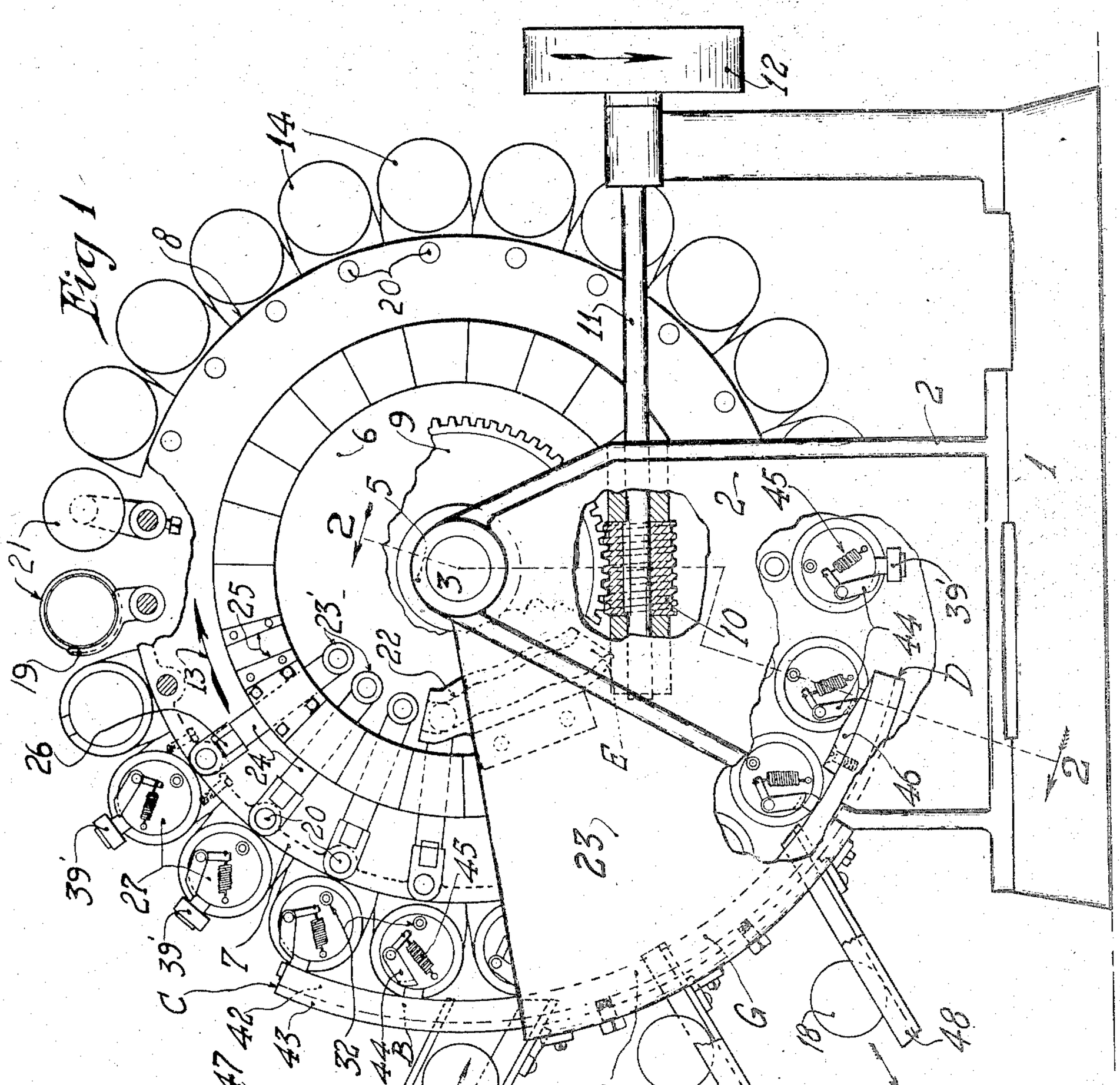
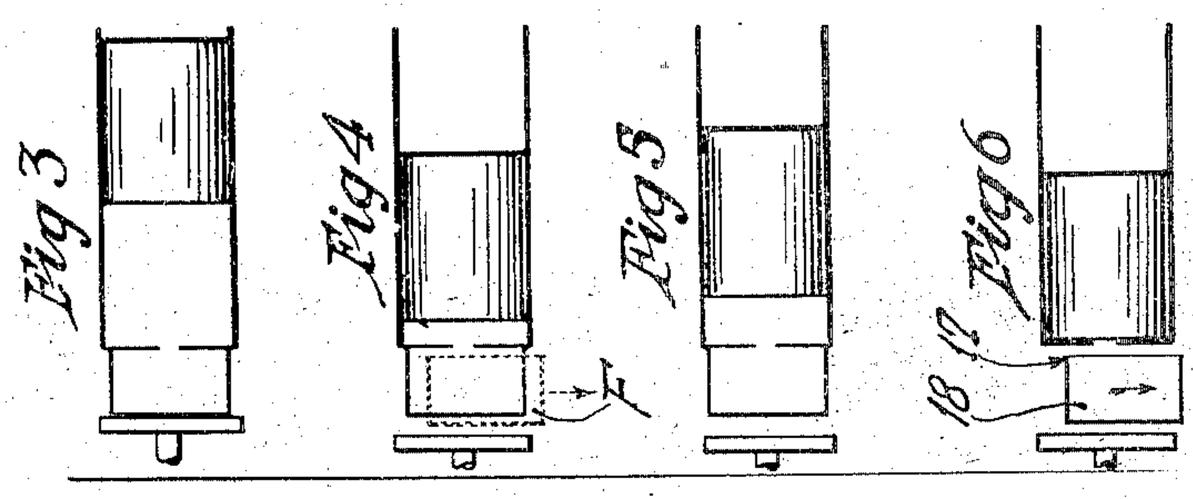
April 15, 1930. A. JOHNSON 1,754,321

