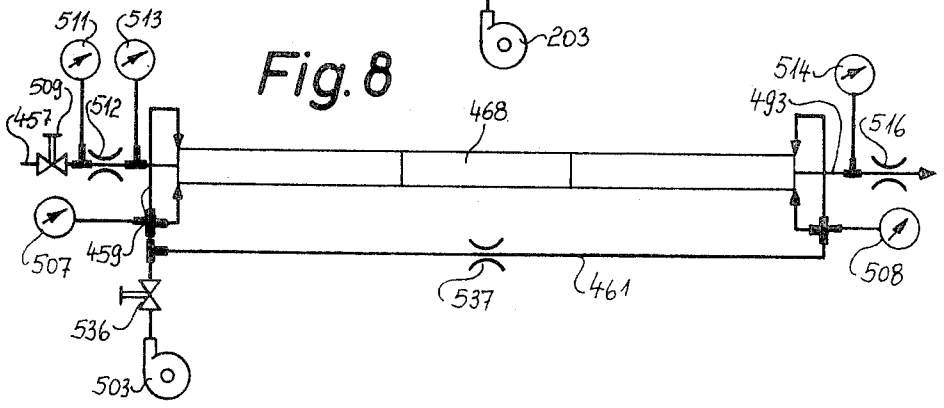
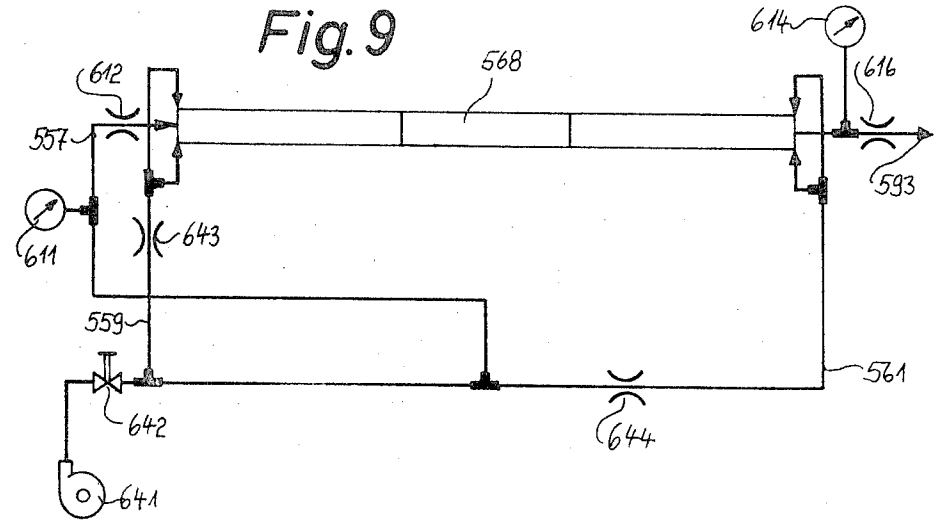



Fig. 9



# METHOD AND APPARATUS FOR TESTING CIGARETTES OR LIKE ROD-SHAPED ARTICLES

## BACKGROUND OF THE INVENTION

The present invention relates to a method and apparatus for testing plain or filter-tipped cigarettes, cigars or cigarillos, filter rod sections and analogous rod-shaped articles. More particularly, the invention relates to improvements in a method and apparatus for testing cigarettes or analogous rod-shaped articles while the articles move sideways and while the ends of the articles are engaged by apertured sealing faces. The testing medium may be air or another gaseous fluid.

It is customary to test cigarettes or analogous rod-shaped articles which constitute or form part of smokers' products by means of a gaseous fluid which is admitted into one or both ends of each article to be tested. Such testing involves the examination of articles for the quality of their rod-like fillers and/or for the presence or absence of holes, open seams, torn end surfaces and/or other defects of their tubular wrappers. Problems arise in connection with the testing of cigarettes or analogous articles which are produced in the form of a continuous rod and are thereupon subdivided by passing them through a so-called cutoff wherein an orbiting knife severs the rod at predetermined intervals so as to convert the rod into a succession of sections of desired length. It happens again and again that the orbiting knife does not sever the rod in a plane which is exactly normal to the rod axis. Consequently, when such articles are tested in an apparatus wherein the end surface of the tubular wrapper are engaged by pairs of apertured sealing faces, the sealing faces do not move into full engagement with the entire end surfaces of the wrappers. Therefore, some testing fluid can escape through the gaps between the sealing faces and the adjacent end surfaces of the wrappers and this can result in faulty indications of the testing unit which monitors the pressure or another characteristic of testing fluid, either while the fluid is being admitted into the wrapper of an article or after the stream of testing fluid has issued from one end of the wrapper. In other words, the failure of the one and/or the other sealing face to fully engage the adjacent end surface of the tubular wrapper between a pair of aligned sealing faces may result in an indication which is identical with that which is produced when the wrapper has one or more pronounced holes or an open seam. On the other hand, the cigarette rod sections whose ends are not located in planes which are exactly normal to the axes of the respective cigaretts are not necessarily defective because, when such cigarette rod sections are united with filter stubs to form filter cigarettes, the slanted end surfaces of the cigarette rod sections are normally those which face away from the respective filter stubs so that they are ignited when the filter cigarette is lighted. Such lighting usually results in immediate combustion of a certain length of the tubular paper wrapper so that the fact that the free end of the tobacco-containing section of a filter cigarette was cut at a slant is not even noticed by the smoker.

German printed publication No. 1,532,189 discloses a testing apparatus wherein the article-engaging sealing faces are provided on elastic portions of sealing elements. A drawback of such apparatus is that the wear on the sealing elements is extensive so that they must be exchanged, inspected and/or readjusted at frequent intervals with attendent losses in output of the testing apparatus. The elastic portions of the sealing elements must be inflated in order to provide a satisfactory sealing action. The manufacturing cost of such sealing elements is very high.



## SUMMARY OF THE INVENTION

An object of the invention is to provide a novel and improved method of testing the fillers and/or wrappers of plain or filter-tipped cigarettes or analogous rod-shaped articles which constitute or form part of smoker's products according to which the testing operation will not result in ejection or segregation of articles having wrappers with end surfaces located in planes which make an acute or obtuse angle with the article axis.

Another object of the invention is to provide a testing method according to which the testing of articles whose appearance or configuration does not conform exactly to the desired configuration but which are otherwise satisfactory can be carried out with equal facility as the testing of articles which are of proper size and/or shape.

A further object of the invention is to provide a novel and improved apparatus for testing the fillers and/or wrappers of cigarettes or analogous rod-shaped articles which is capable of properly testing articles of perfect shape as well as slightly imperfect articles.

