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(54) PRESSURE TESTING OF CANS

(71) We, G. STAEHLE GmbH & Co. Mercedesstrasse 15, 7 Stuttgart 50, Germany, a German Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a device for the pressure-testing of cans, in particular multi-part-aerosol cans.

Various types of high pressure testing devices for aerosol cans are already known. In all these devices, basically only the weld seam is subjected to a high pressure test. The bottom seam and the mouth seam, which are additional weak points in three-part aerosol cans, are however not tested. In practice it has been found that in the mass production of such three-part aerosol cans leakages occur just as frequently as a result of faulty closures on the floor or mouth, as on the weld seam. Because of the possible leakages or insufficient pressure resistance of the said double seam joints, it is accordingly extremely important to subject the whole can to a high pressure test. It is therefore an object of the invention to provide a pressure testing device for aerosol cans in which all parts of the housing of the aerosol cans are tested for leakages and pressure resistance.

This object is achieved in accordance with the invention by a device for the pressure-testing of multi-part-aerosol or other cans, having a pressure dispenser which grasps the can, transfers it into a freely suspended position and charges the interior of the can with a test pressure medium, characterised in that a rotating test wheel is provided on the circumference of which test stations are distributed and in the centre of which a central control and supply unit is situated; in that each test station comprises a pressure dispenser which is provided with a clamping

device for clamping the cans and is connected through an inlet valve with a compressed-air or other test medium source; in that an outlet valve and a pressure switch are attached to the connecting conduit of the pressure dispenser with the central control and supply unit, between the pressure dispenser and the inlet valve; in that the valves and the pressure switch of each test station are controllable by the non-rotating central control and supply unit in dependence upon the position of the rotating test wheel; and in that the cans to be tested can be fed to the test wheel in each case at fixed points on the circumference by a charging device and can be removed by a removal device.

In application to an aerosol can such a test procedure thus comprises checking the whole of the prefabricated aerosol can housing for leakages and pressure resistance. The procedure is basically extremely simple because the clamping and the supply of pressure can be effected at the opening of the aerosol can housing, which opening is present in each case for the subsequent insertion of the valve. Accordingly, no special measures or arrangements for the test have to be taken with regard to the prefabricated aerosol can. The clamping of the aerosol can at the valve opening and the sealing thereof do not present any difficulties. The test pressure can easily be supplied via the pressure source. The test pressure acts on the clamped but freely suspended aerosol can. Since in this arrangement no parts of the aerosol can housing other than the valve opening are supported by any means whatsoever, i.e. the can is freely suspended, if the pressure resistance is insufficient or there are sealing faults, the floor will simply be forced off by the test pressure. If there is a fault in the upper plate or at the mouth, this likewise will be forced off. Since the mouth is clamped, in this case the aerosol

can together with the floor will simply drop off. If the pressure resistance is satisfactory and instead only the airtightness is insufficient, this is easily established by the fact that at the end of the test time the test pressure within the aerosol can is no longer sufficient. All faulty aerosol cans can be detected and discarded. The method can be carried out quickly and can therefore easily be incorporated into the mass production of aerosol cans.

According to a preferred embodiment, during the pressure release the spent air from an already tested can is supplied to a can engaged by the pressure source but not yet tested, until there is a pressure equalisation, and only then is the can still to be tested brought to the test pressure. The compressed air introduced into the can up to the test pressure is thus not wasted when it is discharged. Rather, it is recovered in order to bring the interior of an can still to be tested to a certain internal pressure. The compressed air requirements can be considerably reduced by means of such a procedure.

The device can easily be adapted to the output rate of an attached machine for manufacturing aerosol cans, by a suitable choice of size of the test wheel, suitable choice of the number of test stations on its circumference, and a suitable rotational velocity of the said test wheel. The high pressure test device can therefore easily be incorporated in a continuous and automatic assembly line for aerosol cans. Depending on requirements, the device can be provided with a fully mechanical, automatic control means, an electrical control means, or a combined mechanical and electrical control means.

Further details, advantages and features of the invention will appear from the following description. One embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a partially cut away front view of the embodiment,

Fig. 2 is a partially cut away sectional view of a test station and its arrangement on the test wheel,

Fig. 3 shows diagrammatically the connection of various test stations to the compressed air source and to one another, and

Fig. 4 is a functional diagram to explain the operation of the device.