CAN TESTING MACHINE

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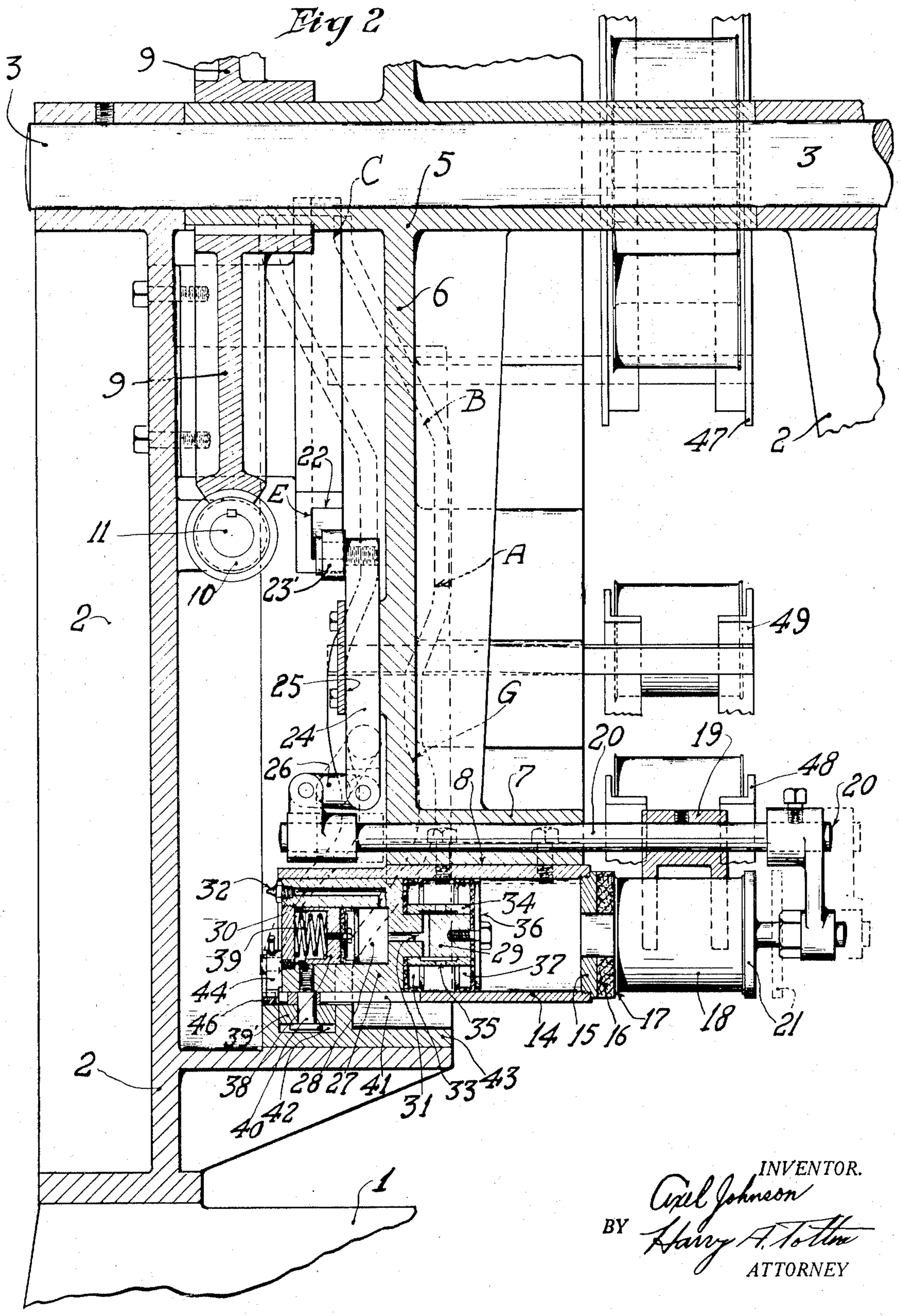
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CAN TESTING MACHINE

