# United States Patent [19]

**Stein**

[11] **3,814,241**

[45] **June 4, 1974**


[54] **OPPOSITELY RECIPROCATING CONTAINER INSPECTING MACHINE**


[76] Inventor: **David F. Sklar,** deceased, late of Kent Cliffs, Putnam County, N.Y. by **Francis S. Stein,** 120 Chestnut Rd., Manhasset, N.Y. 11030



[22] Filed: **Feb. 2, 1973**

[21] Appl. No.: **329,053**

[52] **U.S. Cl.** ..... **209/80,** 33/172 E, 33/174 L

[51] **Int. Cl.** ..... **B07c 5/00**

[58] **Field of Search** ..... 209/80, 88, 73; 198/127; 33/172 E, 174 L



[56] **References Cited**

UNITED STATES PATENTS

3,618,762 11/1971 Sklar ..... 209/80



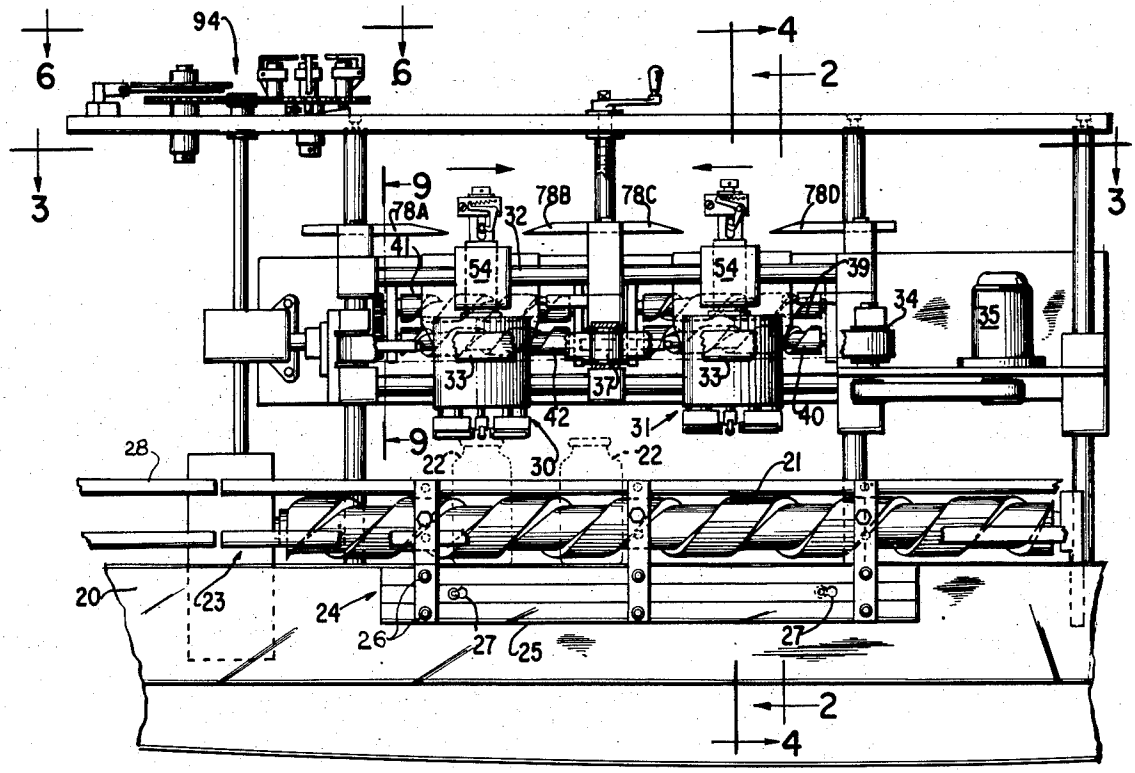
*Primary Examiner*—M. Henson Wood, Jr.
*Assistant Examiner*—Gene A. Church
*Attorney, Agent, or Firm*—Smythe & Moore



[57] **ABSTRACT**

A machine and method for inspecting and sorting glass bottles or containers wherein there are at least a pair of oppositely reciprocating testing heads. The testing heads have control circuits for ejecting unacceptable bottles or containers.