Fig. 1 shows a frame 10, on which a test wheel 12 rotates in a clockwise direction, between support stands 11. Aerosol cans 13 are supplied to the test wheel 12 via a run-in groove 14, and are released at a run-out groove 15. The aerosol cans 13 are placed by the run-in groove 14 into transporting troughs 16 of a transporting star 17. The transporting troughs 16 are designed in the

manner shown in the Figure so that they engage and convey the aerosol cans 13 only in the left-hand section of the transporting star 17 shown in Fig. 1. The transporting star 17 is part of the test wheel 12.

Separate test stations 18 are provided at equal angular intervals on the circumference of the test wheel. In the embodiment illustrated, the test wheel 12 has twenty-four such test stations. A central control and supply unit is provided in the middle of the test wheel 12. Each test station 18 is connected via a tube 19 to the central control and supply unit in such a way that the tube 19 is continuously charged with compressed air, which passes to the central control and supply unit via a compressed air main pipe 20. Just as the individual test stations 18 are connected via the tube 19 to the central control and supply unit, their parts which are to be controlled are also connected via electrical control lines to the central control and supply unit. This is effected for example by tapping points rotating with the test wheel 12, which sense a stationary segment disc with segments subjected to electrical potentials, on the circumference of the central control and supply unit, and thus the correct control signals are obtained in each case. A fully mechanical control system can be used instead of such an electrical control system.

Fig. 2 shows one of the test stations 18 in detail. An aerosol can 13 is shown at the top right-hand corner in chain-dotted lines. Depending on the layout of the test wheel and transporting start, this may for example have a length of 70 to 300 mm. The aerosol can 13 has a prefabricated valve opening with a diameter of 1 inch. A pressure dispenser in the form of a hollow tube 21 is now securely connected to the test wheel 12. One end of the hollow tube is secured to the test wheel 12. The other end has an air supply nozzle 22, whose external diameter is greater than the external diameter of the hollow tube 21. A rubber clamping ring 23 is also provided on the outside of the hollow tube 21, in the vicinity of the air supply nozzle 22. In its rest state the rubber clamping ring 23 has a circular shape. At its axial end remote from the air supply nozzle, it engages in a ring nut of a clamping sleeve 24 which is axially displaceably mounted on the hollow tube 21 and is urged by a spring 25 in the direction away from the air supply nozzle 22. The clamping sleeve 24 engages and takes the rubber clamping ring 23 when there is a movement in this direction. The clamping sleeve 24 is compressed against the effect of the spring 25 by means of a compression slide means 26, which has a cam on its flat face opposite the clamping sleeve 24 and can be displaced relative to the test wheel 12 in a radial

direction under the action of a cam ring 27, which it senses via a ball-bearing 28 to reduce the friction. Obviously, the compression slide means 26 is constantly maintained, by compression springs not shown in the Figure, in its bearing position on the curve, which is formed by the cam ring 27.

In the rest position the compression slide means 26 is displaced radially outwards to such an extent that its side provided with a cam, and situated in the right-hand part of the Figure, coincides in position with the correspondingly shaped axial end face of the clamping sleeve 24 opposite the said compression slide means 26. In this way the clamping sleeve 24 is urged away by the spring 25, with entrainment of the rubber clamping ring 23, as far as possible from the air supply nozzle 22. The Figure however shows the position in which, by means of the cam on the cam ring 27 fixed relative to the rotating test wheel 12 by connection with the housing 29, the compression slide means 26 is urged inwardly against the action of the compression spring forcing it radially outwardly. In this position the cam on the flat side of the compression slide means 26 forces the clamping sleeve 24 in the Figure towards the right. The rubber clamping ring 23 thus runs on to the section of enlarged circumference of the air supply nozzle 22. The increase in diameter caused thereby results in the aerosol can 13 being clamped in an airtight manner on its valve opening. The aerosol can 13 is thus clamped freely suspended at the test station in such a way that it is taken by the transporting star 17 and further transported in a freely suspended, clamped state, until the clamping sleeve 24 can return to its initial position and the rubber clamping ring 23 releases the aerosol can 13.

In addition to the afore-described clamping device for the aerosol can 13, each test station 18 is provided with a control device for supplying and releasing the compressed air through the hollow tube 21 serving as the pressure dispenser. Like the hollow tube 21, this control device is also securely connected to the test wheel 12. An inlet valve 30 is attached to the supply pipe for the compressed air from the central control and supply unit, to the tube 19, the said inlet valve 30 conveniently being a 2/2 valve. The inlet valve 30 is connected to one arm of a pressure distribution unit 31, the latter being connected by a further arm to the hollow tube 21 and by the two remaining arms to a pressure switch 32 and an outlet valve 33 respectively, the latter likewise conveniently being a 2/2 valve. A pressure equalisation valve 34 is connected to the outlet valve 33 on the side remote from the pressure distribution unit 31, the said pressure equalisation valve 34 conveniently being a

2/3 valve.