Still another object of the invention is to provide a testing apparatus which can accept and properly test articles whose axial length deviates from a desired length and which can test such articles at the rate at which the articles issue from a high-speed machine for the production of plain or filter-tipped cigarettes or the like.

One feature of the invention resides in the provision of a method of testing the fillers and/or wrappers of cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler. Examples of such articles are plain or filter-tipped cigarettes, cigars or cigarillos as well as sections of filter rods. The method comprises the steps of moving an article sideways between travelling first and second sealing faces, moving at least the first sealing face toward the second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween (the extent to which a sealing face engages the adjacent end surface depends on the position of the plane of such end surface with reference to the axis of the tubular wrapper), passing a gaseous testing fluid between the apertured sealing faces and through the gas permeable filler therebetween, and simultaneously directing streams of a gaseous sealing fluid against the exterior of the tubular wrapper in the region of the two sealing faces.

The method may further comprise the steps of maintaining the testing fluid in each of the apertured sealing faces at a first predetermined pressure in the absence of leaks in the tubular wrapper between the sealing faces, and maintaining the sealing fluid in the region of each sealing face at a second predetermined pressure which at least approximates the pressure of testing fluid in the respective sealing faces. The directing step may include discharging annular streams of compressed air or other suitable gaseous sealing fluid substantially radially of the tubular wrapper between the sealing faces. More particularly, the annular streams of sealing fluid

can be at least substantially normal to the axis of the tubular wrapper between the sealing faces or each annular stream of sealing fluid can be discharged in a direction making an oblique angle with the axis of the tubular wrapper between the sealing faces so that the direction of sealing fluid discharge has a component which is normal to and a component which is parallel with the axis of the wrapper.

The passing step may include admitting streams of compressed testing fluid into both ends of the gas permeable filler between the sealing faces. The method may further comprise the step of monitoring in the course of the passing step any changes in at least one characteristic of the testing fluid. Such changes are indicative of the quality of the tubular wrapper and/or filler between the sealing faces. The characteristic is preferably the pressure of testing fluid, and such testing fluid can be admitted into one or both ends of the wrapper between the sealing faces.

The passing step may comprise admitting a stream of compressed testing fluid into one end of the filler between the sealing faces and monitoring at least one characteristic of the stream of testing fluid after it issues from the other end of the filler.

The method may further comprise the steps of establishing a source of compressed gaseous fluid, discharging from such source at least one first fluid stream which constitutes the testing fluid, and discharging from the source two second fluid streams which constitute the streams of sealing fluid.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved testing apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary axial sectional view of a testing apparatus which embodies one form of the invention;

FIG. 2 is a similar fragmentary axial sectional view of a second testing apparatus;

FIG. 3 is an enlarged axial sectional view of a section of a sealing element in the apparatus of FIG. 1;

FIG. 4 is an enlarged axial sectional view of a section of a sealing element in the apparatus of FIG. 2;

FIG. 5 is a diagram of the pneumatic circuit in the testing apparatus of FIG. 1;

FIG. 6 is a similar diagram of a pneumatic circuit which constitutes a modification of the circuit shown in FIG. 5;

FIG. 7 is a diagram of the pneumatic circuit in the apparatus of FIG. 2;

FIG. 8 is a diagram of a pneumatic circuit which constitutes a first modification of the pneumatic circuit shown in FIG. 7; and

FIG. 9 is a diagram of a pneumatic circuit which constitutes a second modification of the circuit shown in FIG. 7.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The testing apparatus of FIG. 1 comprises a testing conveyor 1 which includes a drum-shaped body or rotor 2 and two stationary end portions or caps 3 and 4 secured to a stationary shaft (not shown) which rotatably supports the rotor 2. Thus, the end portions 3 and 4 do not share the movements of the rotor 2. The rotor 2 includes a cylindrical central portion 6 and two annular holders 7 and 8 which are disposed at the opposite axial ends of and rotate with the cylindrical portion 6.

The cylindrical portion 6 is provided with equidistant sets of axially aligned projections 12 which define composite receiving means or flutes 13 each adapted to receive a rod-shaped article 68 constituting a filter cigarette of double unit length. Each such article 68 has a tubular wrapper 68*b* (see FIG. 3) with two annular end surfaces 68*a* (one shown in FIG. 3) and a rod-shaped filler 68*c* which is surrounded by the tubular wrapper 68*b* and is permeable to gas. FIG. 1 merely shows a single receiving means or flute 13 but is clear that the cylindrical portion 6 is provided with a substantial number of equidistant flutes which are parallel to its axis and each of which can receive a discrete rod-shaped article 68.

Each of the holders 7 and 8 has a substantially U-shaped profile and includes an annular central portion disposed between two ring-shaped flanges 7*a*, 7*b* and 8*a*, 8*b*. The annular central portions of the holders 7 and 8 are secured to and rotate with the cylindrical portion 6 of the rotor 2. The holders 7 and 8 are provided with aligned axially parallel holes for reception of specially configurated tubular sealing elements 14 and 16. Each pair of sealing elements 14, 16 is disposed at the opposite axial ends of the respective flute 13. The holders 7, 8 are further provided with sets of axially parallel channels 9 and 11, one for each sealing element 14 or 16, which serve to supply compressed gaseous sealing fluid to the nozzles 69 (see FIG. 3) of the respective sealing elements. Each of the sealing elements 14, 16 is parallel with the axis of the cylindrical portion 6 and each thereof extends across the space between the flanges 7*a*, 7*b* or 8*a*, 8*b* of the respective holder 7, 8. In the spaces between such flanges, the sealing elements 14 and 16 are respectively provided with annular recesses or constrictions 17, 18 which receive bifurcated portions 19, 21 of axially parallel pin-shaped followers 27, 28, one for each of the sealing elements 14, 16. A median portion of each sealing element 14 is surrounded by a relatively weak helical spring 22 which bears against a collar 24 of the respective sealing element 14 and reacts against the respective bifurcated portion 19. Similar relatively weak helical springs 23 surround the sealing elements 16 and bear against the collars 26 of such sealing elements while reacting against the respective bifurcated portions 21. The purpose of the helical springs 22, 23 is to bias the respective sealing elements 14, 16 toward each other i.e., toward the adjacent ends of the associated flute 13.