**8 Claims, 18 Drawing Figures**



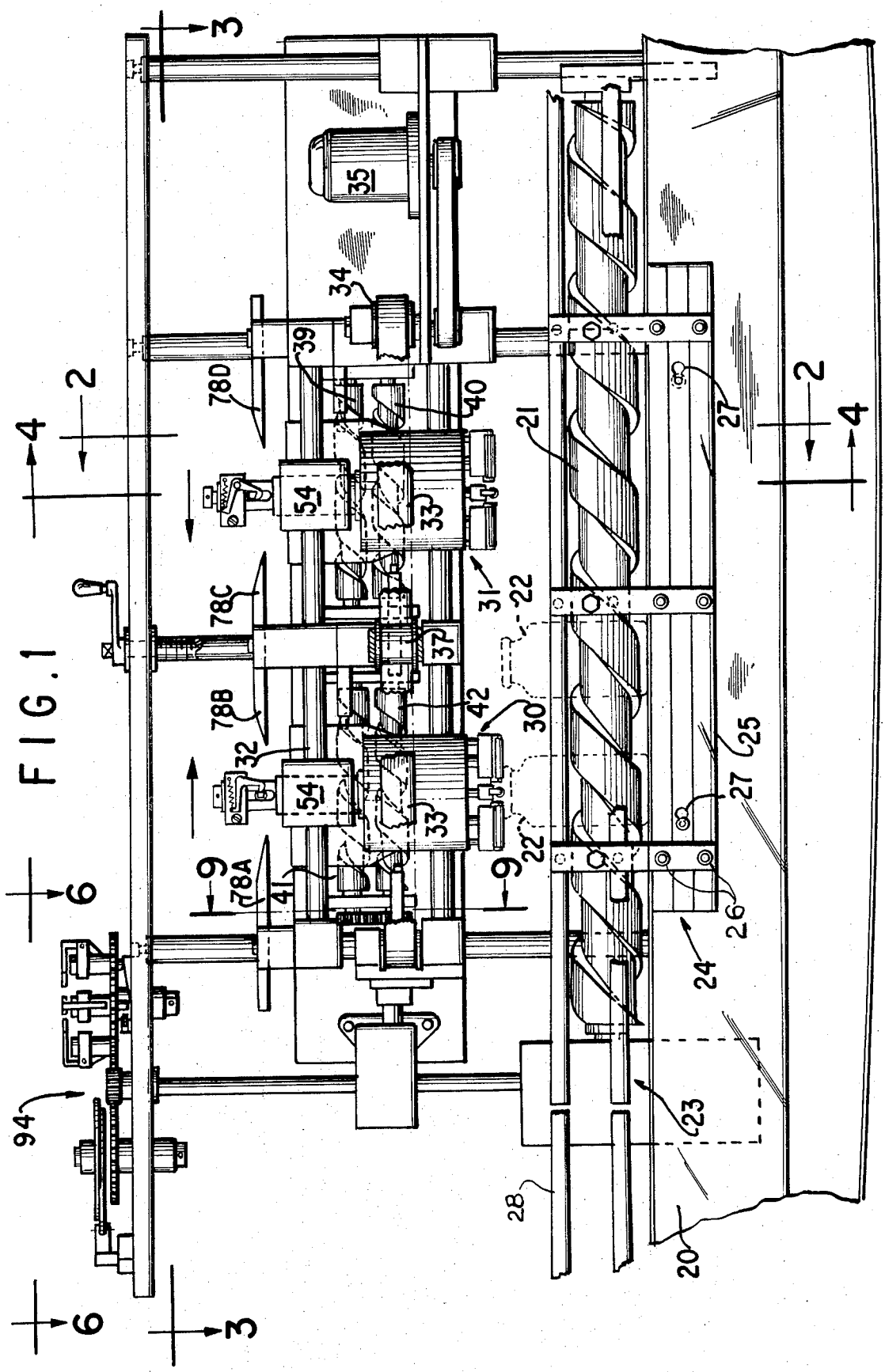

3
2
4
6
9
35
34
39
78D
40
21
27
54
33
31
22
78C
37
42
78B
30
32
25
41
78A