Fig. 3 shows the connection of the individual valves to one another and to the compressed air source. A compressed air source 35 feeds the compressed air main pipe 20, via a monitoring unit 36, with air at a pressure corresponding to the desired test pressure, and which is for example 15 atmospheres excess. The tubes 19 which supply the compressed air to the individual test stations 18 are connected to the compressed air main pipe. In Fig. 3 all the valves are shown in the position which they adopt when the aerosol cans 13 are under the test pressure. It should be noted that Fig. 3 does not show two adjacent test stations 18. From Fig. 1 it can be seen that in each case a test station is connected to the sixth following test station via the pressure equalisation tubes 37. The two test stations shown in Fig. 3 are thus separated from one another by five other test stations on the circumference of the test wheel 12.

An individual test station operates as follows: After the inlet valve 30 is actuated, the test pressure is fed to the aerosol can 13. The aerosol can remains at this test pressure for a predetermined test time. The pressure in the aerosol can is then monitored via the pressure switch 32 and it is determined whether it coincides with the test pressure. Only in this case is the tested aerosol can 13 retained in the production cycle and released for further treatment. The outlet valve 33 and simultaneously the pressure equalisation valve 34 are then actuated. The test pressure from the aerosol can 13 is thus conveyed, until there is pressure equalisation, via the pressure equalisation tube 37 to a test station, in which the aerosol can 13 stands shortly before the point in time at which it is brought to the test pressure by actuation of the inlet valve 30. After pressure equalisation has occurred the pressure equalisation valve 34 returns to its position shown in the Figure, the outlet valve 33 still being open, and releases the remaining pressure via a silencer 38 into the atmosphere. With respect to the compressed air, the test cycle is thus completed.

Fig. 4 serves to illustrate the time and position sequence of the individual stages. In this connection, the test wheel with its 24 test stations arranged separately on its circumference is shown only diagrammatically. The stationary cam ring 27 which controls the clamping device is also shown diagrammatically.

The aerosol cans 13 are supplied on the left (slightly above 0°) from the run-in groove 14 to the test wheel 12. The ball-bearing 28 then runs on to the inclined face of the cam ring 27, and presses the compression slide means 26 radially inwards and thus compresses the rubber clamping

ring 23, via the clamping sleeve 24, on to the inclined face forming the transition between the air supply nozzle and the external circumference of the hollow tube 21. At the end of this stage the aerosol can 13 is clamped in a self-supporting manner. The release of compressed air from the already tested aerosol can begins at the end of this clamping stage, as is illustrated by an arc of a circle provided with arrows and shading, passing the 30° mark, until there is pressure equalisation. Immediately following this the inlet valve 30 opens and the aerosol can is brought to the full test pressure over the next arrowed and shaded arc. At 60° the full test pressure is already achieved. The clamped aerosol can 13 under the test pressure is then taken by the test wheel 12 to 270°. With an output of 250 aerosol cans per minute, the test time accordingly takes about 3.5 seconds. In the case of a smaller output or a lower rotational velocity of the test wheel, the test time is correspondingly increased. At the end of the test time the pressure switch 32 is actuated and the test pressure is monitored (arrowed and shaded arc past 270°). If the pressure measured is no longer equal to the test pressure, the aerosol can is automatically discarded. Immediately after the monitoring the aerosol can 13 which has been tested is vented by actuating the outlet valve 33. At the same time the pressure equalisation valve 34 opens for a part of the pressure release stage (shaded area marked equalise). The cam, displaced radially inwardly by more than 270°, then passes on the cam ring 27 to an inclined face in its outwardly radially displaced part (Fig. 4, left-hand side). The stages on the clamping device take place in the reverse sequence. The aerosol can 13 is released and finally transferred to the run-out groove 15. With regard to all the details, reference is made to the Figures, from which all further necessary information can be obtained.