The followers 27, 28 are reciprocably mounted in the flanges 7*a*, 7*b* and 8*a*, 8*b* of the respective holders 7 and 8. Such followers are respectively surrounded by relatively strong helical springs 29 and 31 each of which reacts against the respective flange 7*a*, 8*a* and bears against the respective bifurcated portion 19, 21. These bifurcated portions are rigid with the respective followers 27, 28. The outer end portions of the followers 27, 28 extend beyond the flanges 7*b*, 8*b* and respectively carry rollers 32, 33 which track stationary ring-shaped face cams 34, 36 which are respectively mounted in the

end portions 3 and 4. The springs 29 bias the rollers 32 against the adjacent left-hand face of the cam 34, and the springs 31 bias the rollers 33 against the adjacent right-hand face of the cam 36. The outer end portions of the holders 7, 8 are respectively connected with rings 37, 38 which are provided with pairs of axially parallel bores 39, 41 and 42, 43. One pair of bores 39, 41 is provided for each sealing element 14, and one pair of bores 42, 43 is provided for each sealing element 16. Each bore 39 is aligned with the axial bore 75 of the respective sealing element 14, and each bore 42 is alinged with the axial bore 75 of the respective sealing element 16. Each bore 41 is aligned with the respective channel 9 of the holder 7, and each bore 43 is aligned with the respective channel 11 of the holder 8.

The stationary end portions 3 and 4 respectively support ring-shaped valve plates 44 and 46 which are respectively secured to the corresponding end portions 3, 4 by radially extending pins 47, 48. The inner end faces of the valve plates 44, 46 are provided with washers 49, 51 which respectively abut against the rotary rings 37, 38. As shown in FIG. 1, the pins 47, 48 allow the valve plates 44, 46 to move axially of the cylindrical portion 6, and the testing apparatus further comprises suitable springs, not shown, which bias the washers 49, 51 of the valve plates 44, 46 against the respective rings 37, 38. The valve plate 44 and its washer 49 are provided with an arcuate slot 52 into which a gaseous testing fluid can enter on its way into successive bores 39 in response to rotation of the cylindrical portion 6 and holders 7, 8 with respect to the stationary end portions 3, 4. A similar arcuate slot 54 is provided in the valve plate 44 and its washer 49 radially inwardly of the slot 52 to allow for admission of gaseous sealing fluid into successive bores 41 of the ring 37 and hence into successive channels 9 of the holder 7 when the cylindrical portion 6 rotates. The valve plate 46 and its washer 51 are provided with two arcuate slots 53, 56. The slot 53 admits testing fluid into successive bores 42, and the slot 56 admits sealing fluid into successive bores 43 when the cylindrical portion 6 rotates with the holders 7 and 8. The length of the slots 52, 54 and 53, 56 in the valve plates 44, 46 and their washers 49, 51 corresponds to the length of the testing station through which successive rod-shaped articles 68 travel sideways when the rotor 2 is driven by a suitable system of gears or the like, not shown. The valve plates 44, 46 are respectively connected with the discharge ends of conduits 57, 58 which serve to admit into the slots 52, 53 a compressed gaseous testing fluid, preferably air. The valve plates 44 and 46 are further connected with conduits 59, 61 which serve to admit a compressed gaseous sealing fluid (preferably air) into the respective slots 54, 56.

The holders 7 and 8 are respectively connected with sleeves 62, 63 which extend across the spaces between the flanges 7*a*, 7*b* and 8*a*, 8*b* and carry a number of equidistant projections 64, 66. The sleeve 62 forms with the stationary end portion 3 a labyrinth seal 62*a* serving to prevent entry of atmospheric air into the space which accommodates the rollers 32 of the followers 27. A similar labyrinth seal 63*a* is formed by the sleeve 63 with the stationary end portion 4 to prevent entry of atmospheric air into the space which accommodates the rollers 33 of the followers 28. The projections 64 and 66 of the sleeves 62 and 63 serve to generate pulses in synchronism with rotation of the rotor 2. Such projections may constitute permanent magnets which move past stationary induction coils in a manner well known from the art of testing apparatus for cigarettes or the like.

The front or inner section of the tubular sealing element 14 is shown on a larger scale in FIG. 3. It will be seen that this section of the sealing element 14 is formed with an annular chamber 67 the front or left-hand portion of which communicates with the orifice of the aforementioned annular nozzle 69. The front section of the sealing element 14 is further provided with a radially extending port 71 which serves to admit sealing fluid into the chamber 67 and by way of this chamber into the orifice of the annular nozzle 69. The port 71 communicates with the respective channel 9 of the holder 7 and by way of this channel with the respective bore 41 of the ring 37. Thus, when the rotor 2 is in motion, the annular nozzle 69 in the front section of the sealing element 14 will receive a sealing fluid during the interval of travel of the sealing element 14 past the testing station which is determined by the position and length of the slots 52, 54 in the valve plate 44 and its washer 49.

FIG. 3 further shows that the front section of the sealing element 14 includes a cylindrical central portion 73 and an annulus 72 which surrounds the cylindrical portion 73. The chamber 67 is machined into the periphery of the cylindrical portion 73 and the port 71 is machined into the annulus 72. The front end of the annulus 72 is connected with a disk 74 which has a centrally located opening 74*a* large enough to permit entry of the adjacent end of a rod-shaped article 68. The end surface 68*a* of the wrapper 68*b* of such article then abuts against the apertured annular sealing face SF of the cylindrical portion 73 so that the right-hand end of the rod-like filler 68*c* of the article 68 is adjacent to the discharge end of the axial bore 75. This bore 75 communicates with the slot 52 of the valve plate 44 and its washer 49 during travel of the article 68 past the testing station. It will be noted that the orifice of the annular nozzle 69 is defined in part by the inner side of the disk 74 and in part by the apertured sealing face SF on the cylindrical portion 73 of the front section of the sealing element 14. The orifice of this nozzle is located in a plane which is exactly normal to the axis of the article 68 shown in FIG. 3, i.e., normal to the longitudinal direction of the respective flute 13. Therefore, when the port 71 communicates with the conduit 59, it discharges an annular stream of compressed sealing fluid against the exterior of the tubular wrapper 68*b* in immediate proximity of the right-hand end surface 68*a*. Such annular stream of sealing fluid prevents uncontrolled escape of testing fluid which is admitted by way of the bore 75 even if the apertured sealing face SF engages only a relatively small portion of the end surface 68*a*. Such situation may arise when the plane of the end surface 68*a* is not exactly normal to the axis of the article 68. Consequently, an article 68 which is otherwise satisfactory but has a wrapper 68*b* whose end surface or end surfaces 68*a* are not located in a plane which is exactly normal to the article axis will not be segregated as a defective article because the annulus of sealing fluid which impinges against the external surface of the wrapper 68*b* in immediate proximity of the end surface 68*a* will prevent escape of testing fluid which is admitted by way of the bore 75, especially if the pressure of sealing fluid is maintained at a value which at least approximates the pressure of testing fluid in the bore 75.

The front section of the sealing element **14** shown in FIG. **3** is separably or permanently connected with the rear or outer section which is provided with the aforementioned recess **17** and collar **24.** The sealing elements **16** are preferably identical with the sealing elements **14** and are mirror symmetrical thereto with reference to a plane which is normal to the axis of the rotor **2** and extends midway between the flanges **7***a* and **8***a*.