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Fig 2



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UNITED STATES PATENT OFFICE

AXEL JOHNSON, OF OAKLAND, CALIFORNIA, ASSIGNOR TO AMERICAN CAN COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF NEW JERSEY

CAN-TESTING MACHINE

Application filed December 4, 1926. Serial No. 152,591.

This invention relates to a can or container testing apparatus designed for detecting and separating leaky from non-leaky cans.

My present invention has for its principal object to provide an automatic testing apparatus which separates the leaky from the non-leaky cans or containers, in accordance with their ability to maintain or hold a minus pressure or vacuum therein for a predetermined period. Another object is to provide an independent pressure creating means for each can or container, whereby the common vacuum pump and the pipes extending therefrom and leading one to each container are eliminated. A further object is to provide a traveling structure for mounting the pressure creating means and which also mounts in associated relation to each pressure creating means a ported base with which the periphery of the can or container contacts while the determined pressure is created therein. Another object is to provide in connection with such apparatus means for receiving the defective cans or containers, and a separate means for receiving the perfect cans or containers, the respective means conducting their respective articles to different points, thereby maintaining the automatic segregation or separating of the leaky from the non-leaky tested cans or containers.

Further objects and advantages of this invention will appear as the description of the preferred embodiment is understood.

The invention, in its preferred embodiment, consists in a movable support having a cylinder associated therewith and a piston mounted therein, there being provided means for positioning the open mouth of a can or container to be tested in registry with the interior of the cylinder, and there being also provided means for moving the piston within the cylinder to create a minus pressure or vacuum within the interior of the can or container, the piston being held to its initial pressure creating position for a predetermined time and then released to move to substantially normal position within its cylinder, compressing within the cylinder and container any air which may have leaked therein during the creation of the minus pressure or vacuum, and in this manner determining the leaky from the non-leaky cans; should the can develop pressure above that originally created therein, the same dropping by gravity from the end of the cylinder.

To more fully comprehend the invention, reference is directed to the accompanying drawings, wherein—

Fig. 1 is a view in broken side elevation of the preferred embodiment of my invention, illustrating the parts in their respective positions, during a complete cycle of operation of the apparatus.

Fig. 2 is a vertical sectional view taken on line 2—2 Fig. 1, viewed in the direction of the arrows.

Fig. 3 is a diagrammatic view of one of the cylinders with a can or container held to the mouth thereof and the piston in its position to create the maximum testing pressure within the can or container.

Fig. 4 is a similar view with the piston in advanced position and the can or container holder released therefrom, there being indicated in dotted lines the can or container dropping from the end of the cylinder, should air have leaked thereinto during the movement of the piston into position—Fig. 3.

Fig. 5 is a similar view with the piston again retracted, insuring the holding of a non-leaky can or container to the end of the cylinder.