26
24
94
23
28
20

FIG. 1

FIG. 2

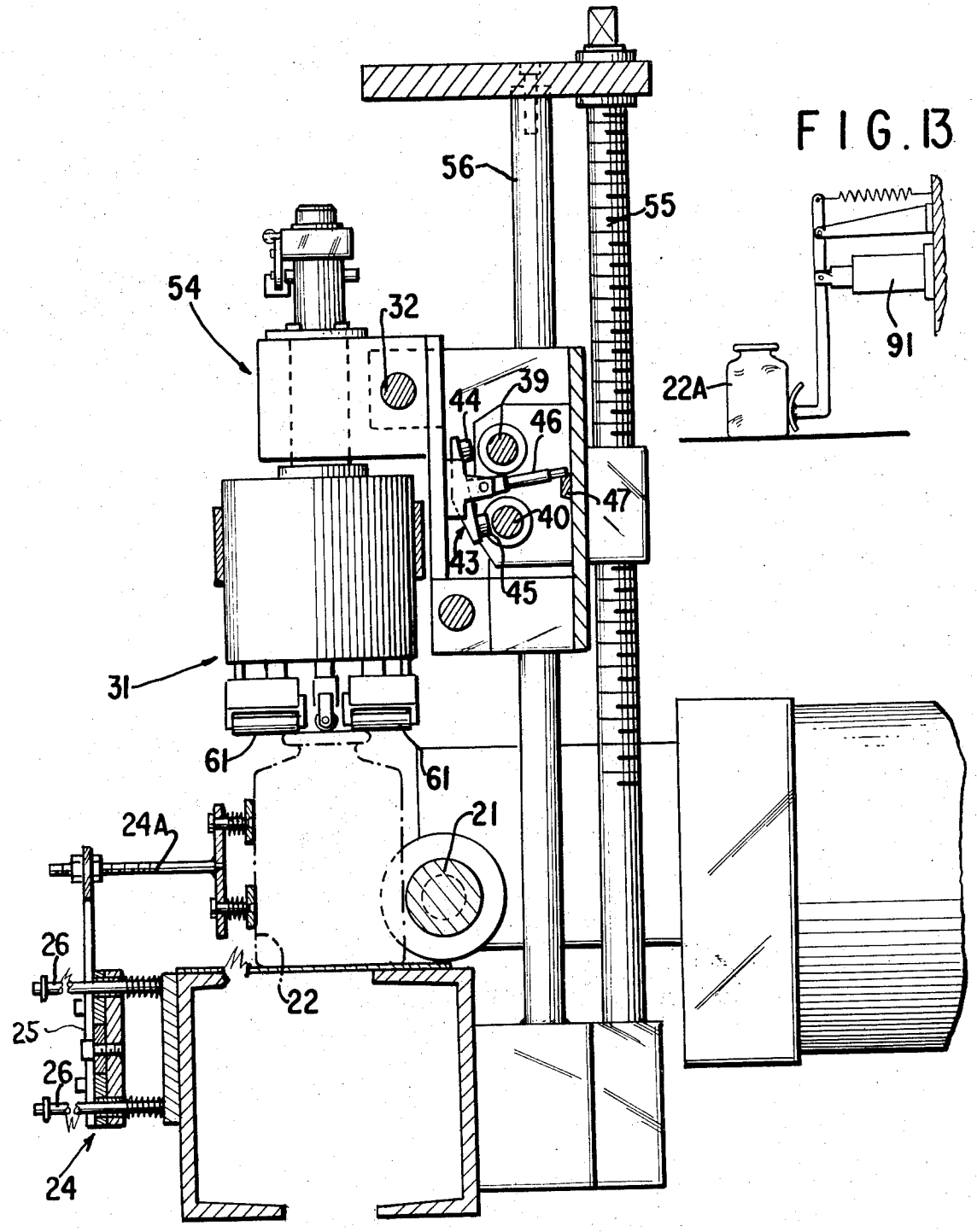



FIG. 13

FIG. 3

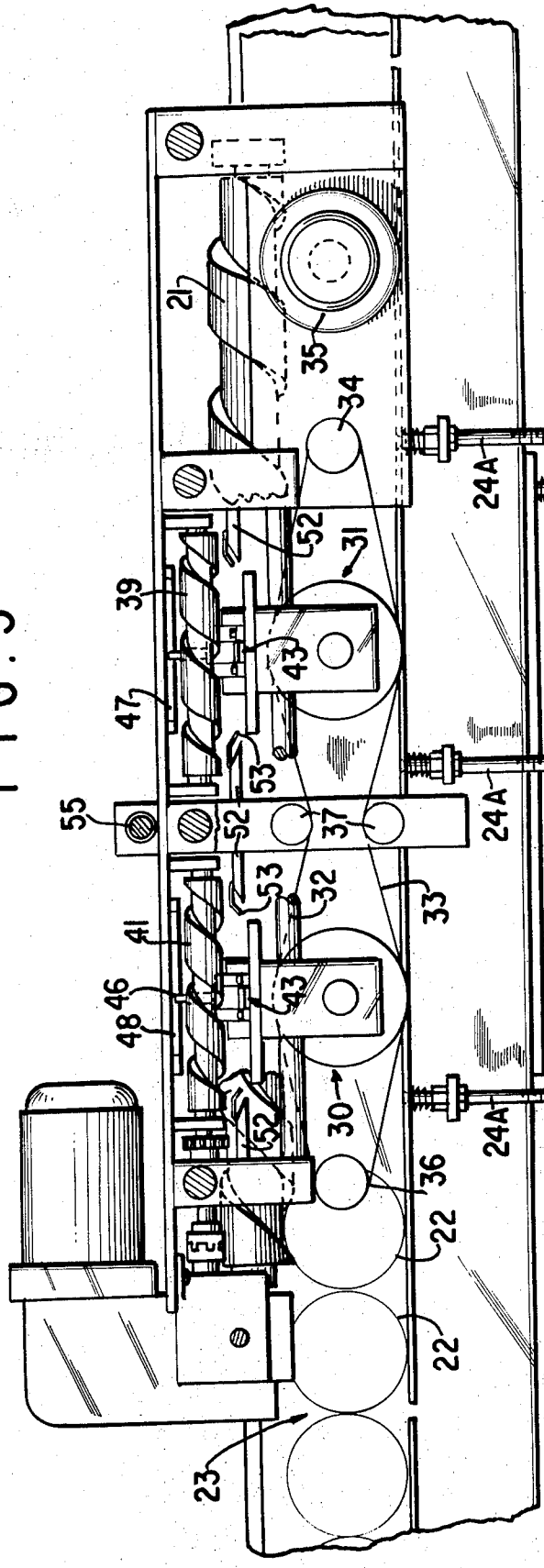

21
35
34
52
