Nov. 25, 1952 R. E. WAGENHALS 2,618,963

TUBE TESTING MACHINE

Filed April 4, 1949

FIG. 1.

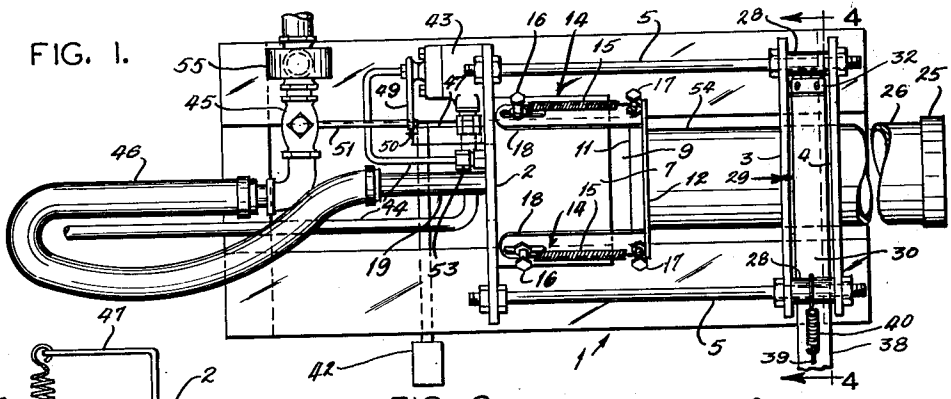


FIG. 2.

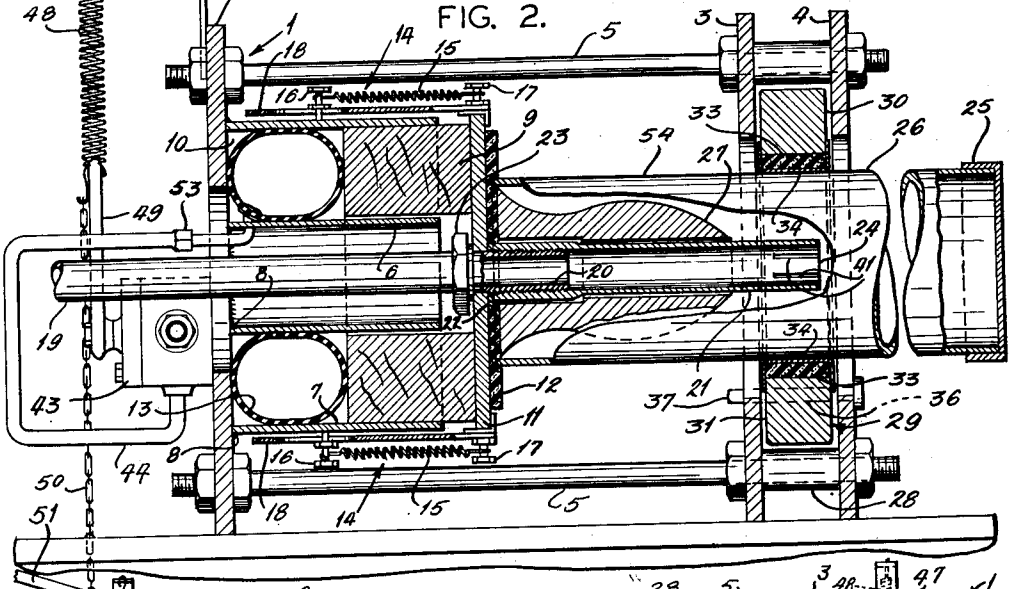


FIG. 3.

