March 29, 1932. W. DIETER 1,851,755

CAN TESTING MACHINE

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Fig. 2.

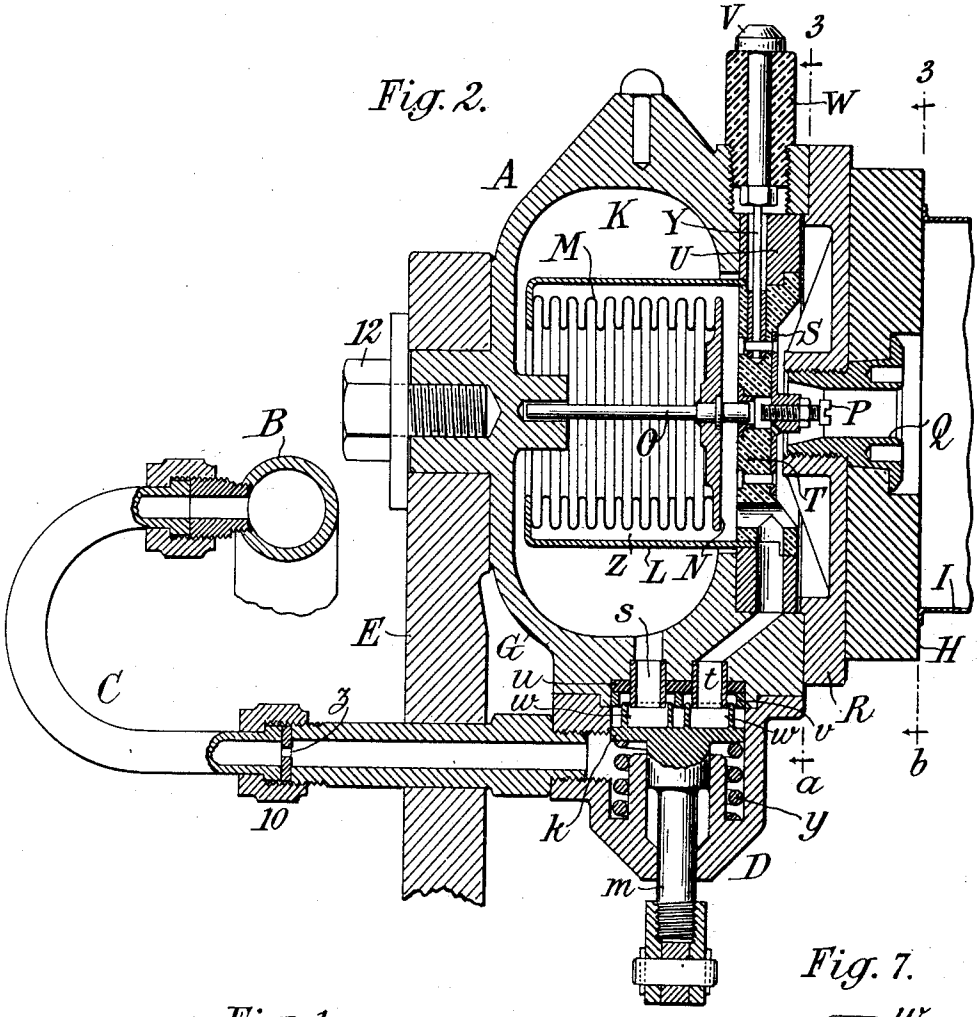


Fig. 1.

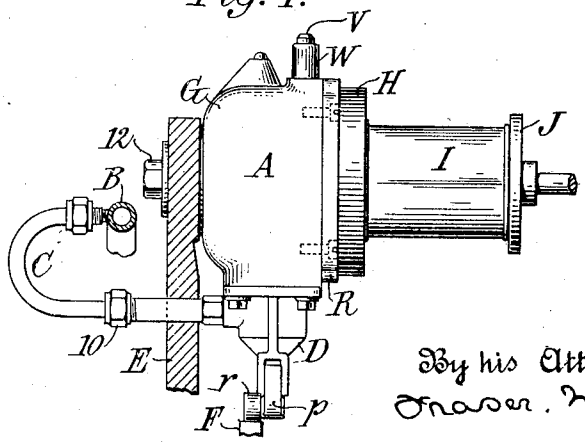


Fig. 7.