31
39
43
47
53
55
37
32
33
41
46
48
30
36
22
23
24A
26
24

FIG. 15

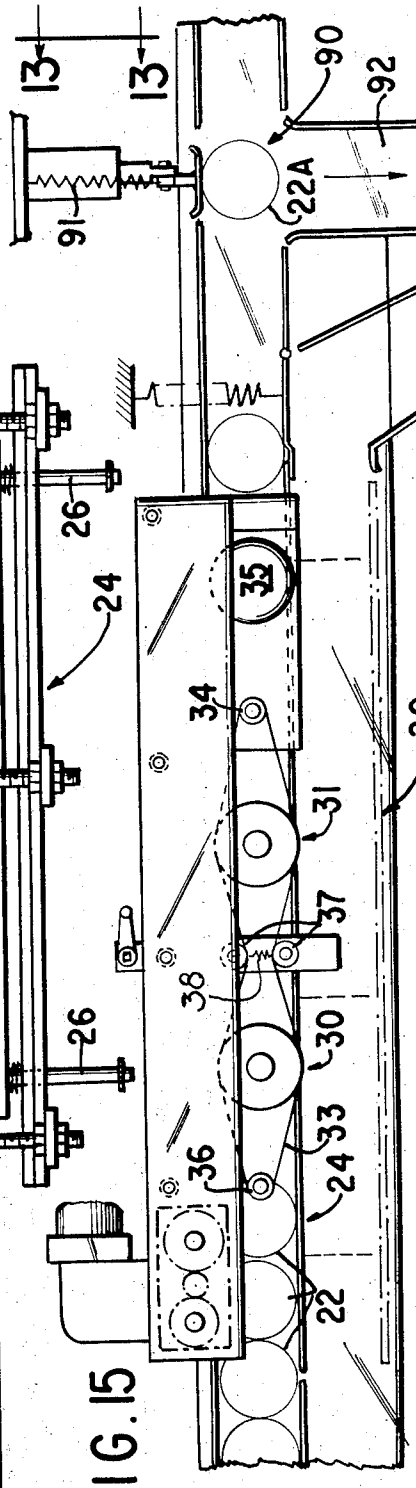
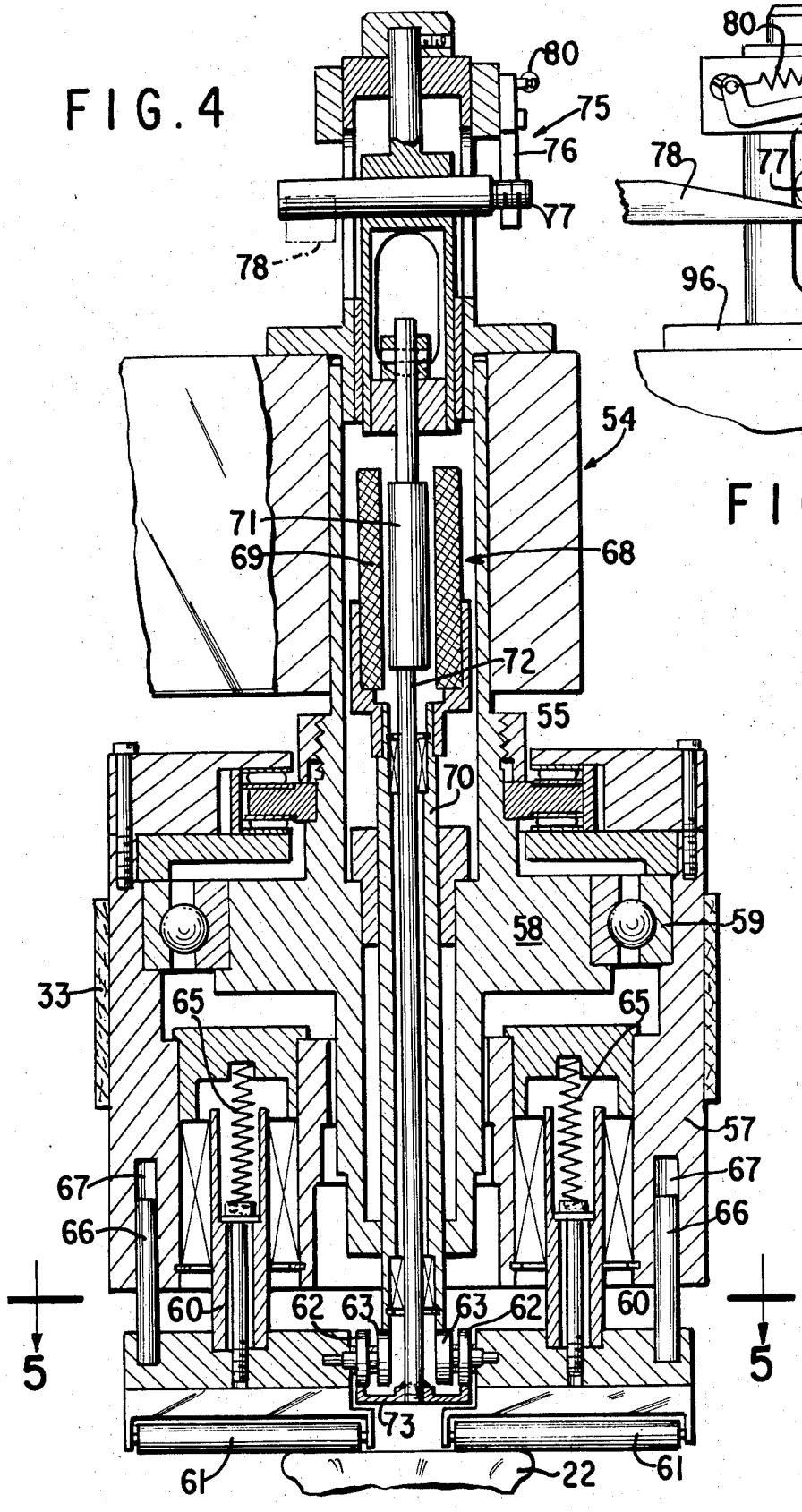