Fig. 6 is a corresponding view with the piston in its forwardmost position in the cylinder, causing the creating of normal pressure within the can or container, the can or container being indicated as dropping by gravity from the cylinder end.

Referring more particularly to the drawings, wherein like characters of reference designate corresponding parts, throughout the several views, 1 designates a base upwardly from which extend the spaced supports 2, in the upper ends of which are mounted the ends of a horizontally disposed shaft 3. The shaft affords a horizontal axis on which is rotatably mounted the hub 5 of a disk 6, the periphery of which is laterally flanged at 7, and is provided with the transverse pockets or depressions 8. To the hub 5 of the disk 6 is keyed

a gear 9 with which intermeshes a driving worm 10 carried by a rotatable driving shaft 11 and which on its end mounts a power wheel 12 to be driven in the direction of the arrow by power from any suitable source to cause a rotation of the disk 6 in the direction of the arrow 13—Fig. 1.

Disposed transversely of the periphery of the disk 6 and one removably mounted in each depression 8 are a plurality of open ended cylinders 14, the corresponding ends thereof being closed by ported plates 15 which mount on their outer surface yieldable seating disks 16 with which are adapted to engage or contact the peripheral wall 17 of the mouth of a can or container 18. The cans or containers when first registering with their respective seats 16 rest in cradles 19, one of which is associated with each cylinder 14.

Longitudinally reciprocable in the flange 7 and transversely of the disk 6, and one associated with each cylinder 14, are the rods 20, each of which on its free end carries an adjustable disk 21 for contacting with the outer or closed end of the can or container 18, as in Fig. 2, to normally maintain its peripheral edge in tight contact with the seating disk 16. The disks are moved inwardly and outwardly into and from can or container engaging position by a cam groove 22 carried on the inner face of a plate 23 extending from one edge of one of the supports 2. The cam during the rotation of the disk 6 receives the successive rollers 23, one of which is carried on the end of each slide rod 24. The slide rods are movable radially of the disk 6 in guide channels 25—Figs. 1 and 2, and at one end are connected with their associated rods 20 by links 26.

It will be apparent that due to the irregular contour of the cam groove 22, the rollers 23′ in passing therethrough will actuate rods 24 to impart reciprocation to rods 20 and move disk 21 into and from contact with the end of the cans or containers 18 respectively associated therewith.

Within each cylinder 14 is reciprocably mounted a piston 27, the same being provided in its rear end with a chamber 28 and at its forward end with an extension 29. The body of the piston is channeled at 30 to afford a communication from the atmosphere to the inner end of the chamber 28 and is also channeled at 31 to afford a connection from the chamber 28 to the surface of the extension 29. It is preferable that one of the well known valve controlled lubricant nipples 32, such as an Alemite cup, be positioned at the end of the channel 30.

Against the wall of the piston 27, surrounding the extension 29, is a flanged cup washer 33, the same being held in position by a sleeve 34 fitted over the extension 29 and provided with ports 35 registering with channels 31. Against the end of the extension 29 is held by a plate 36 another cup washer 37 the peripheral flanged edge of which is directed toward the edge of the cup washer 33. Within the chamber 28 is an auxiliary plunger 38 normally forced to said chamber toward the channel 31 by the spring 39. Lubricant being supplied through the nipple 32 under pressure into the channels 30 and 31 and filling to capacity the chamber 28 and that portion surrounding the extension 29 between cup washers 33 and 37 affords a means for lubricating the cup washers and maintains the same in tight peripheral frictional contact with the inner surface of the cylinder 14. The supplying of lubricant under pressure into the chamber 28 will cause the recession of the auxiliary plunger 38 against the action of spring 39, and the action of said spring maintains the fluid contained within the piston under pressure at all times.

Each piston near its inner end carries a cam roller 39′ mounted on a stud 40 extending into the piston, said stud operating in a guide slot 41 in its respective cylinder. The cam rollers 39′ operate in a cam groove 42 formed on the inner face of a plate 43 supported by one of the supports 2 and the plate 23, and extending parallel with the periphery of the disk 6 for a portion of its diameter, this being clearly illustrated in Fig. 1. Each piston on its end carries a pivotally mounted dog 44, the end of which is adapted on the full retracted movement of its respective piston in its associated cylinder to create the maximum minus pressure or vacuum therein, to engage with the rear edge of the cylinder wall, as in Figs. 1 and 2 of the drawings, and hold the piston in such position. A spring 45 automatically throws the dog into cylinder end engaging position on the movement of the piston to the end of the cylinder, as above described.