FIG. **5** illustrates a diagram of the pneumatic circuit in the testing apparatus of FIG. **1.** The reference characters **57** and **58** denote the aforementioned conduits which admit testing fluid to the respective ends of the fillers **68***c* which travel past the testing station. The conduits **57** and **58** communicate with each other and are connected with a pressure gauge **76** which monitors a variable characteristic of testing fluid, preferably the pressure of such testing fluid, during introduction of testing fluid into the ends of an article **68** at the testing station. If the deviation of the pressure of testing fluid from a normal pressure is sufficiently large to be indicative of a defective article, for example, because the filler **68***c* of the article does not contain enough or contains too much tobacco or filter material, or because the wrapper **68***b* has one or more holes or an open seam, the gauge **76** produces a signal which is transmitted to an ejecting device (not shown) which expels the defective article **68** before the article is allowed to leave the respective flute **13** or while the article is being transported by a further conveyor, not shown.

FIG. **5** further shows a common source **79** of compressed fluid, for example, an air compressor which can admit compressed gaseous fluid to the conduits **57, 58** by way of a supply conduit **84** controlled by an adjustable valve **81.** The pressure of gas which issues from the valve **81** and is about to enter the conduits **57, 58** is measured by a gauge **82.** The supply conduit **84** further contains a flow restrictor **77** which is located immediately upstream of a junction **77***a* for the conduits **57, 58.** A further junction **83** in the supply conduit **84** serves as a means for admitting compressed sealing fluid to the conduits **59** and **61.** These conduits respectively contain flow restrictors **78** and **80.** It will be noted that the testing apparatus of FIG. **1** utilizes a single source of compressed gaseous fluid, namely, the air compressor **79,** which delivers such fluid to the conduits **57, 58** for admission into the ends of successive filter cigarettes **68** of double unit length while such cigarettes travel past the testing station, as well as for admission into the conduits **59, 61** so as to insure proper sealing of the ends of tubular wrappers **68***b* on such articles during travel along the slots **54** and **56.**

The holder **8** and its sealing elements **16** constitute a first sealing unit, and the holder **7** with its sealing elements **14** constitutes a second sealing unit. Both sealing units share all angular movements of the cylindrical portion **6.** The cams **34, 36** and the followers **27, 28** constitute displacing means for moving the apertured sealing faces SF of aligned sealing elements **14, 16** toward each other during movement of respective flutes toward the testing station.

The operation of the testing apparatus of FIGS. **1, 3** and **5** is as follows:

Filter cigarettes **68** of double unit length are fed into successive flutes **13** at a first transfer station which is located upstream of the testing station (determined by the positions of slots **52, 54** and **53, 56** in the valve plates **44, 46** and their washers **49, 51**). The configuration of cam faces on the cams **34, 36** is such that the springs **29, 31** are allowed to retract the sealing elements **14, 16** at the first transfer station so that there is ample room for insertion of successive cigarettes **68** into consecutive flutes **13.** As the cigarettes **68** approach the testing station, the respective rollers **32, 33** travel along suitably configurated lobes of the cams **34, 36** so that the sealing elements **14, 16** are caused to move toward each other whereby the sealing faces SF of their cylindrical portions **73** engage the adjacent end surfaces **68***a* of tubular wrappers **68***b* in the aligned flutes **13.** The extent of retraction of sealing elements **14, 16** at the first tranfer station is preferably such that the exposed surfaces of their respective disks **74** are in common planes with the inner end faces of the flanges **7***a*, **8***a*. The lengthwise movements of followers **27, 28** are communicated to the respective sealing elements **14, 16** by way of bifurcated portions **19, 21** and helical springs **22, 23.** The helical springs **29, 31** are compressed when the pairs of aligned sealing elements **14, 16** are caused to move toward each other.

The springs **22, 23** are sufficiently weak to enable the sealing elements **14, 16** to come to a halt when their sealing faces SF engage the respective end surfaces **68***a* so that the wrappers **68***b* of the cigarettes **68** are not subjected to excessive deforming stresses. The provision of relatively weak springs **22, 23** constitutes a precautionary measure in order to insure that the sealing elements **14, 16** can properly engage cigarettes **68** which are somewhat shorter or a little longer than a normal cigarette of double unit length. The source **79** furnishes a continuous stream of compressed air into the supply conduit **84** whereby such air flows through the junctions **83, 77***a* and enters the conduits **57, 58** and **59, 61.** The streams of testing air flow into the slots **52, 53** and the streams of sealing air flow into the slots **54, 56.** Thus, when the cylindrical portion **6** of the testing conveyor **1** rotates, successive channels **9, 11** move into register with the slots **54, 56** and successive pairs of axial bores **75** move into register with the slots **52, 53** to receive testing fluid. The respective nozzles **69** discharge annular streams of sealing fluid against the external surfaces of the wrappers **68***b* adjacent to the respective sealing faces SF whereby such sealing fluid escapes through the central openings **74***a* of the respective disks **74.** The pressure of air which flows into the supply conduit **84** is determined by adjustment of the valve **81,** and such pressure is indicated by the gauge **82.** The throttling action of the flow restrictors **78, 80** is selected in such a way that the pressure of sealing fluid in the conduits **59, 61** at least approximates the pressure of testing fluid in the conduits **57, 58** provided that the wrapper **68***b* of the momentarily tested cigarette **68** does not exhibit a substantial leak. The streams of testing fluid which are discharged by the conduits **57, 58** flow into the ends of fillers **68***c* in cigarettes **68** while such cigarettes travel past the testing station.

As mentioned above, the annular streams of sealing fluid which are discharged by the nozzles **69** travelling past the testing station insure satisfactory testing of cigarettes whose wrappers **68***b* have end surfaces **68***a* located in planes which are not exactly normal to the axes of such cigarettes. In the absence of annular streams of sealing fluid, such cigarettes would be ejected together with truly defective cigarettes because the testing fluid streams entering the aligned axial bores

75 of sealing elements 14, 16 which travel past the testing station would be free to escape between the sealing faces SF and the inclined end surfaces 68*a*. The streams of sealing fluid which are discharged by the nozzles 69 prevent escape of testing fluid between the sealing faces SF and the end surfaces 68*a* provided that such sealing faces and the respective end surfaces define gaps due to inclination of the end surfaces.