13
13
90
92
91
22A
35
34
20
31
37
38
30
33
36
24
22

FIG. 4


80
75
76
77
78
54
71
69
68
72
55
70
58
59
33
65
65
57
67
67
66
66
60
62
63
63
62
60
5
5
73
61
22
61


80
78
77
76
96

FIG. 4A

FIG. 5

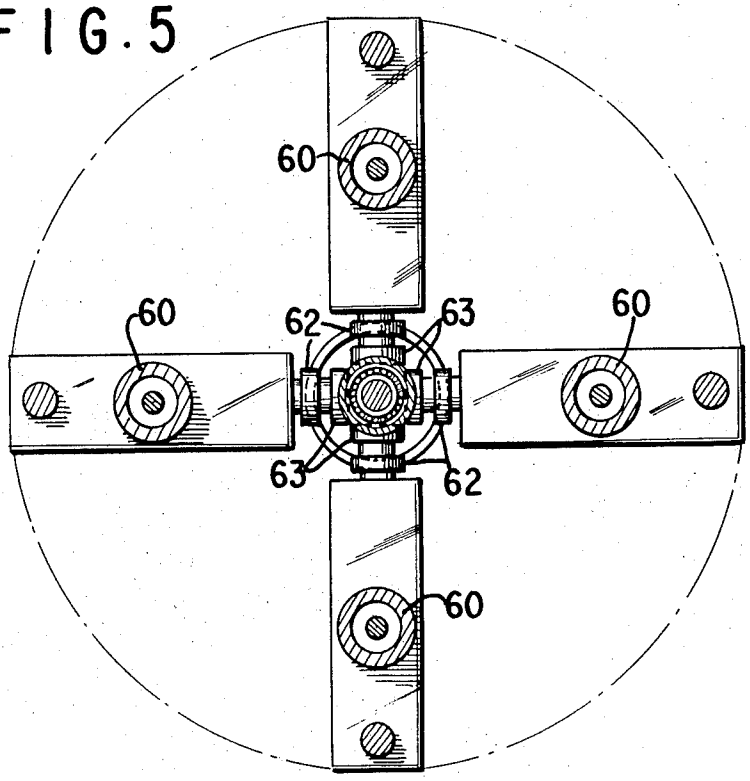

60
60
62
63
60
63
62
60

FIG. 6

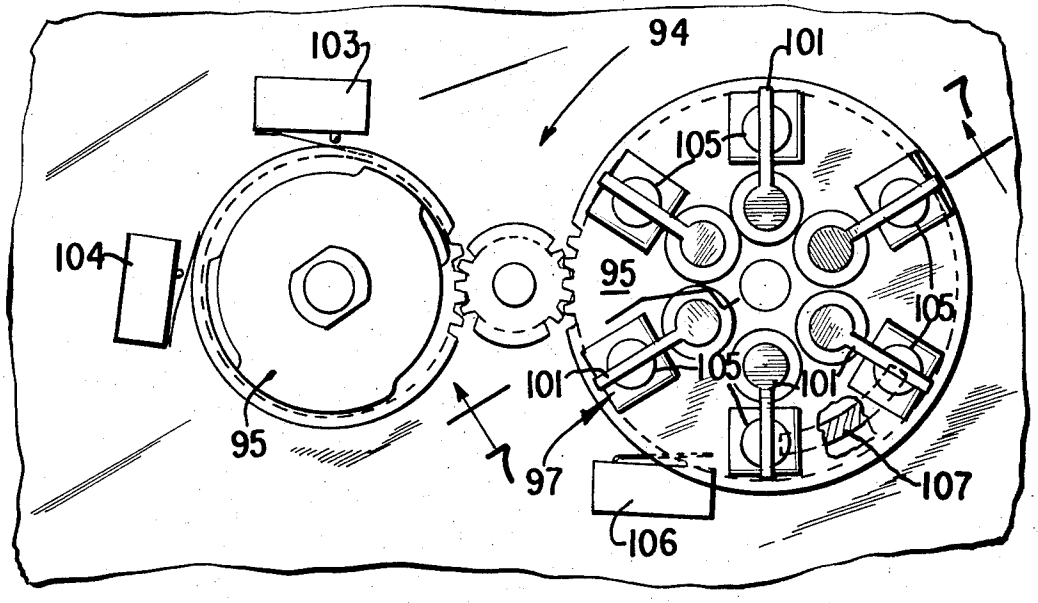

103
94
101
105
104
95
105
105
101
101
95
97
107
106

FIG. 7

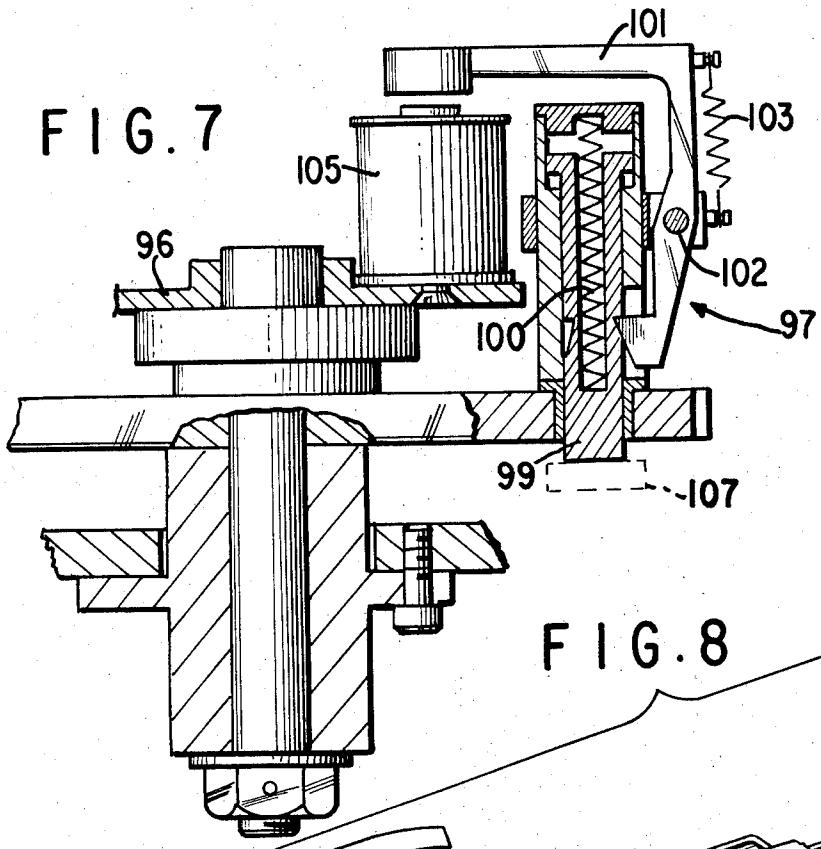
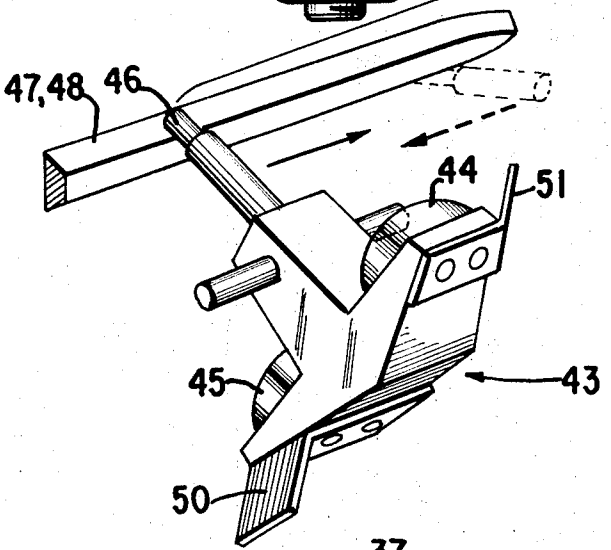



FIG. 8



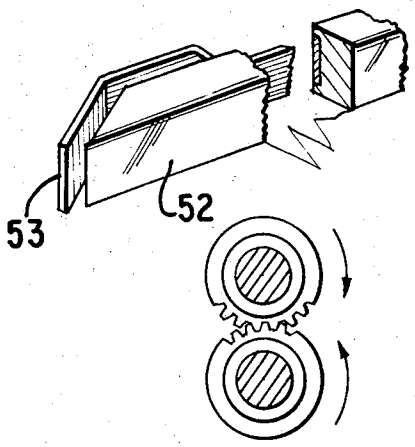




FIG. 9

FIG. 10

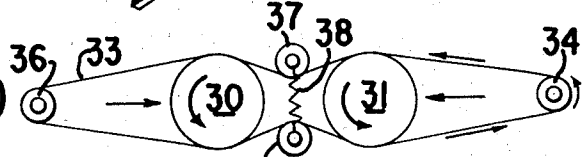
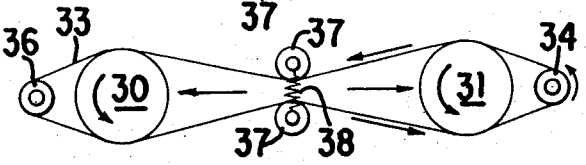