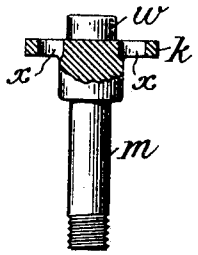


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Fig. 3.

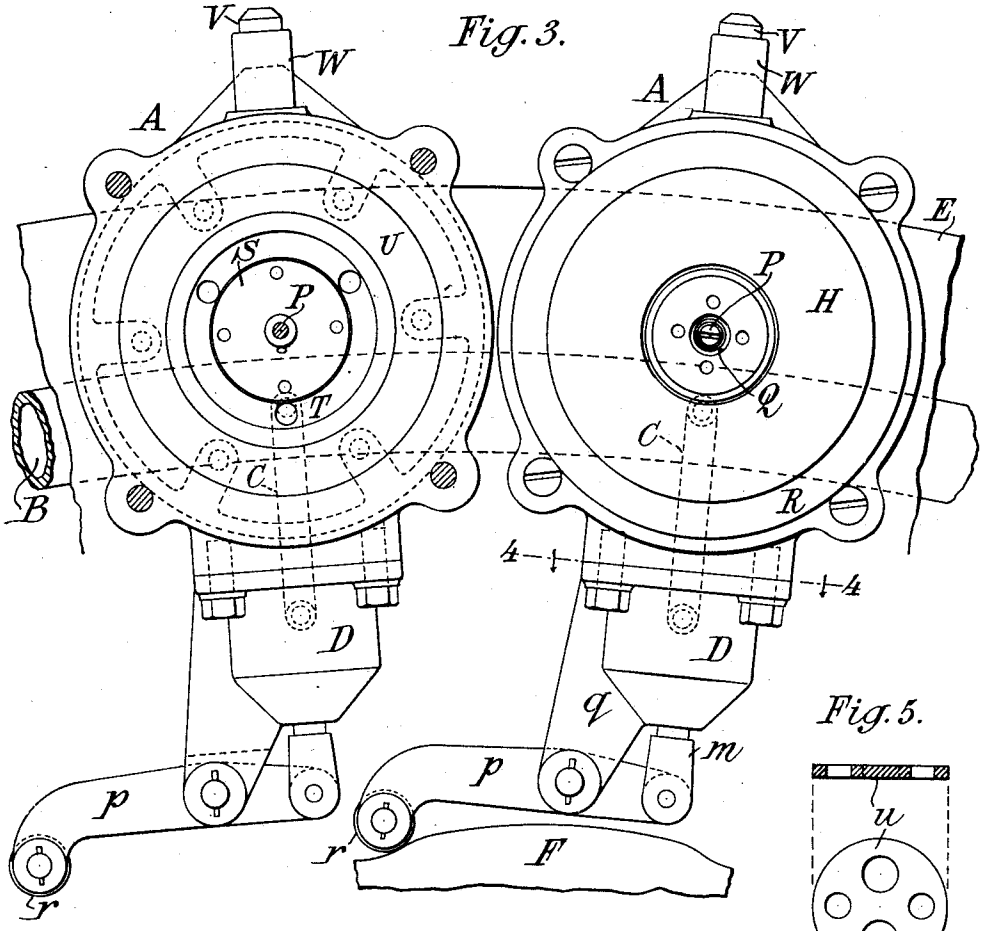



Fig. 5.




Fig. 4.

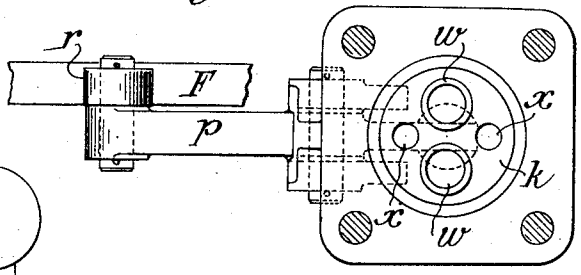



Fig. 6.

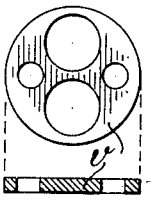
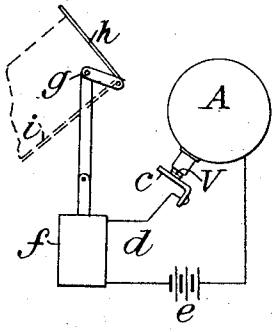



Fig. 8.