WHAT WE CLAIM IS:—

1. Device for the pressure-testing of multi-part-aerosol or other cans, having a pressure dispenser which grasps the can, transfers it into a freely suspended position and charges the interior of the can with a test pressure medium, characterised in that a rotating test wheel is provided on the circumference of which test stations are distributed and in the centre of which a central control and supply unit is situated; in that each test station comprises a pressure dispenser which is provided with a clamping device for clamping the cans and is connected through an inlet valve with a compressed-air or other test medium source; in

that an outlet valve and a pressure switch are attached to the connecting conduit of the pressure dispenser with the central control and supply unit, between the pressure dispenser and the inlet valve; in that the valves and the pressure switch of each test station are controllable by the non-rotating central control and supply unit in dependence upon the position of the rotating test wheel; and in that the cans to be tested can be fed to the test wheel in each case at fixed points on the circumference by a charging device and can be removed by a removal device.

2. Device according to claim 1, characterised in that the pressure dispenser consists of a hollow tube which is firmly connected at its one end with the test wheel and at its other end, which can be introduced into an opening of the can, comprises an air supply nozzle of diameter enlarged in comparison with the external diameter of the hollow tube and clamping seal on the external circumference of the hollow tube.

3. Device according to claim 2, characterised in that the pressure dispenser penetrates a clamping sleeve which is axially displaceable in relation to the pressure dispenser.

4. Device according to claim 3, characterised in that the clamping sleeve abuts at the end on the clamping seal, is spring-loaded in the axial direction away from the clamping seal and can be loaded in the opposite direction by a drive dependent upon the test wheel position for clamping in the can by deformation of the clamping seal on the air supply nozzle.

5. Device according to claim 4, characterised in that the drive takes place through a cam ring stationary in relation to the test wheel.

6. Device according to any preceding claim, characterised in that the outlet valve is connected in each case through a pressure-equalisation tube with the pressure dispenser of a subsequent test station.

7. Device according to claim 6, characterised in that the pressure-equalisation tube is connected between inlet valve and outlet valve to the pressure dispenser.