FIG. 11



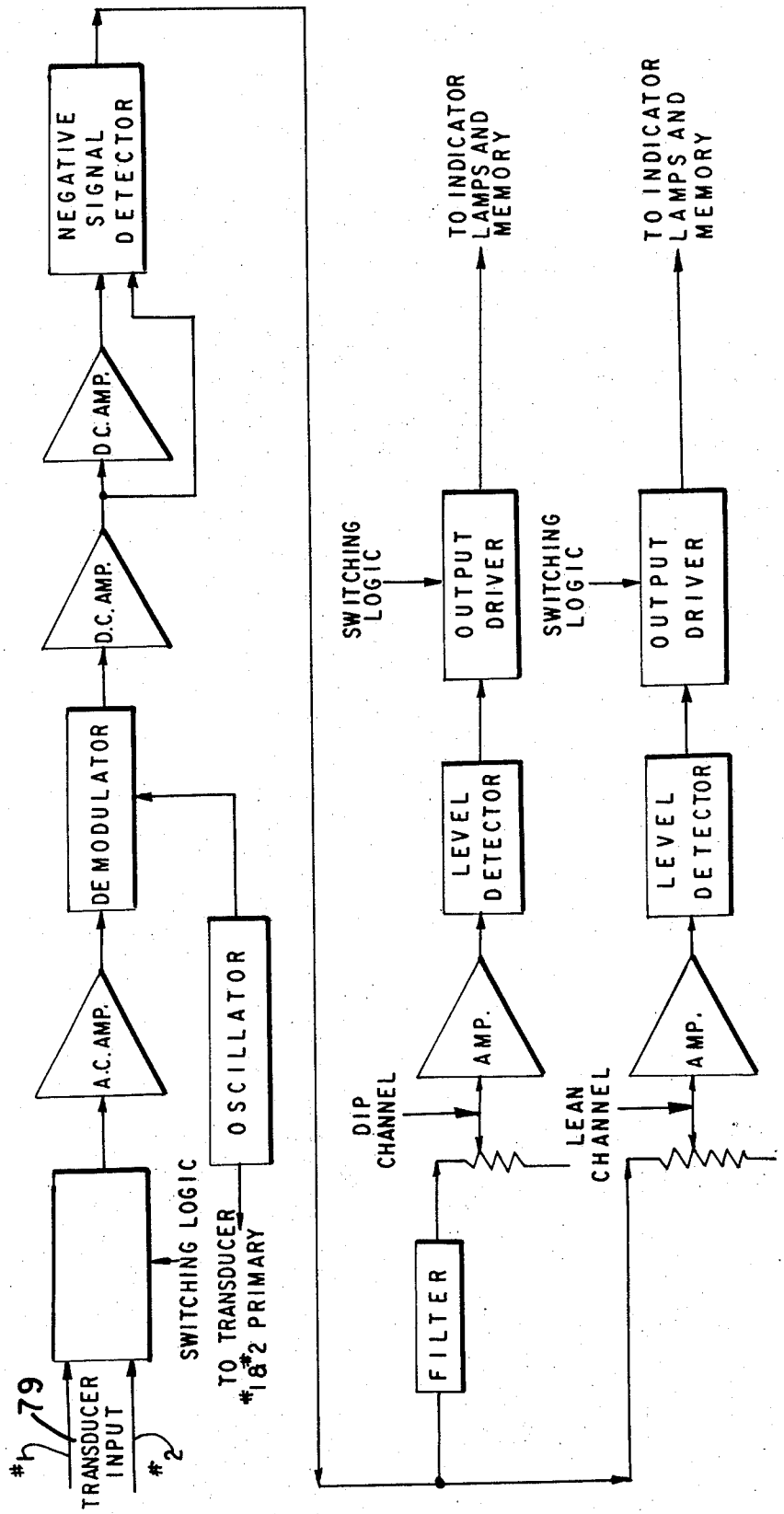

TRANSDUCER INPUT
#2
#4 79
SWITCHING LOGIC
TO TRANSDUCER #18 #2 PRIMARY
OSCILLATOR
A.C. AMP.
DEMODULATOR
D.C. AMP.
D.C. AMP.
NEGATIVE SIGNAL DETECTOR
FILTER
DIP CHANNEL
LEAN CHANNEL
AMP.
AMP.
LEVEL DETECTOR
LEVEL DETECTOR
SWITCHING LOGIC
SWITCHING LOGIC
OUTPUT DRIVER
OUTPUT DRIVER
TO INDICATOR LAMPS AND MEMORY
TO INDICATOR LAMPS AND MEMORY

FIG. 12

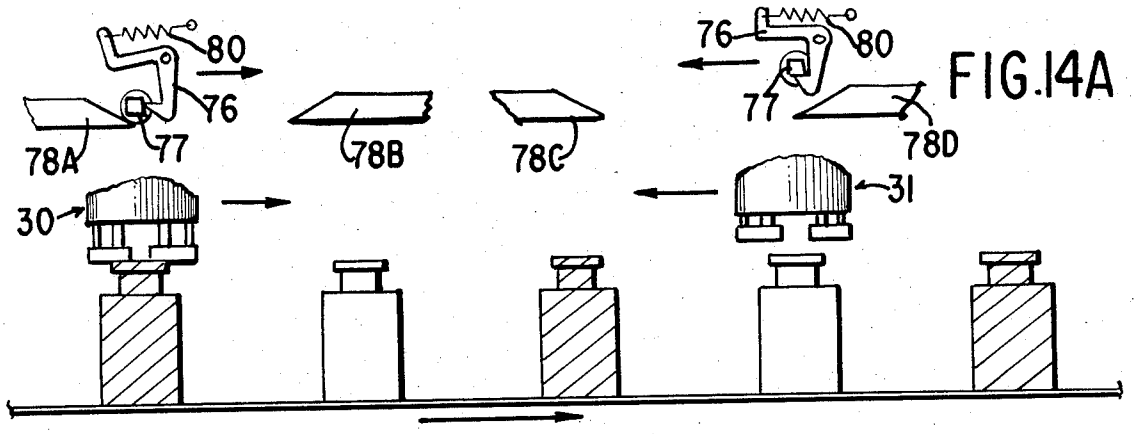



FIG.14A

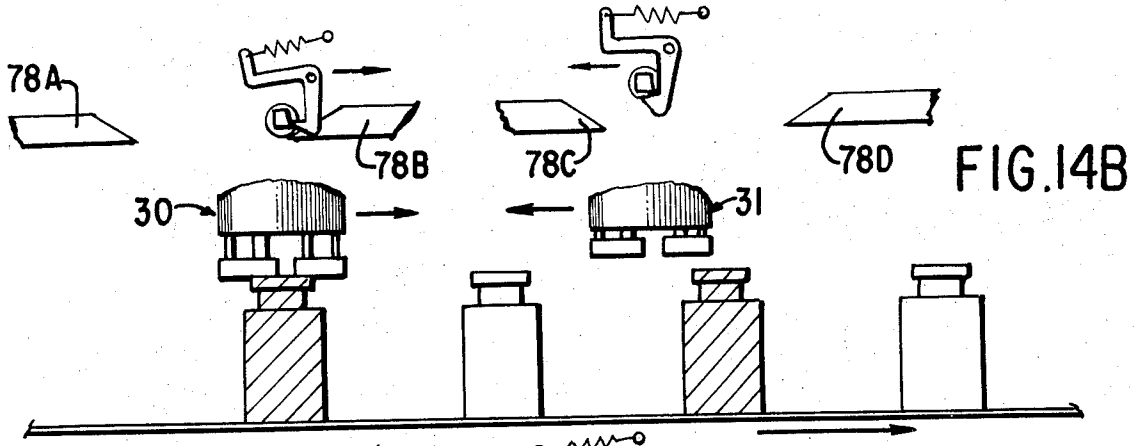



FIG.14B

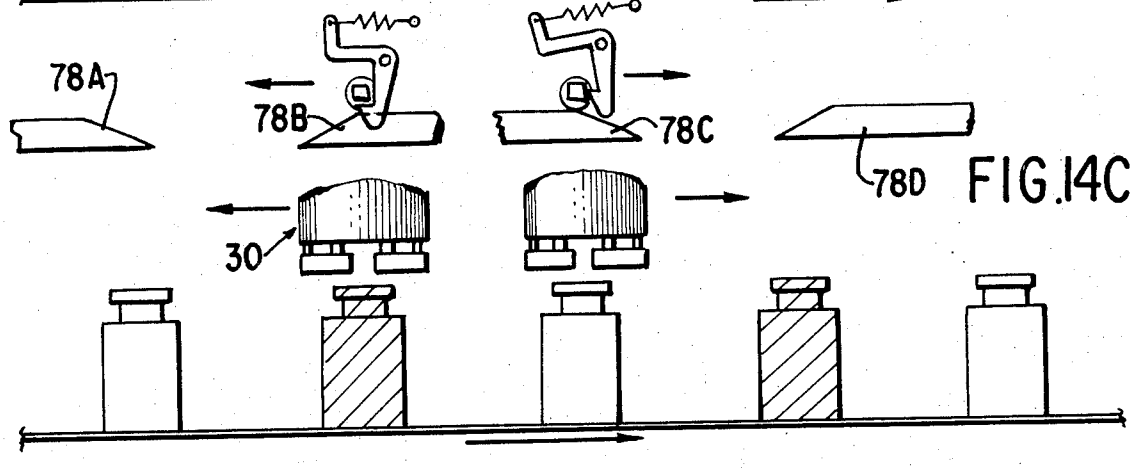



FIG.14C

# OPPOSITELY RECIPROCATING CONTAINER INSPECTING MACHINE

## SPECIFICATION

This invention relates to container or bottle inspecting machines and particularly to a machine for determining the acceptability thereof.