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# UNITED STATES PATENT OFFICE

WILLIAM DIETER, OF NEWARK, NEW JERSEY

## CAN TESTING MACHINE

Application filed June 10, 1931. Serial No. 543,289.

This invention relates to machines for testing sheet metal cans or similar receptacles and for discarding or discharging leaky cans.

An example of a machine for this purpose is contained in the patent to Peter Kruse, No. 779,719, dated January 10, 1905. In such machines the cans to be tested are fed in succession to the machine and carried around in a rotary path. Each can is pressed against a yielding gasket, and compressed air is introduced to the can and to a chamber between which is a movable partition such as a diaphragm; the test is continued for a suitable period, and if during this time an interior leakage occurs from the can, the pressure on that side of the diaphragm is diminished and the diaphragm is consequently displaced by the superior pressure on the opposite side, and then its displacement acts to operate a tripping mechanism whereby at the end of the travel of the cans through the machine, the defective cans are automatically ejected through a discharge chute or into a receptacle while the perfect cans are discharged through the normal delivery outlet.

The object of the present invention is to provide an improved construction applicable to machines for this purpose, whereby to make the operation of the machine as sensitive and positive as possible. A further object is to cheapen the machine and construct it with individual testing units, any one of which, if it becomes defective, can be removed and replaced without interfering with the others.

In the accompanying drawings—

Figure 1 is an elevation of one of the units, showing it applied upon a fragment of the rotary frame or turntable of the machine;

Fig. 2 is a diametrical section through one of the units in a radial plane coincident with the axis of rotation of the turntable;

Fig. 3 is a sectional elevation showing two of the units, that at the left on the plane of the line $3^a$ and that at the right on the plane of the line $3^b$ in Fig. 2;

Fig. 4 is a section on the plane of the line 4—4 in Fig. 3;

Figs. 5 and 6 are sections and elevations of disks forming part of the air-controlled valve;

Fig. 7 is an elevation of the movable member of the valve; and

Fig. 8 is a diagram illustrating the circuit connections.

In the drawings no attempt is made to show the general structure of the machine, which is well known.

Referring, for example, to the aforesaid patent, the various can testing elements are carried by the rotary disk E which is mounted to turn on a suitable shaft or stud carried by fixed framework and having gearing for revolving it. In the accompanying drawings a corresponding disk or turntable E is shown, and there is also shown a fixed cam piece or ring F. The testing units A, A are carried on the turntable E, which also carries a pipe B which is fed with compressed air. From this pipe branches C, C lead to valve shells D, one for each unit, by which the compressed air is fed to the individual units.

The description of one unit will serve for all, since they are duplicates of one another. Each consists of a casing G suitably fastened to the turntable E and having a flat face covered by a gasket H of suitably yielding material, such as rubber, against which the can I to be tested is pressed by a pad or plunger J, as shown in Fig. 1, this being operated by any known mechanism,—such, for example, as the means shown in the aforesaid patent, where the pad is marked $m, m'$,—automatic means being provided for moving the pad into position to press the can against the gasket in the entering position and for retracting it to release the can in the final discharging position; as these mechanisms are well known, it is not thought necessary to illustrate them here.

The casing G is formed hollow to constitute a chamber K, within which is located a shell L forming the base of a multiple diaphragm M of the bellows type commonly called a "sylphon"; the opposite ends of this diaphragm are hermetically secured to the inner end of this shell and to a disk N, on which is fastened a center pin or stud O, the outer end of which, projecting beyond the

disk, serves as a contact stud or button which, as the diaphragm expands or contracts, moves into or out of contact with an adjustable contact screw P which is accessible for purposes of adjustment through the central opening of a flanged thimble Q which serves for fastening the gasket H to the flat outer face or head R of the unit. To afford the adjusting screw P an insulating support, it is engaged in the threaded hub of a metal disk S which is fastened on a disk or cap T of insulating material, such as vulcanized fiber, which is seated in a ring U or other convenient fitting of metal, which in turn is seated in the casing G.