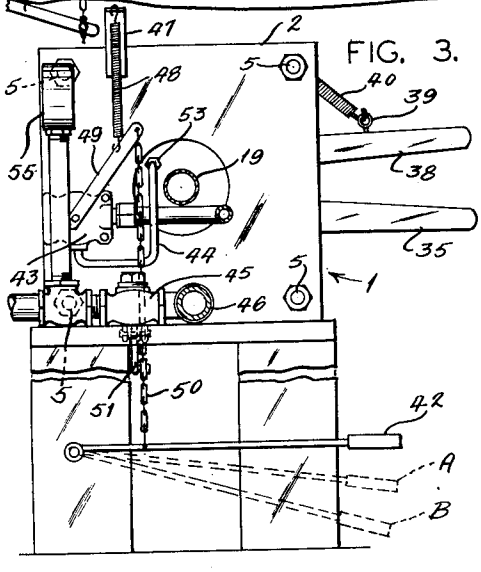
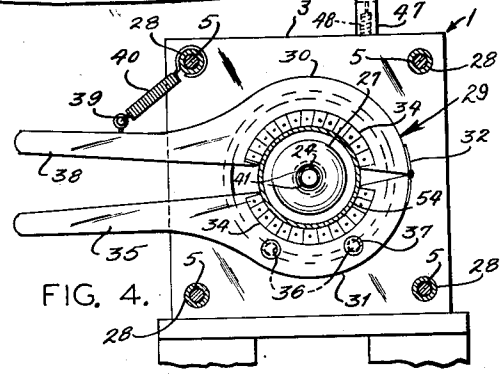


FIG. 4.



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TUBE TESTING MACHINE

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2 Claims. (Cl. 73—37)

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This invention relates to machines for testing the strength of tubes, particularly shipping tubes made of wound paper and having a slip cap adhesively secured to one end thereof. This invention comprises a supporting frame, a nozzle adapted to be positioned in a shipping tube having one open end and one capped end, means for controlling the flow of air through said nozzle, and means for holding said tube against lengthwise movement.

The object of this invention is to help establish a quality standard for shipping tubes by testing the strength of the tube, the cap strength, and the strength of the joint between the cap and the tube.

Another object of this invention is to provide a test for the impact load capacity of the capped end of a tube by directing a blast of air against said capped end.

Another object of this invention is to apply a load, by means of air pressure inside the tube, which will be comparable to the actual shipping load.

Another object of this invention is to provide an easily applied gripping means for securing the tube being tested.

Another object of this invention is to provide for the automatic and effective sealing of the open end of the tube before testing pressure is applied.

A further object of this invention is to provide a tube testing machine of simple design requiring only a few simple motions for inserting and withdrawing the tube to be tested.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a plan view of the device,

Fig. 2 is a longitudinal vertical cross-sectional view of the device with the return devices shown rotated around the outer cylinder 45° from their position in Fig. 1,

Fig. 3 is a vertical view of the left end of the device; and

Fig. 4 is a cross-sectional view taken along the lines 4—4 of Fig. 1.

In the accompanying drawings, my invention is shown in a tube testing machine comprising a frame 1 consisting of an upstanding left plate 2 and two spaced upright right plates 3 and 4 disposed in spaced relation to the left plate 2 by means of tie rods 5. To the inside of the left plate 2 are concentrically secured an inner cylinder 6 and an outer cylinder 7 by means of welds 8. Into the annulus so formed is slidably mounted an annular piston 9, so that a space 10 is formed between the left plate 2 and the annular piston 9. A stop plate 11 is secured to the right face of annular piston 9. Fastened to the stop plate 11 is a resilient gasket 12. In the space 10 between the left plate 2 and the piston 9 is a self-contained expanding means such as a rubber innertube 13.

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The use of an innertube has several advantages. It provides a means for actuating the annular piston 9 which need not be made to a close tolerance. The surfaces of the inner cylinder 6 and the outer cylinder 7 require no machining since no small tolerance is required for proper functioning of the piston 9. Thus, this system requires no lubrication for the cylinder walls or the piston.

Four return devices 14 are fastened at equal intervals around the periphery of the outer cylinder 7. Each return device 14 comprises a return spring 15, one end of which is fastened to a bolt 16 mounted on the outer cylinder 7, the other end being fastened to a bolt 17 mounted on the peripheral edge of the stop plate 11, and a slotted safety guide 18 which is rigidly secured to the bolt 17 on the stop plate 11 so that the bolt 16 on the outer cylinder 7 fits within the slot on the safety guide 18.