In the production of containers, such as glass bottles, considerable difficulty has been encountered in providing a testing or inspection system which will eliminate bottles having defective lips and bottles that are too short and yet not reject bottles which are actually acceptable. A machine of the type concerned must be adjustable to accommodate various size containers and must be relatively fast in its operation. With increased speed of bottle-making machines, the inspecting machine speed must be increased accordingly.

one of the objects of the invention is to provide a machine which will inspect and classify bottles without unnecessarily rejecting useable bottles.

Another of the objects of the invention is to provide a machine which will classify bottles at increased rates of speed over those now available.

In one aspect of the invention, the containers or bottles to be inspected are conveyed past at least a pair of rotatable testing heads, the conveyor, therefore, being continuously movable. One of the heads moves onto the top of the bottle and is movable therewith. The other head is retracted upon completion of its testing of a bottle and is returned to a first portion as the other head is testing. That is, the heads are reciprocating oppositely relative to each other, one being in inspecting and testing position on a moving bottle while the other is returning. In this manner, it is possible to move the heads at a fast rate without undue vibration. If a reject signal is produced, a gate will be operated so that the container will move to a reject point. The test head also has means to detect a container that is too short.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

FIG. **1** is a partial front elevation of the machine;

FIG. **2** is an enlarged fragmentary sectional view along the line **2—2** of FIG. **1**;

FIG. **3** is a view taken along the line **3—3** of FIG. **1**;

FIG. **4** is an enlarged sectional view taken along the line **4—4** of FIG. **1** showing a testing head;

FIG. **4A** is a fragmentary view of the latch mechanism taken in the direction **4A—4A** of FIG. **4**;

FIG. **5** is a view taken along the line **5—5** of FIG. **4**;

FIG. **6** is an enlarged fragmentary plan view of the control mechanism taken in the direction **6—6** of FIG. **1**;

FIG. **7** is an enlarged fragmentary sectional view taken along the line **7—7** of FIG. **6**;

FIG. **8** is an exploded perspective view showing operation of the testing head latch;

FIG. **9** is a view taken along the line **9—9** of FIG. **1**;

FIGS. **10** and **11** are schematic views showing movement of the testing heads;

FIG. **12** is a schematic block diagram showing one type of circuit;



FIG. **13** is a view looking in the direction **13—13** of FIG. **15**;

FIGS. **14A**, **14B** and **14C** are diagrammatic views to show operation of the testing head latch means; and

FIG. **15** is a fragmentary top view of FIG. **3**.

Where appropriate, the same reference numerals will be used to designate the same or equivalent parts in the various figures.

First a general description of the machine and its operation will be given and then a detailed description of certain of the parts.

Referring to FIG. **1**, frame **20** has mounted thereon coarse thread conveyor screw **21**, the pitch of the threads of which are chosen according to the diameter or size of the bottles to be classified. Bottles **22** are fed to the conveyor at **23**, the bottles being guided by adjustable fence or guide **24**. Fence **24** may be carried on member **25** which is detachably held on frame **20** by means of bolts **26, 26** which cooperate with keyhole slots **27, 27** (FIG. **1**). Such will permit easy removal of fence **24** and guide **28** when necessary to use a different size fence or spacing, depending upon the bottle size being tested.

Rotating heads **30, 31** are reciprocably carried by rod or track **32**. The rotatable heads are rotated by belt **33** driven by pulley **34** which is driven by motor **35**. The other end of the belt is carried on idler pulley **36**.

The portion of the belts between the rotating heads is drawn together by spring urged rollers **37** which are drawn toward each other by springs **38**, as schematically shown in FIGS. **10** and **11**.

The rotating heads **30, 31** are oppositely reciprocated on rod **32** by screws **39, 40** and **41, 42** in a manner that will be described at a later point. When the head **30** arrives at a point over a bottle, as in FIG. **1**, the testing head will be released and the rotating head moved along with the bottle, as seen in FIG. **10**. Belt **33** is in contact with both heads so as to rotate them, and the belt is held in driving contact with the rotating heads by the rollers **37** and spring means **38**.

At the same time as head **30** moves to the right (FIG. **10**), head **31** has had its testing portion moved upwardly and is moved to the left in position to be released onto the bottle which will have been moved into position thereunder when head **31** reaches its initial or leftmost position (FIG. **10**). The testing head of **30** then is raised to release the bottle tested thereby which continues on its path to the delivery or rejection zone. Head **31** has its testing portion released to engage the bottle which passed head **30** and moves therewith to the right as seen in FIG. **11**.

The bottles are spacedly engaged and moved by the conveyor in relation to the movement of the rotating and testing heads so that one bottle will be tested by the first head **30** and an adjacent bottle by second head **31** when it reaches the proper position thereunder.

The reciprocable testing heads are reciprocated in the proper direction by rockable block means **43**. Block means **43** are rockably mounted on their respective rotating heads and have screw thread engaging buttons **44, 45** extending therefrom. Buttons **44** or **45** are engageable with their respective screws **38, 40, 41** and **42** according to the position to which the block **43** has been rocked. The blocks are arranged to be rocked by cam-engaging rod **46** which engages respective cams **47, 48**. When a block **43** is in its upper position as seen in FIG. **8**, button **45** will engage its lower screw **40** or

42 so as to cause traverse of its head. The block on the other head will have been rocked so that button 44 will engage its screw, causing traverse of its rotating head in the opposite direction.

Blade means 50, 51 are on blocks 43, 44 for contacting blades 53 on fixed bars 52 to cause the rockable blocks 43 to pivot, which will result in driving of the heads to be reversed at the end of their strokes to the opposite direction.

As described in Applicant's Patent No. 3,618,762 bottles having a mouth with an angle thereacross within certain limits are acceptable, providing the lips are smooth. If the angle is too great or the bottle is too short, it is not acceptable. The angle of the lip must be such that a cap can be properly placed thereon. If there are dips in the lip, then a cap will not seal so it is not acceptable.