If a cigarette 68 which travels between the arcuate slots 52, 53 comprises a wrapper having a substantial leak, for example, a hole in the wrapper or a partially open seam, the drop of fluid pressure in the conduits 57, 58 is registered by the pressure gauge 76 and an appropriate signal is transmitted to an ejecting device, not shown, which is located downstream of the testing station. The gauge 76 can be connected with the ejecting device by a suitable transducer whose construction forms no part of the present invention. Once a cigarette 68 has moved beyond the testing station, the cams 34, 36 allow the springs 29, 31 to expand so that the corresponding sealing elements 14, 16 are retracted and the freshly tested cigarette 68 is permitted to leave the respective flute without any damage to its ends. Such cigarette can be thereupon tranferred onto a suitable cutting conveyor, not shown, wherein it is severed midway across its filter stub of double unit length so as to yield two discrete cigarettes of unit length. As mentioned before, defective cigarettes can be segregated from satisfactory cigarettes before they reach the second transfer station at which the satisfactory cigarettes are removed from their respective flutes 13, or the ejection station can be placed adjacent to a conveyor which receives satisfactory and defective cigarettes from the testing conveyor 1.

FIG. 2 illustrates a portion of a second testing conveyor 101. This conveyor is utilized for testing of filter cigarettes 168 of double unit length each of which is preferably identical with the cigarettes 68 which are tested in the apparatus of FIG. 1. The main difference between the testing apparatus of FIGS. 1 and 2 is that the apparatus of FIG. 2 comprises only one set of axially movable sealing elements 201. Such sealing elements are mounted in a holder 107 which is substantially identical with the holder 7 of FIG. 1. As shown in FIG. 4, the front or inner section of a sealing element 201 is provided with an annular nozzle 221 which is inclined with reference to the axis of the filter cigarette 168 in the respective flute 113 in such a way that the direction in which the annular stream of sealing fluid is being discharged from such nozzle 221 has a component which is substantially normal to the axis of the cigarette and a component which is substantially parallel to the cigarette. All such component parts of the testing apparatus shown in FIGS. 2, 4 and 7 which are clearly analogous to or identical with the corresponding parts of the apparatus shown in FIG. 1 are denoted by similar reference characters plus 100.

The holder 8 of FIG. 1 is replaced by a simplified holder 186 which rotates with the cylindrical portion 106 of the rotor 102 and is provided with a set of equidistant fixedly mounted sealing elements 202 replacing the sealing elements 16 of FIG. 1. The construction of each sealing element 202 is similar to that of the front section of a sealing element 201 with the exception that the sealing elements 202 are stationary with respect to the holder 186. The front section of each sealing element 201 and each sealing element 202 has an axial bore 187 which is aligned with the respective flute 113 of the cylindrical portion 106. The bore 187 of each sealing element 202 communicates with a radial bore 188 which in turn communicates with a radial bore 188*a*. The sealing element 202 shown in FIG. 2 has a convex peripheral surface 189 which forms part of a continuous cylindrical surface. The remaining portions of such continuous cylindrical surface are defined by the peripheral surfaces 189 of the other sealing elements 202 on the holder 186 which latter rotates with the cylindrical portion 106. The peripheral surfaces 189 of successive sealing elements 202 travel along the concave surface of a first shoe 191 which is connected with a conduit 193 for evacuation of testing fluid. The concave surface of the shoe 191 is provided with an arcuate chamber or slot 192 located at the testing station and serving to receive testing fluid from successive radial bores 188*a* which in turn receive such testing fluid from the radial bores 188 and axial bores 187 of successive sealing elements 202. The shoe 191 is biased against the peripheral surfaces 189 of successive sealing elements 202 by suitable springs, not shown in FIG. 2.

The peripheral surfaces 189 of successive sealing elements 202 in the holder 186 are further engaged by the concave surface of a second stationary shoe 194 which is connected with a conduit 161 for admission of sealing fluid. The concave surface of the shoe 194 has an arcuate chamber or slot 196 the length of which corresponds to the length of the chamber 192 and which is also located at the testing station. The purpose of the chamber 196 is to admit sealing fluid to radial bores 222 of consecutive sealing elements 202 when the cylindrical portion 106 is in motion. Such sealing fluid enters an annular chamber 219 of the respective sealing element 202 and the chamber 219 communicates with the aforementioned annular nozzle 221 for discharge of an annulus of sealing fluid against the external surface of the wrapper 168*b* of the cigarette 168 which is located in the respective flute 113. The conduits 157 and 159 shown in the right-hand portion of FIG. 2 are connected to the valve plate 144 in the stationary end portion 103 in the same way as the conduits 57, 59 to the valve plate 44 of FIG. 1. The conduit 157 admits testing fluid, and the conduit 159 admits sealing fluid which is allowed to enter the nozzle 221 of that axially movable sealing element 201 in the holder 107 which travels past the testing station.

Referring to FIG. 7, it will be noted that the conduit 157 for testing fluid is provided with an adjustable valve 209 and with a flow restrictor 212 located between the valve 209 and the valve plate 144 (not shown in FIG. 7). The conduit 157 is further connected with a pressure gauge 211 which monitors the pressure of testing fluid upstream of the flow restrictor 212. The conduit 193 which is connected with the aforementioned shoe 191 is provided with a flow restrictor 216 and communicates with a second pressure gauge 214 which indicates the pressure of testing fluid after such fluid has passed through a filter cigarette 168 during travel of such cigarette along the slot 152 of the valve plate 144. The source of testing fluid which is connected with the conduit 157 is not shown in FIG. 7. Such source may be a blower 203 which serves to admit compressed sealing fluid into the conduits 159, 161. Each of these conduits is provided with an adjustable valve 204, 206 and the conduits 159, 161 respectively

communicate with pressure gauges **207, 208.** The conduit **159** admits sealing fluid into the slot **154** of the valve plate **144,** and the conduit **161** admits sealing fluid into the chamber or slot **196** of the stationary shoe **194** shown in FIG. **2.** The valves **204** and **206** can be readily adjusted in such a way that the fluid pressure indicated by the gauge **207** equals or approximates the pressure indicated by a gauge **213** as well as that the gauge **208** indicates a pressure which is also indicated by the gauge **214** when the conduit **193** receives testing fluid from a satisfactory rod-shaped article **168.**

Referring again to FIG. **4,** there is shown the front section of one of the sealing elements **201** or a complete sealing element **202.** This structure comprises an annulus **218** surrounding a cylindrical portion **217.** The nozzle **221** is defined in part by the cylindrical portion **217** and in part by the annulus **218.** The apertured sealing face of the cylindrical portion **217** is shown at SF. This sealing face is in full engagement with the end surface **168***a* of a tubular wrapper **168***b* if the end surface **168***a* is located in a plane which is exactly normal to the axis of the filler **168***c* in the cigarette **168.** Otherwise, the end surface **168***a* defines with the adjacent sealing face SF a relatively small or a relatively large gap through which the testing fluid could escape to thereby enable the gauge **214** to indicate a pressure which is normally indicative of a defective article. However, since the nozzle **221** discharges an annular stream of sealing fluid, the testing fluid cannot escape and is compelled to enter the tubular wrapper **168***b* even if the end surface **168***a* is not exactly normal to the axis of the cigarette **168.** The axial bore of the cylindrical portion **217** is shown at **187.**