A pipe 19 passes centrally through the left plate 2 through the inside of the inner cylinder 6 and through the stop plate 11 and terminates with a long threaded portion 20 on which a nozzle 21 is screwed. A base 22 of the nozzle 21 abuts against the stop plate 11. A nut 23 and the base 22 of the nozzle 21 cooperate to secure the pipe 19 and the nozzle 21 to the stop plate 11 so that the three move as an integral unit with the piston 9.

An orifice 24 of the nozzle 21 is positioned at a predetermined distance from a cap 25 of a tube 26 to be tested so that the inrushing air will simulate an impact load on said cap.

A tube guide 27 is slidably mounted over the nozzle 21 and abuts against the resilient gasket 12 mounted on the stop plate 11. This tube guide is for quickly and easily centering the tube 26 on the same center line as that of the piston 9, and can easily be replaced with a tube guide of another size depending upon the diameter of the tube to be tested by simply sliding said tube guide off the nozzle and sliding on one of the desired diameter.

The two right plates 3 and 4 held apart by spacers 28 support a tube holder 29 which comprises an upper jaw portion 30 and a lower jaw

portion 31 connected by a hinge 32. The jaw portions 30 and 31 are lined with a suitable friction material, such as a sponge rubber lining 33 with strips of emery cloth 34 mounted thereon at intervals. The lower jaw portion 31 is provided with a lower jaw handle 35 and holes 36 to accommodate pins 37 which hold the lower jaw portion 31 securely to the right plates 3 and 4. The upper jaw portion 30 is provided with an upper jaw handle and a screw-eye 39 for fastening one end of a spring 40. The other end of the spring 40 is secured to one of the tie rods 5.

The tube holder 29 like the tube guide 27 can be replaced with a tube holder having a jaw diameter of a different size depending upon the diameter of the tube to be tested. This is done by removing the pins 37 and replacing the tube holder with one of the proper jaw diameter, and then replacing said pins.

The end of the test nozzle 21 has slots 41 which enable the operator to clean loose fragments from the friction surfaces 33 and 34 of the tube holder 29 by holding the palm of one's hand over the nozzle orifice 24 and depressing a pedal 42 or any suitable manually operable means to its lower position causing said particles to be removed by air pressure.

The pedal 42 is the means by which a four-way valve 43 connected in an air line 44 to the innertube 13, and a cut-off valve 45 connected in an air line 46 to the nozzle 21, are actuated. A bar 47 fixed to the frame 1 secures the upper end of a spring 48, the lower end of which is connected to a control arm 49 of the four-way valve 43. A chain 50 is suspended from the control arm 49 of the four-way valve 43 and is secured to a control arm 51 of a cut-off valve 45 and to the pedal 42.

The spring 48 holds both control arm 49 and 51 and pedal 42 in their upward positions as shown in the full lines in which both valves are closed. As the pedal 42 is depressed, both control arms 49 and 51 are rotated downwardly and when the pedal 42 reaches the intermediate depressed position A as indicated by the dotted lines in Fig. 3, the four-way valve 43 opens, allowing air to pass through a reducing valve 53 and enter the innertube 13, the cut-off valve 45 remaining closed.

As the pedal 42 is further depressed to its lowest position B, as indicated by dotted lines in Fig. 3, the control arms 49 and 51 are further rotated downwardly causing the cut-off valve 45 to open, allowing a blast of air to pass through the nozzle 21 which directs it against the capped end of the tube 26. This also causes an increase in pressure within the tube 26.

As the pedal 42 is released and gradually allowed to return to its normal upward position shown in the full lines, the cut-off valve 45 is closed. When the pedal 42 reaches the intermediate depressed position A, the four-way valve 43 allows the innertube 13 to exhaust. When the pedal 42 reaches its upward position shown in the full lines, both valves are closed.

In operation, the uncapped end of the tube 26 to be tested is inserted through the right end of the device by a simple lateral movement to the left into the jaw portions 30 and 31 of the tube holder 29 and over the tube guide 27 until it abuts against the resilient gasket 12 mounted on the stop plate 11. The operator then moves the upper jaw handle 38, which is normally held up by the spring 40, downwardly so that the friction surfaces 33 and 34 of the upper jaw portion 30 contacts the outer cylindrical surface of the tube 26. Thus, the tube 26 is held securely against lateral movement by the action of the friction surfaces 33 and 34 on the jaw portions 30 and 31 of the tube holder 29.