The rotating head 30 or 31 (FIG. 4) is carried on on vertically adjustable support 54 which is screw threadedly mounted on post 55 (FIG. 2), the support 54 being guided by rod 56. The support carries the head 30 or 31 and the drives therefor as can be seen in FIG. 2.

Rotatable drum 57 is carried on central bushing 58, ball bearing 59 being located between the bushing 58 and drum 57. Bushing 58 is mounted on support 54. Drum 57 has vertically movable plungers 60 having bottle contacting rollers or feelers 61 thereon. Each of the plungers 60 has roller means 62, 63 (FIGS. 4, 5) projecting inwardly therefrom. Springs 65 urge the plungers outwardly, the plungers being vertically guided by pins 66 sliding in apertures 67.

Differential transformer 68 has coil 69 which is carried by vertically movable tube 70 which is positioned within bushing 58 in accordance with the position of the lower rim of tube 70 as governed by rollers 63.

Armature 71 is carried on slidable rod 72 which has cup-shaped button 73 at the bottom thereof. The upper rim of button 73 is contactable by rollers 62 so as to position armature 71 in accordance with the relative position of the rollers.

A latch means 75, for holding a rotating head in an upper ineffective position and for lowering it for testing, is seen in FIGS. 4 and 4A. In the upper or ineffective position, latch dog 76 engages pin 77 and holds the assembly including rod 72 and button 73 from descending. Buttong 73 through rollers 62 will hold plungers and rollers 61 in an upper ineffective position.

Upon reaching a position over a bottle to be tested, the latch is unlatched by the appropriate latch release cam 78 (78A, 78B, 78C, 78D of FIGS. 14A, 14B and 14C) to release the assembly so that the testing operation can be accomplished.

AS the head rotates, the rollers will roll around the lip of the bottle which will control the position of armature 71 relative to coil 69. As the button 73 descends along with the plungers, there will be no relative movement between the armature and coil so that a signal therefrom to the transducer input 79 (FIG. 12) will not change. If the bottle is too short, the descent of the plungers and rollers 61 relative to the heads can be used to provide a signal.

If the lip is angled, then pairs of the rollers will move up or down so as to cause movement of the armature relative to the coils through action of the rollers on button 73 and tube 70. The signal will be transmitted to the circuit for setting the bottle rejection mechanism if the angle is too great. In the event there is an indentation in the lip that is too great, one of the rollers will move therein sufficiently far to move button 73 down so as to change position of armature 71 relative to coil 69 and provide a rejection level signal to the circuit for the bottle involved.

Next, the release operation will be described, referring especially to FIGS. 4, 4A and 14A, B and C. Spring 80 urges latch dog 76 in a clockwise direction (FIGS. 4A and 14A, B and C) and under a pin 77 when pin 77 is raised. As an example, when the head 31 in FIG. 14A moves to the left and pin 77 is down so the rotating testing rollers are in contact with the bottle, pin 77 will engage cam 78D and be raised so that spring 80 will cause latch 76 to move under and hold the pin, which is the position shown at the right in FIG. 14A. Such occurs before the head 31 starts in its return direction to the left. At the other end of the travel of the head, cam 78C will hit and release the pin 77 so that the testing head can move downwardly onto the next bottle that has been conveyed thereunder.

FIGS. 14B and 14C show sequential movement of the heads relative to the bottles.

A rejection station for removing a defective bottle is shown at 90 (FIGS. 1, 15) wherein solenoid 91, when activated, pushes a bottle 22A off the track and to a reject conveyor 92. Acceptable bottles continue along conveyor 93.

Signals for the reject action are transmitted to the reject device by the memory mechanism 94, illustrated specifically in FIGS. 6 and 7).

Discs 95, 96 are rotated in timed relation with movement of the bottles through the machine by means of suitable drive means for the various conveyors, heads, head drives, etc. One of the signal-activated means 97 now will be described, such being carried on disc 96. Trip plunger 99 is normally urged downwardly by spring 100 but is restrained from downward movement by pivoted latch 101 which is pivoted at 102, spring 103 normally urging the latch into latching position. If a reject signal is received by the circuit as the result of a defective bottle, it will be directed to the proper signal-activated means through the appropriate switch 103, 104, closed or actuated by its cam on disc 95. Solenoid 105 then will be energized to pivot latch 101 and release plunger 98. With continued timed rotation of disc 96, plunger 98 will actuate switch 106 to give a pulse to solenoid 91 at the proper time. Further movement of disc 96 will cause plunger 98 to move over a suitable cam 107 and relatch the plunger.

Various types of actuating circuits can be used, one being schematically shown in FIG. 12.

It should be apparent that variations can be made in details of construction without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. In a continuous container inspection apparatus, the combination including at least a pair of rotatable inspecting heads having feelers thereon, conveyor means for moving containers through said apparatus in a forward direction, means for reciprocating said heads oppositely relative to each other, means for lowering feelers of a head into testing position onto a container as the head is being moved in a forward direction, means for raising the feelers of the other head which is traveling in a reverse direction relative to the contain-

ers, and electric circuit means actuated by a defective container to produce a signal.

2. An apparatus as claimed in claim 1 wherein the signal activates a container reject means at a predetermined position along the conveyor.

3. An apparatus as claimed in claim 1 wherein the conveyor means includes a threaded rod for engaging the containers and moving the same.

4. An apparatus as claimed in claim 1 wherein there is an armature and electric coil means movable relative to each other in accordance with movement of the feelers as they rotate on the lip of a container.

5. An apparatus as claimed in claim 1 wherein there is a memory device connected to the circuit means to produce a signal at the proper time to operate a reject means for removing a defective container from the conveyor means.

6. An apparatus as claimed in claim 1 wherein the means for reciprocating the heads includes a pair of lead screws for each and a rockable lead screw engaging means on each head.

7. In a container inspection apparatus, the combination including a rotatable inspection head having angularly spaced feelers thereon, means for moving a container under said feelers and moving said feelers on the container, coil means mounted on a vertically movable support on said head, armature means cooperating with said coil and mounted on a separate vertically movable support on said head, said movable supports being freely movable relative to each other and to said head, means on said feelers for selectively contacting either of said supports to move said coil means and armature means upwardly or downwardly relative to each other in response to a unacceptable container or together in response to an acceptable container to produce a signal in accordance with the relative position of said feelers to each other, said feelers providing a null signal when the container is acceptable.

8. An apparatus as claimed in claim 7 wherein each of said feelers has roller means, button means on one of said supports positionable by any of said roller means, and means on the other support positionable by any of said roller means.

* * * * *