On the exterior of the unit is mounted a contact button V which is insulated from the shell and electrically connected to the contact screw P. It is shown as having a shank which is carried through an insulating bushing W, from which a conducting pin Y extends through openings in the ring U and insulating disk T to a metallic connection with the disk S into which the screw P is threaded. In operation the rotation of the turntable carries the unit to a point toward the end of the testing period, where the button V touches a circuit terminal *c* in circuit *d* fed by battery *e* and containing a solenoid *f* connected to the operating arm *g* of a gate *h* suitably located to drop the defective can out of the machine,—as, for example, by rolling it down a chute indicated in dotted lines at *i*—all as shown diagrammatically in Fig. 8. This electrically operating ejecting means forms no part of the present invention and is illustrated only as one example of how the unit provided by the present invention may be applied in connection with suitable ejecting mechanism.

The unit A includes a twin valve for admitting compressed air from the pipe B into the can to be tested and into the chamber K which communicates with the interior of the diaphragm M. The valve comprises a stationary seat and a movable tappet *k* which is conveniently mounted on a stem *m* passing out through the bottom opening in the valve shell D, where it is connected with a lever *p* for operating it. The lever *p* is fulcrumed on a bracket *q* projecting from the shell D and carries a roller *r* which is engaged by the cam F (Fig. 3) at a point in the travel of the unit directly after the can has been placed in position. The cam operation lowers the stem *m* and tappet *k* whereby to admit compressed air through the valve seat openings *s* and *t*. The opening *s* communicates with the chamber K, and the opening *t* communicates through a port with the interior of the can and equally with the exterior of the diaphragm M,—that is to say, with a chamber Z formed around the diaphragm and between it and the shell L. While the valve construction may be greatly varied, that shown in detail has certain practical advantages. The seat openings *s* and *t* are formed through tubes or bushings seated in the casing G and project through openings in a gasket or packing ring *u* (shown separately in Fig. 5), which is held in place by a retaining disk *v* (shown separately in Fig. 6). The tapper *k* is shown as carrying two annular flanges *w*, *w* which are concentric with and enclose the projecting ends of the seat nipples. When the tappet is lowered to the position shown in Fig. 2 by the action of the cam F, the compressed air flows through openings *x* in the tapper and flows around the ends of the flanges *w* and into the respective nipples and their passages *s*, *t*. Thus the air is admitted at equal pressures to the chamber K and to the chamber Z and the interior of the can. On passing the cam F the valve is pressed to its seat by a stiff spring *y*, so that the valve flanges *w* are pressed firmly against the soft gasket *u*, thereby sealing the air in the respective chambers. If the can is tight, the air remains under this equal pressure in both chambers during the entire test period. If, however, there is a leak from the can, the air within it and in the chamber Z is diminished in pressure, whereby the preponderating pressure within the diaphragm forces the pin O toward the right in Fig. 2 until it touches the contact screw P and thereby closes circuit connection with the terminal button V; thereupon, when this button makes contact with the stationary circuit terminal *c*, the current flows through the solenoid and the ejector flap H is opened, so that the can upon its mechanical release by the plunger J, which is operated by the usual mechanism, is rolled out down the chute *i*.

The construction herein set forth has certain important practical advantages. Each unit A, comprising the casing G and its attached parts and contents, together with the valve and its lever *p*, is a complete operative entity and may be separately removed from the machine. To remove it, it is only necessary to disconnect a coupling 10 connecting the two sections of the pipe C and to remove the fastening screws 12, whereupon the unit may be taken off from the turntable E and another like unit substituted. This affords a very convenient way of correcting the machine when any unit gets out of repair or adjustment. As each unit carries its own valve, so that the valve is removed with the unit, the separate testing of the valve is facilitated. The valve construction is such as to afford a thoroughly tight closure, whereby the leakage of air between opposite sides of the diaphragm through the valve is rendered practically impossible. In case of leakage after long use, it is only necessary to remove the valve shell D and replace the packing gasket *u*. The mechanical construction of the machine is simplified because the valve re-

quires operative means only at one point in the rotation of the turntable, and this consists of the simple stationary cam F. Since the testing units are all alike and are so constructed as to favor their production in quantities, the machine is thereby cheapened. The use of the compound or bellows form of diaphragm M results in a greatly increased amplitude of motion for a given change in internal pressure, whereby its operation is made more positive and certain.