The operator then depresses the pedal 42 to its intermediate depressed position A causing the one air line 44 to be opened and allowing air to inflate the innertube 13.

When the tube being tested is not against the gasket 12 perfectly straight, the innertube 13 allows the piston to align itself with the uncapped end of the tube 26 and thus insures an air-tight connection for the test.

The expansion of the innertube 13 forces the piston 9 and the stop plate 11 to the right and forces the resilient gasket 12 further into the uncapped end of the tube 26, said tube being held secure from lateral movement by the tube holder 29. This arrangement makes the tube air-tight. As the stop plate 11 moves to the right, the bolt 17 thereon moves likewise, causing the slotted safety guide 18 to move to the right and causing the return spring 15 to be expanded.

The four return springs 15 insure a smooth motion for the piston 9 in both its power stroke and its exhaust stroke. The slotted safety guides 18 prevent the piston 9 from rotating and provide a limit of travel to the piston movement. Should the innertube 13 blow out, the operator would be in no danger because the safety guides 18 would keep the piston 9 from moving too far to the right.

Depressing the pedal 42 to its lowest position B causes the air line 46 to be opened. This allows air to rush through pipe 19 and into the nozzle 21 which directs it to the capped end of the tube 26. Thus the inrushing air tests the impact load capacity of the capped end of the tube and tests the strength of the joint between the cap 25 and cylindrical wall 54 of tube 26. The pedal 42 is kept in the lower position B until the standard test pressure is attained as indicated on gage 55. The pressure built up within the tube 26 tests the strength of the cylindrical wall 54 of said tube.

To remove the tube, the pedal 42 is released from lower position B to its intermediate depressed position A, thereby cutting off the air flow through the pipe 19 and the nozzle 21 and causing the innertube 13 to exhaust. As the innertube 13 exhausts, the piston 9 moves to the left by force of the return spring 15. This breaks the seal on the uncapped end of the tube 26 and releases the pressure within the tube. The operator then allows the pedal 42 to return to its upward position shown in the full lines and releases the upper jaw handle 38 which raises by force of the spring 40 attached thereto, thus removing the friction surfaces 33 and 34 of the jaw portions 30 and 31 from the tube periphery. The tube 26 is then withdrawn from the device by hand. If desired, the tube may be removed from the device by depressing the foot pedal to its lowest position, thereby causing a blast of air to come through the nozzle pushing the tube out of the testing machine.

Obviously, the hereinbefore described tube testing machine admits of considerable modification without departing from the invention. Therefore, I do not wish to be limited to the precise arrangements shown and described.

What I claim is:

1. Testing apparatus for subjecting shipping tubes having a cap permanently sealed over one

end to quality tests, said apparatus comprising an elongate nozzle for directing air under pressure interiorly of the tube, tube holding means fixed in the apparatus and having jaws for gripping and holding the tube with its capped end unsupported and at a predetermined distance from said nozzle, guide means removably carried by said elongate nozzle in position to guide the tube into a substantially centered relation with the nozzle, and piston operated sealing means movable over the open end of the tube to seal the same for internal pressure test, the distance between the nozzle and the cap being predetermined for testing the strength of the sealed cap under air pressure impact.

2. Testing apparatus for quality testing shipping tubes having a cap permanently sealed on one end and an open end, said apparatus including an elongate nozzle for delivery of air under pressure in a predetermined direction, guide means removably mounted over said elongate nozzle in position to guide the open end of the shipping tube over said nozzle and into a substantially centered relation with said nozzle, means fixed in position in the apparatus and adapted for substantially circumferentially engaging and holding the shipping tube intermediate its ends

and in a fixed position over said nozzle with its capped end spaced a predetermined distance from the air delivery end of the nozzle for impact testing of the sealed cap, and piston operated sealing means movable over the open end of the shipping tube to seal the same for static pressure testing thereof.

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