It will be noted that the annular stream of sealing fluid which issues from the nozzle **221** impinges upon the external surface of the wrapper **168***b* at a relatively short distance from the sealing face SF. This means that the apparatus which utilizes sealing elements of the type shown in FIG. **4** will not detect eventual damage to the outermost ends of a tubular wrapper **168***b,* namely, eventual holes or rips in those portions of the wrappers **168***b* which are located between the respective end surface **168***a* and the point where the stream of testing fluid issuing from the nozzle **221** impinges upon the wrapper. However, this is not detrimental because, when the filter cigarette **168** is thereupon severed midway between its ends to yield two filter cigarettes of unit length, and a filter cigarette of unit length is lighted, such lighting results in immediate combustion of a certain length of the wrapper **168***b* closely adjacent to the end surface **168***a* so that the presence of a leak or rip in such outermost end portion of the tubular wrapper **168***b* is of no consequence.

The construction of each sealing element **201** (fully shown in FIG. **2**) is preferably identical with that of a sealing element **14** or **16** shown in FIG. **1,** excepting that the nozzle **221** of the sealing element **201** is configurated in the same way as the nozzle **221** of a sealing element **202,** i.e., the stream of sealing fluid which issues from the nozzle of the sealing element **201** travelling past the testing station will be discharged in a direction having a component which is normal to and a component which is parallel with the axis of the article **168** in the respective flute **113.**

The operation of the apparatus shown in FIGS. **2, 4** and **7** is as follows:

The cigarettes **168** are admitted into successive flutes **113** at a first transfer station which is not shown in FIG. **2.** The cam **134** thereupon causes successive rollers **132** to move the corresponding sealing elements **201** toward the aligned sealing elements **202** so that the end surfaces **168***a* of the tubular wrapper **168***b* between such sealing elements **201, 202** are engaged by the respective sealing faces SF. From there on, the testing operation is carried out substantially in the same way as described in connection with FIGS. **1, 3** and **5,** excepting that the testing fluid is admitted by way of conduit **157** and passes through a cigarette **168** at the testing station prior to entering the conduit **193.** The sealing action of fluid which is admitted by way of conduits **159** and **161** is practically identical to the sealing action of fluid which is admitted by the conduits **59, 61** with the exception that the nozzles **221** discharge sealing fluid in directions having radial and axial components with respect to the respective cigarettes **168.** The axial movement of a sealing element **201** which approaches the testing station is terminated when its sealing face SF engages the adjacent end surface **168***a* while the other end surface **168***a* already abuts against the sealing face SF of the aligned sealing element **202** in the holder **186.** During travel past the testing station, the sealing fluid which is admitted by way of the conduit **159** and enters the slot **154** of the stationary valve plate **144** is allowed to flow to the bore **141** of the ring **137** and thereupon through the corresponding channel **109** of the holder **107** to enter the annular chamber **219** of the sealing element **201** by way of the bore **222** and to be discharged by way of the respective nozzle **221.** On the other hand, the sealing fluid which is admitted by way of the conduit **161** enters the chamber **196** of the stationary shoe **194** and flows through the radial bore **222** of the respective sealing element **202** to thereupon enter the chamber **219** and to be discharged by way of the respective annular nozzle **221.**

The pressure of testing fluid in the conduit **157** downstream of the flow restrictor **212** is substantially higher than the pressure upstream of the flow restrictor **216.** This is attributed to resistance which is offered to the flow of testing fluid by the filler **168***c* of the respective cigarette **168** as well as to at least some porosity of the tubular wrapper **168***b.* The valves **204** and **206** enable the operator to select the pressure of sealing fluid in the conduits **159** and **161** in such a way that the pressure respectively approximates the pressure downstream of the flow restrictor **212** and upstream of the flow restrictor **216** provided that the wrapper **168***b* of the tested cigarette **168** is satisfactory. Proper adjustment of pressure in the conduits **159, 161** can be readily determined by observing the pressure gauge **207** simultaneously with the pressure gauge **213** and by observing the pressure gauge **208** simultaneously with the pressure gauge **214.** The valve **209** serves to allow for selection of the initial pressure of testing fluid, and such initial pressure is indicated by the gauge **211.** The flow restrictor **212** thereupon reduces the pressure so as to make sure that the pressure of testing fluid which enters the adjacent end of the filler **168***c* travelling past the testing station is best suited for carrying out a satisfactory testing operation. Such pressure is indicated by the gauge **213.**

The pressure gauge **214** is connected with a suitable transducer which furnishes signals serving to eject those cigarettes **168** which exhibit substantial leaks or open seams so as to allow for escape of substantial

quantities of testing fluid during flow of such fluid from the conduit 157 to the conduit 193.

Referring to FIG. 6, there is shown the pneumatic circuit of a third testing apparatus. This circuit is very similar to that shown in FIG. 5 because the conduits 257 and 258 are designed to admit testing fluid into the respective ends of a filter cigarette 268 of double unit length during travel of such cigarette past a testing station. The pneumatic circuit has a single source 279 of compressed fluid (preferably air) which is admitted to the conduits 259, 261 by way of a first junction 283 and to the conduits 257, 258 by way of a second junction 277*a* after the fluid has passed through a flow restrictor 277. All flow restrictors shown in FIGS. 5 to 9 are preferably of the adjustable type. The conduits 259, 261 are respectively provided with adjustable valves 326, 328 and with pressure gauges 327, 329. The conduits 257, 258 communicate with each other and are connected with a common pressure gauge 276. The pressure gauge 276 furnishes indications or signals to a suitable transducer which controls the ejector for defective cigarettes in the same way as described in connection with FIG. 1. The valves 326 and 328 can be adjusted to insure that the pressure in conduits 259 261, will be at least substantially identical with the pressure in conduits 257 and 258 during testing of a satisfactory cigarette. The valves 326, 328 will be adjusted until the indications of the pressure gauges 327, 329 coincide with the indications of the pressure gauge 276.

It will be noted that the main difference between the circuits of FIGS. 5 and 6 is that the flow restrictors 78, 80 of FIG. 5 are replaced with the adjustable valves 326, 328.

The operation of the testing apparatus which includes the circuit of FIG. 6 is as follows:

The source 279 furnishes compressed air which is admitted to the junction 283 and thence to the conduits 259, 261 for sealing fluid. The junction 283 further admits compressed air into the conduits 257, 258 by way of the adjustable valve 331 and flow restrictor 277 as well as junction 277*a*. The gauges 327, 329 indicate whether or not the pressure of sealing fluid in the conduits 259, 261 at least approximates the pressure of sealing fluid which is being admitted into successive cigarettes 268 by way of conduits 257, 258.