8. Device for the pressure-testing of cans, substantially as herein described and shown in the drawings.

9. Cans when pressure-tested by the device of any preceding claim.

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Fig.1

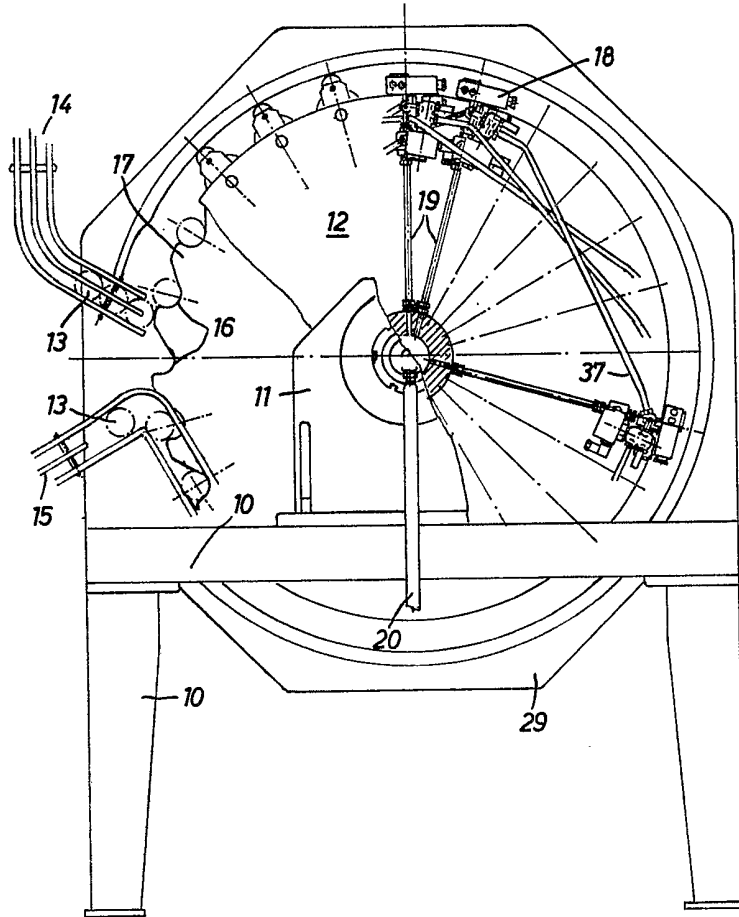


Fig. 2

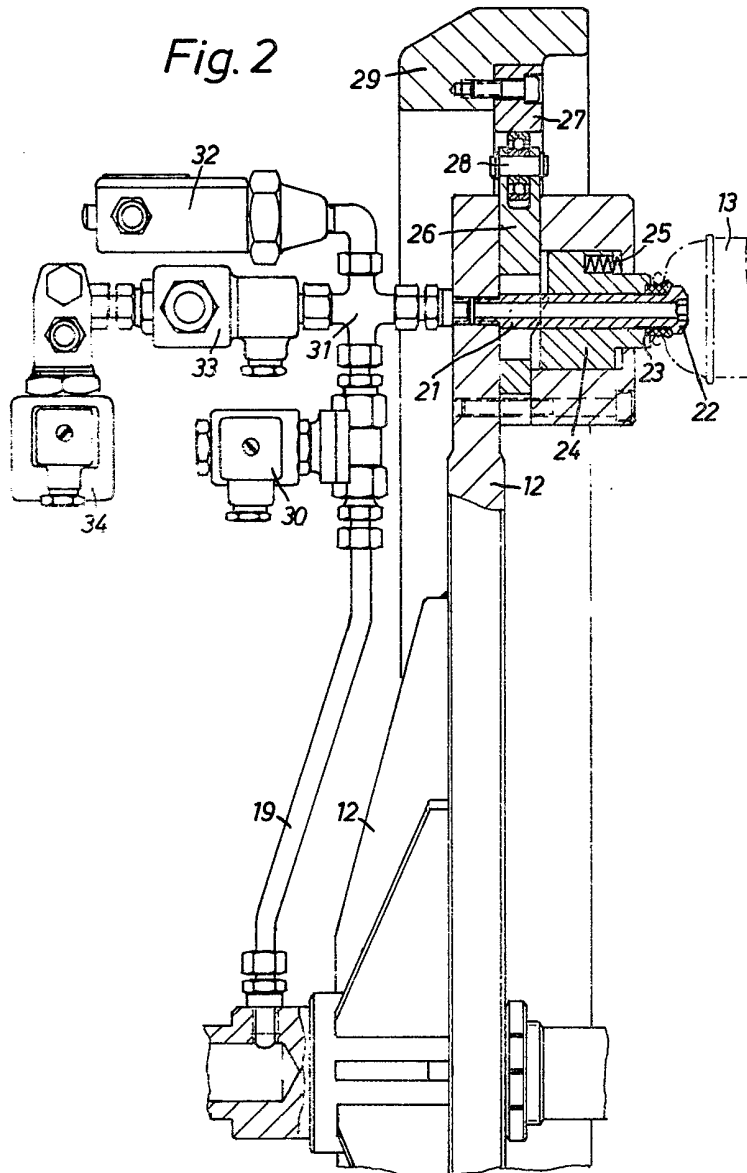


Fig. 3

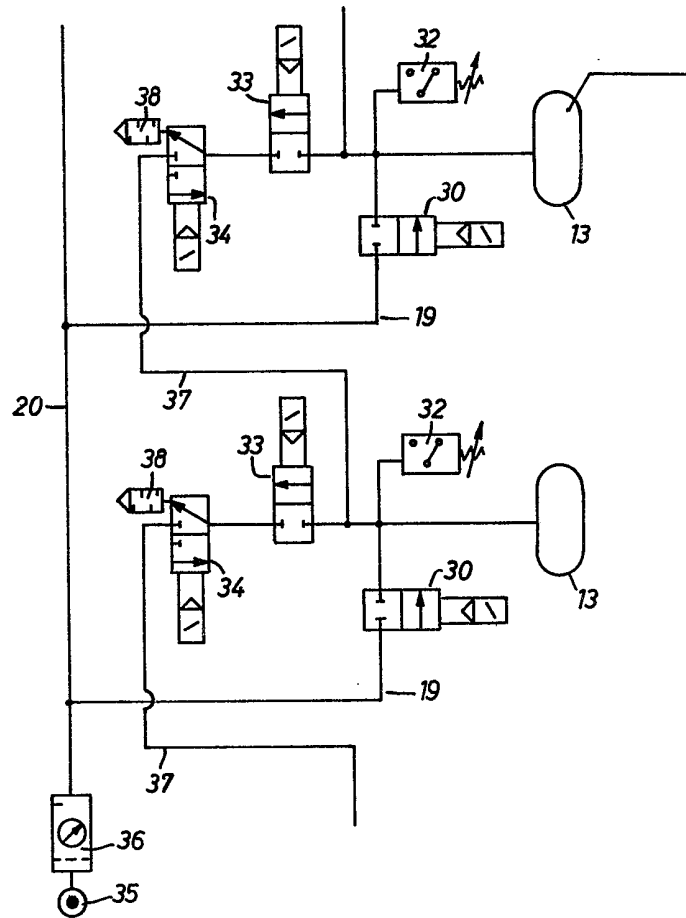


Fig. 4