At the lower end of the flange 43 is located a dog releasing cam 46 over which is adapted to ride the free ends of the dogs 44 on the rotation of the disk 6 in an hereinafter described manner, thus releasing the pistons from their locked position within their associated cylinders and again rendering the same free for reciprocation therein.

Disposed angularly to the periphery of the disk 6 with its discharge end in a position to deliver cans or containers to be tested to the cradles 19 as the same are successively presented thereto is a can feed runway 47, preferably of a type to deliver cans or containers by gravity to the apparatus.

Extending at an inclination from the periphery of the wheel within the path of travel of the cradles 19 and at a point to one side of the cam groove 42 are the discharge runways 48 and 49, the discharge runway 48 receiving leaky cans and conveying the same from the apparatus, and the discharge runway 49 re-

ceiving the non-leaky cans, and discharging these from the apparatus.

Power being applied to the wheel 12 to rotate the same in the direction of the arrow, Fig. 1, and which operation will rotate the disk 6 in the direction of the arrow 13, and cans or containers 18 being supplied to the runway 47, the apparatus operates in the following manner:—

On each cylinder 14 successively registering with the discharge end of the runway 47, its disk 21 lies in the dotted lined position—Fig. 2, and the cylinder piston is in its full inward or forward position in its cylinder, Fig. 6, this being due to the contour of the cam groove 42 at the point A. The can or container 18 rolls by gravity and rests in one of the cradles 19 with its open end or mouth in register with the yieldable disk 16. The upward travel of the disk 6 causes the roller 23′ to travel to a position in its associated cam groove 22 to actuate the slide bar 24 to operate its connected mechanism and move the disk 21 from dotted to full line position, Fig. 2, tightly clamping or seating the mouth of the can or container against the yieldable seat 16 to make an air tight contact therebetween.

Immediately after this action, the cam roller 39′ enters the portion B of the cam groove 42 and is gradually retracted from its forwardmost position, to the position indicated in Fig. 3, creating a minus pressure or vacuum within the can or container and in the forward end of its associated cylinder 14. The above movement of the piston is a full stroke movement, enabling the dog 44 carried thereby to engage the rear edge of the cylinder 14, after which time the cam roller 39′ leaves the end of the cam groove 42 at the point C.

With the minus pressure or vacuum created in the can or container, the same travels approximately 290 degrees with the piston in its full retracted position. If the can is tight, this pressure will remain constant, but if the can is not tight, this pressure will diminish in accordance with the size of the leak. On the cylinder arriving at the lower end of the flange 43, the dog 44 engages the releasing cam 46 and the cam roller 39′ associated with the piston enters the cam groove 42 at the point D, thus the piston is unlocked by the release of the dog 44 and is mechanically operated by the contour of the cam groove 42. Approximately at this same time, the cam roller 23′ enters the cam groove 22 at the point E, and the contour of the walls of said groove 22 are such as to operate the mechanism associated with the disk 21 and move the disk to dotted lined position, Fig. 2, disengaged from the can or container at which time the piston is moved forwardly in the cylinder from its position in Fig. 3 to that in Fig. 4.

Should air have entered the can or container since the drawing of the initial vacuum and the locking of the piston in its retracted position, the forward movement of the piston will break the vacuum, displace the air which has been admitted by leakage, and the can or container will drop by gravity, as indicated at F, Fig. 4. This will prove a defective or leaky can and such dropping takes place when the cylinder lies opposite the discharge runway 48.

It will be observed in this operation that the piston is not moved forwardly a full stroke in its cylinder, as is clearly indicated in Fig. 4; therefore if the can or container was tight and did not leak air, the same would be held to the disk 16 by the vacuum or minus pressure remaining therein.

To preclude the premature dropping from and to hold a good can or container into contact with its yieldable seating disk 16, after the disk 21 has been moved from its closed end, the piston 27 is again moved rearwardly in its cylinder from its position in Fig. 4 to the position in Fig. 5, this being made possible by the contour of the cam groove 42 at the point G. With the piston in this position, a slightly increasing minus pressure is created in the can over that existing when the piston is in the position, as in Fig. 4, thus a good can or non-leaky can is vacuum held to the seating disk 16.