The present machine has no exhaust valve or exhaust air conduit. The residual air which remains in the chamber Z and the communicating passages leading thence through the gasket H to the interior of the can, escapes upon the release of the can and serves a useful function in forcibly separating the can from a possible adhesion to the gasket H. The air communicating with the interior of the diaphragm, including that in the chamber K, is imprisoned and thereby conserved.

A practically desirable feature is the introduction in each branch pipe C of a choke gasket *z*, being a disk with a small hole for holding back any rush of air when the valve is opened. This enables the use of compressed air with much higher pressure than has heretofore been practicable. The choke gasket may serve also as a packing between the two members of the coupling 10.

The size of the orifice in the choke gasket is necessarily determined by experiment, since it varies with the pressure in the supply conduit B, also to some extent with the capacity of the can to be tested and the rapidity with which the machine is to operate. Cans for some purposes require to be more thoroughly tested against leakage than others, and the machine may be adapted for these variations by varying its speed, by varying the pressure in the air conduit, and by suitably graduating the size of the choke orifice. Another advantage of the choke orifice is that it enables adjustments to be made for the effect of temperature variation; it is known that the sudden admission of compressed air into a can raises the temperature therein, which may establish a temperature difference between the chambers on opposite sides of the diaphragm,—a condition which in the past has sometimes created difficulty in the adjustment of the testing elements; but with the choke orifice, the drop of pressure on passing this orifice lowers the temperature and this may approximately compensate for the raise of temperature occurring when the air enters the can. The retardation of the flow of air by the choke orifice is also of advantage, in that it enables the air valve to be opened somewhat in advance of the usual practice, whereby to discharge any surplus pressure from the chamber K and create a better initial equalization of pressures on opposite sides of the diaphragm.

It is, of course, to be understood that the machine may be constructed for operation either with compressed air or with rarefied air or vacuum.

It is to be understood that the type of machine to which the present invention is directed and upon which it is an improvement, comprises an endless carrier with means for advancing it continuously or intermittently, with a series of testing units carried thereby, each unit adapted to receive a can to be tested and enclosing two chambers, one of which is in communication with the interior of the can under test, and a movable part such as a diaphragm interposed between such chambers, with a valve or valves receiving air under pressure opened to admit the same under equal pressure to both chambers at the beginning of the testing period and thereupon closed and held closed during the testing period, and with a can discharge controlled by the mechanism in the nature of a trip device which is operated under control of said movable part or diaphragm, so that in case of diminution of pressure on the side of the latter communicating with the interior of the can, the latter on being released at the end of testing period, is discharged through a different outlet from that receiving the delivery of normal cans.

What I claim is:

1. In a can testing machine of the described type, the respective testing units each comprising a hollow casing forming a chamber, a shell within such chamber, a bellows diaphragm within such shell, and relatively movable electric contacts, one of the contacts connected to the diaphragm, whereby an electric circuit is controlled by the movement of the diaphragm.

2. A can testing machine of the described type, the respective testing units each comprising a hollow casing forming a chamber, a diaphragm within such casing, its one side communicating with said chamber and its other side communicating with the interior of the can under test, a valve shell having separate ports communicating with the chambers on opposite sides of the diaphragm, and a valve in said shell movable to simultaneously open or close said ports.

3. The structure of claim 2, the valve and its seat comprising annular portions and a gasket at the admission to the respective ports.

4. The structure of claim 2, with a spring for closing the valve and means for opening the valve against the stress of such spring.

5. The structure of claim 2, with a spring for closing the valve and means for opening the valve against the stress of such spring, comprising a lever carried by the unit exteriorly of said valve shell and adapted to be operated by a cam to impart opening movement to the valve.

6. The structure of claim 2, combined with a compressed air pipe carried by the rotary member of the machine and branches therefrom to the valve shells of the respective units.

7. The structure of claim 2, combined with an annular compressed air pipe carried by the revolving carrier of the machine with branch pipes therefrom leading to the valve shells of the respective units.

8. The structure of claim 2, combined with a compressed air pipe carried by the revolving carrier of the machine with branch pipes therefrom leading to the valve shells of the respective units, and a choke in each such branch adapted to drop the pressure of the inflowing air.

9. The structure of claim 2, the valve being a twin valve having separate seating portions to close both ports.

In witness whereof, I have hereunto signed my name.

WILLIAM DIETER.