Referring to FIG. 8, there is shown a circuit which is similar to the circuit of FIG. 7. A source 503 of compressed air admits such air into a first sealing air conduit 461 and a second sealing air conduit 459. The pressure of fluid in the conduits 459, 461 is determined by the valve 536 which can be adjusted by the operator. The conduit 461 contains an adjustable flow restrictor 537 and communicates with a pressure gauge 508. The conduit 459 communicates with a pressure gauge 507. The testing fluid is admitted by way of a conduit 457 which contains an adjustable valve 509 and communicates with a pressure gauge 511. Furthermore, the testing conduit 457 contains an adjustable flow restrictor 512 followed by a second pressure gauge 513. The conduit 493 which receives testing fluid after it has passed through a cigarette 468 at the testing station contains a flow restrictor 516 and is in communication with a pressure gauge 514.

The main difference between the circuits of FIGS. 7 and 8 is that the valve 206 is replaced by the flow restrictor 537.

The operation of the testing apparatus which embodies the structure of FIG. 8 is as follows:

The testing fluid is admitted from a suitable source to the conduit 457 to pass through the flow restrictor 512 and to enter the respective end of a filter cigarette 468 of double unit length while such cigarette travels past the testing station. The testing fluid thereupon enters the conduit 493 and its pressure is indicated by the gauge 514. If the pressure is without a predetermined range, the cigarette 468 is defective and the gauge 514 causes the associated transducer to effect an ejection of such cigarette. The filler of a cigarette 468 offers a certain resistance to the flow of testing fluid therethrough, particularly if such filler is satisfactory.

The valve 536 enables the attendant to select the pressure of sealing fluid in the conduit 459 in such a way that the pressure at least approximates the pressure of testing fluid downstream of the flow restrictor 512. The flow restrictor 537 reduces the pressure of sealing fluid in the conduit 461 to such an extent that the pressure indicated by the gauge 508 at least approximates the pressure of testing fluid in the conduit 493 upstream of the flow restrictor 516 (such pressure of testing fluid is indicated by the gauge 514).

Referring finally to FIG. 9, there is shown a circuit which is similar to the circuits of FIGS. 7 and 8. The main difference between the circuits of FIGS. 7–8 and FIG. 9 is that the latter circuit comprises a common source 641 of compressed air for admission to the conduit 557 for testing air and to the conduits 559, 561 for sealing fluid. All such parts of the apparatus shown in FIG. 9 which are clearly analogous to or identical with the corresponding parts of the apparatus shown in FIG. 7 are denoted by similar reference characters plus 400. The conduit which conveys fluid from the source 641 contains an adjustable valve 642 which admits fluid to the conduit 561 by way of a flow restrictor 644. The valve 642 also admits the sealing fluid to the conduit 559 which contains a flow restrictor 643. The testing air conduit 557 branches from the conduit 561 upstream of the flow restrictor 644 and contains a flow restrictor 612 as well as a control gauge 611. The testing air conduit 593 contains a flow restrictor 616 and is connected with a pressure gauge 614. The tested article is shown at 568. The flow restrictor 612 is identical with the flow restrictor 643. The purpose of the flow restrictor 644 is to reduce the pressure of sealing fluid in the conduit 561 to match the pressure of testing fluid as indicated by the gauge 614.

The operation of the testing apparatus which embodies the structure of FIG. 9 is as follows:

The source 641 furnishes compressed air to the conduits 559, 561 and 557. The pressure of fluid prior to entry into such conduits is selected by the setting of adjustable valve 642. The gauge 611 performs only a controlling function, for example, to indicate a buildup of pressure in the event of a clogging of the conduits.

An important advantage of the improved testing method and apparatus is that they allow for discrimination between truly defective articles and those articles whose configuration might not be perfect but which can still be classified with satisfactory articles. Thus, the number of unnecessary rejects is reduced to a minimum because the testing apparatus does not initiate the ejection of cigarettes having one or both end surfaces of their wrappers located in planes which are not exactly normal to the article axis.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of our contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by letters Patent is set forth in the appended CLAIMS:

**1.** A method of testing cigarettes or analogous rod-shaped articles wherein an openended tubular wrapper having two end surfaces surrounds a gas-permeable filler, comprising the steps of moving an article sideways between travelling first and second apertured sealing faces; moving at least said first sealing face toward said second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween; passing a gaseous testing fluid between said apertured sealing faces through the gaspermeable filler therebetween; and simultaneously directing streams of a gaseous sealing fluid against the exterior of the tubular wrapper in the region of said sealing faces so that said sealing fluid opposes the escape of said testing fluid between said sealing faces and the respective end surfaces.

**2.** A method as defined in claim **1,** wherein said directing step includes discharging annular streams of sealing fluid substantially radially of the tubular wrapper between said sealing faces.

**3.** A method as defined in claim **2,** wherein said annular streams of sealing fluid are at least substantially normal to the axis of the tubular wrapper between said sealing faces.

**4.** A method as defined in claim **1,** further comprising the step of monitoring in the course of said passing step changes in at least one characteristic of the testing fluid, such changes being indicative of the quality of the article between said sealing faces.

**5.** A method as defined in claim **4,** wherein said characteristic is the pressure of testing fluid and said testing fluid is admitted into both ends of the wrapper between said sealing faces.

**6.** A method as defined in claim **1,** wherein said passing step comprises admitting a stream of testing fluid into one end of the filler between said sealing faces and monitoring at least one characteristic of the stream of testing fluid after it issues from the other end of the filler.

**7.** In a testing apparatus for cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, a combination comprising a mobile conveyor having at least one elongated receiving means positioned thereon to support an article for sidewise movement in response to movement of said conveyor; a first sealing unit provided on said conveyor and having at least one apertured sealing face adjacent to one end of said receiving means; a second sealing unit including at least one tubular sealing element having an apertured sealing face adjacent to the other end of said receiving means; displacing means for moving at least one of said sealing faces toward the other sealing face during movement of said conveyor so that at least a portion of each end surface on the tubular wrapper of an article in said receiving means is engaged by the respective sealing face; mean for passing a gaseous testing fluid between said sealing units by way of a wrapper in said receiving means while the end surfaces of the wrapper are engaged by said sealing faces; and means for directing annular streams of a gaseous sealing fluid against the exterior of the wrapper in said receiving means in the region of said sealing faces while the end surfaces of the wrapper are engaged by said sealing faces so that said sealing fluid opposes the escape of said testing fluid between said sealing faces and the respective end surfaces.