On the can arriving at a point in register with the inner end of the runway 49, the piston is forced forwardly in its cylinder, its roller 39′ having arrived at the point A of the cam groove 42, and the minus pressure within the cylinder reduced to zero permitting the can to drop by gravity into the runway 49; it having been tested.

I claim:—

1. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, vacuum creating means carried thereby and movable therewith, means within the path of travel of the vacuum creating means for delivering a can to be tested into cooperative relation therewith, means for operating the vacuum creating means for producing a vacuum within the can sufficient to retain the can in suspended cooperative relation therewith, means for operating the vacuum creating means to reduce to approximately normal the initial vacuum produced therein to permit the can to drop by gravity from its operative position should air have leaked thereinto.

2. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, vacuum creating means carried thereby and movable therewith into cooperative relation with which a can to be tested is operatively positioned, means for operating

the vacuum creating means for producing a vacuum within the can sufficient to retain the can in suspended cooperative relation therewith, means for retaining the vacuum creating means in operated position for a predetermined period, means for returning the vacuum creating means to approximately normal position to permit the can to drop by gravity from its operative position should air have leaked thereinto during the vacuum holding period.

3. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising a movable support, vacuum creating means carried thereby and into cooperative relation with which a can to be tested is operatively positioned with its mouth in cooperative relation with the vacuum creating means, means for operating the vacuum creating means to produce a vacuum within the can and for retaining the can in suspended operative position, means for holding the vacuum producing means in its operated position for a predetermined period, means for returning the same to approximately its normal position to reduce the vacuum within the can and permit the same to drop by gravity from its operative position should air have leaked thereinto during the vacuum holding period.

4. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, vacuum creating means carried thereby and movable therewith and into cooperation with which a can to be tested is positioned with its body extended in a substantially horizontal position laterally from the vacuum creating means, means for operating the vacuum creating means for producing a vacuum within the can sufficient to retain the can in suspension relative thereto, and means for operating the vacuum creating means to reduce to approximately normal the initial vacuum drawn within the can to permit the same to drop by gravity from its operative position should air have leaked thereinto.

5. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, vacuum creating means carried thereby and movable therewith and into cooperative relation with which a can to be tested is operatively positioned, means for operating the vacuum creating means for producing a vacuum within the can sufficient to retain the can in suspension relative thereto, and means for operating the vacuum creating means to reduce to approximately normal the initial vacuum produced within the can to permit the can to drop by gravity from its operative position should air have leaked thereinto, said vacuum producing means adapted for subsequent operation to reduce to normal the initial vacuum produced within the can to permit a non-leaky can to drop by gravity from its operative position.

6. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, a cooperating piston and cylinder carried thereby and the cylinder provided with an outlet, a yieldable seat at the cylinder outlet and into cooperative relation with which the open mouth of a can to be tested is operatively positioned, means for operating said piston to produce a vacuum within the can, means for holding the open mouth of the can against said seat during the movement of said piston, means for locking said piston in its operated position, means for releasing said can holding means to permit the can to be suspended by the vacuum produced therein, means for releasing said piston locking means and permitting the return of the piston to approximately normal position to reduce to approximately normal the initial vacuum produced in the can to permit the can to drop by gravity should air have entered the same.

7. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, a cylinder carried thereby and movable therewith, a piston therein, said cylinder and piston constituting a vacuum creating means into cooperative relation with which a can to be tested is operatively positioned with its mouth in cooperative relation with and closing the cylinder mouth, means for operating the parts of the vacuum creating means for producing a vacuum within the can, means for retaining the parts of the vacuum creating means in operated position for a predetermined period, means for returning the parts to approximately normal position to permit the can to drop by gravity from its operative position should air have leaked thereinto, said parts of the vacuum creating means adapted for subsequent relative movement by said means to normal position to permit a non-leaky can to drop by gravity therefrom.

8. An apparatus for testing can or container bodies and separating the leaky from the non-leaky; comprising a can feeding station, a series of vacuum creating means movable relatively thereto for successively receiving cans therefrom and for operation for producing a vacuum therein to hold the cans in suspension, a plurality of can discharge stations into relative cooperation with which the held cans successively move, means for successively operating the vacuum creating means to reduce to approximately normal the initial vacuum produced within the respective cans as the cans successively move into registry with the first of said discharge stations, said vacuum creating means adapted for movement to normal non-vacuum cre-

ating position as the same cooperates with the second of said discharge stations.

9. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising a can feeding station, a series of vacuum creating means movable relatively thereto for successively receiving cans therefrom and for operation for producing vacuum therein to hold the cans in suspension, each comprising a cylinder and a piston reciprocable therein, a plurality of can discharge stations into relative cooperation with which the suspended cans successively move, means for moving the piston of the successive vacuum creating means to reduce to approximately normal the initial vacuum produced within the respective cans as the cans successively register with the first of said discharge stations, said pistons adapted for movement to normal position as the same move into cooperative relation with the second of said discharge stations.

10. An apparatus for testing can or container bodies and separating the leaky from the non-leaky, comprising an endless traveling support, vacuum creating means carried thereby and movable therewith, means within the path of travel of the vacuum creating means for delivering a can to be tested into cooperative relation therewith, means for operating the vacuum creating means for producing a vacuum within the can sufficient to retain the can in suspended cooperative relation therewith, means for operating the vacuum creating means to reduce to approximately normal the initial vacuum produced therein to permit a leaky can to drop by gravity from its operative position should air have leaked thereinto, said means adapted for subsequently operating the vacuum creating means to reduce to normal the initial vacuum produced within the can to permit a non-leaky can to drop by gravity from its operative position, and separating means within the path of travel of the cans to receive and convey the leaky and non-leaky cans from the apparatus.

11. In a can testing apparatus, means for producing a vacuum within the can to be tested, comprising a cylinder provided with an opening over which the open mouth of the can to be tested is positioned closing the cylinder, a piston reciprocably mounted within the cylinder, a washer carried by the piston and frictionally engaging the cylinder wall, a piston having a fluid containing chamber within the piston communicating with the washer and provided with a fluid supply orifice, and means within the piston for maintaining the fluid within said chamber under pressure to force said washer against said cylinder wall.

12. In a can testing apparatus, means for producing a vacuum within the can to be tested, comprising a cylinder provided with an opening over which the open mouth of the can to be tested is positioned closing the cylinder, a piston reciprocably mounted within the cylinder, a washer carried by the piston and frictionally engaging the cylinder wall, a piston having a fluid containing chamber within the piston communicating with the washer and provided with a fluid supply orifice, and a spring actuated auxiliary piston within the main piston for maintaining the fluid within said chamber under pressure to force said washer against said cylinder wall.

13. In a can testing apparatus, means for producing a vacuum within the can to be tested, comprising a cylinder provided with an opening over which the open mouth of the can to be tested is positioned closing the cylinder, a piston reciprocably mounted within the cylinder, a pair of annular cup washers carried by the piston with the cups facing each other, a fluid containing chamber formed within the piston communicating with the cup washers and provided with a normally closed fluid supply orifice, and an auxiliary spring pressed piston within the main piston for maintaining the fluid within said chamber under pressure to force said cup washers against said cylinder wall.

14. In a can testing apparatus, means for producing a vacuum within the can to be tested, comprising a cylinder provided with an opening over which the open mouth of the can to be tested is positioned closing the cylinder, a piston reciprocably mounted within the cylinder, and releasable means carried by said vacuum producing means for locking the piston in its operated or vacuum producing position in the cylinder.

15. In a can testing apparatus, means for producing a vacuum within the can to be tested, comprising a cylinder provided with an opening over which the open mouth of the can to be tested is positioned closing the cylinder, a piston reciprocably mounted within the cylinder, and a pivoted locking dog carried by the piston and adapted for engagement with the cylinder wall for releasably holding the piston in vacuum creating position within the cylinder.

16. An apparatus for testing can or container bodies and separating the leaky from the non-leaky bodies, comprising means for creating a vacuum and with which means a can to be tested is cooperatively positioned, means for operating the vacuum creating means to produce a vacuum within the positioned can sufficient to retain it suspended in cooperative relation therewith, and means for reducing the initial vacuum produced therein to permit the can to drop by gravity from its operative position should air have leaked thereinto.

In testimony whereof I have signed my name to this specification.

AXEL JOHNSON.