**8.** A combination as defined in claim **7,** wherein said fluid directing means includes annular nozzles provided in said heating units and arranged to discharge annuli of sealing sealing againt the exterior of the wrapper in said receiving means.

**9.** A combination as defined in claim **8,** wherein each of said nozzles is arranged to discharge compressed gaseous sealing fluid substantially at right angles to the longitudinal direction of said receiving means.

**10.** A combination as defined in claim **7,** wherein said fluid passing means comprises first conduit means for admitting testing fluid into one end of a wrapper in said receiving means by way of one of said apertured sealing faces, second conduit means for receiving testing fluid by way of the other apertured sealing face, and means for monitoring a characteristic of the testing fluid in said second conduit means.

**11.** A method of testing cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gase-permeable filler, comprising the steps of moving an article sideways between travelling first and second apertured sealing faces; moving at least said first sealing face toward said second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween; passing a gaseous testing fluid between said apertured sealing face through the gas-permeable filler therebetween; simultaneously directing streams of a gaseous sealing fluid against the exterior of the tubular wrapper in the region of said sealing faces; maintaining the testing fluid in each of said apertured sealing faces at a first predetermined pressure in the absence of leaks in the tubular wrapper between said sealing faces; and maintaining the sealing fluid in the region of each of said sealing faces at a second predetermined pressure which at least approximates the pressure of testing fluid in the respective sealing faces.

**12.** A method of testing cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, comprising the steps of moving an article sideways between travelling first and second apertured sealing faces; moving at least said first sealing face toward said second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween; passing a gaseous testing fluid between said apertured sealing faces through the gas-permeable filler therebetween; and simultaneously directing streams of a gaseous sealing fluid against the exterior of the tubular wrapper in the region of said sealing faces, including discharging annular streams of sealing fluid substantially radially of the tubular wrapper between said sealing faces, each of said annular streams of sealing fluid being discharged in a direction making an oblique angle with the axis of

the tubular wrapper between said sealing faces so that said direction has a component which is normal to and a component which is parallel with the axis of the wrapper.

13. A method of testing cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, comprising the steps of moving an article sideways travelling first and second apertured sealing faces; moving at least said first sealing face toward said second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween; passing a gaseous testing fluid between said apertured sealing faces through the gas-permeable filler therebetween, including admitting streams of compressed testing fluid into both ends of the gas-permeable filler between said sealing faces; and simultaneously directing streams of a gaseous sealing fluid against the exterior of the tubular wrapper in the region of said sealing faces.

14. A method of testing cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, comprising the steps of moving an article sideways between travelling first and second apertured sealing faces; moving at least said first sealing face toward said second sealing face so that each sealing face engages at least a portion of the respective end surface of the wrapper therebetween; passing a gaseous testing fluid between said apertured sealing faces through the gas-permeable filler therebetween; simultaneously directing streams of a gaseous sealing surface against the exterior of the tubular wrapper in the region of said sealing faces; establishing a source of compressed gaseous fluid; discharging from said source at least one first fluidstream which constitutes said testing fluid; and discharging from said source two second fluid streams which constitute said streams of sealing fluid.

15. In a testing apparatus for cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, a combination comprising a mobile conveyor having at least one elongated receiving means positioned thereon to support an article for sidewise movement in response to movement of said conveyor; a first sealing unit provided on said conveyor and having at least one apertured sealing face adjacent to one end of said receiving means; a second sealing unit including at least one tubular sealing element having an apertured sealing face adjacent to the other end of said receiving means; displacing means for moving at least one of said sealing faces toward the other sealing face during movement of said conveyor so that at least a portion of each end surface on the tubular wrapper of an article in said receiving means is engaged by the respective sealing face; means for passing a gaseous testing fluid between said sealing units by way of a wrapper in said receiving means while the end surfaces of the wrapper are engaged by said sealing faces; means for directing annular streams of a gaseous sealing fluid against the exterior of the wrapper in said receiving means in the region of said sealing faces while the end surfaces of the wrapper are engaged by said sealing faces; means for maintaining the testing fluid in each of said units at a first predetermined pressure in the absence of leaks in the wrapper located in said receiving means; and means for maintaining the sealing fluid at a second pressure which at least approximates said first pressure.

16. In a testing apparatus for cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surround a gas-permeable filler, a combination comprising a mobile conveyor having at least one elongatd receiving means positioned thereon to support an article for sidewise movement in response to movement of said conveyor; a first sealing unit provided on said conveyor and having at least one apertured sealing face adjacent to one end of said receiving means; a second sealing unit including at least one tubular sealing element having an apertured sealing face adjacent to the other end of said receiving means; displacing means for moving at least one of said sealing faces toward the other sealing face during movement of said conveyor so that at least a portion of each end surface on a tubular wrapper of an article in said receiving means is engaged by the respective sealing face; means for passing a gaseous testing fluid between said sealing units by way of a wrapper in said receiving means while the end surfaces of the wrapper are engaged by said sealing faces; and means for directing annular streams of a gaseous sealing fluid against the exterior of the wrapper in said receiving means in the region of said sealing faces while the end surfaces of the wrapper are engaged by said sealing faces, including annular nozzles provided in said sealing units and arranged to discharge annuli of sealing fluid against the exterior of the wrapper in said receiving means, each of said nozzles being arranged to discharge compressed gaseous sealing fluid in a direction which has a component normal to and a component parallel with the longitudinal direction of said receiving means.

17. In a testing apparatus for cigarettes or analogous rod-shaped articles wherein an open-ended tubular wrapper having two end surfaces surrounds a gas-permeable filler, a combination comprising a mobile conveyor having at least one elongated receiving means positioned thereon to support an article for sidewise movement in response to movement of said conveyor; a first sealing unit provided on said conveyor and having at least one apertured sealing face adjacent to one end of said receiving means; a second sealing unit including at least one tubular sealing element having an apertured sealing face adjacent to the other end of said receiving means; displacing means for moving at least one of said sealing faces toward the other sealing face during movement of said conveyor so that at least a portion of each end surface on the tubular wrapper of an article in said receiving means is engaged by the respective sealing face; means for passing a gaseous testing fluid between said sealing units by way of a wrapper in said receiving means while the end surfaces of the wrapper are engaged by said sealing faces, comprising a source of compressed gaseous testing fluid, communicating first and second conduit means respectively connected with said first and second sealing units to admit testing fluid into both ends of a wrapper in said receiving means by way of the respective apertured sealing faces, and means for monitoring a characteristic of testing fluid in said communicating conduit means; and means for directing annular streams of a gaseous sealing fluid against the exterior of the wrapper in said receiving means in the region of said sealing faces while the end surfaces of the wrapper are engaged by said sealing faces.

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