July 27, 1965 W. J. PELTIER 3,197,620

SYSTEM FOR COUNTING MOVING OBJECTS OF DIFFERENT DIMENSIONS

Filed June 25, 1962 2 Sheets-Sheet 1

FIG. 3

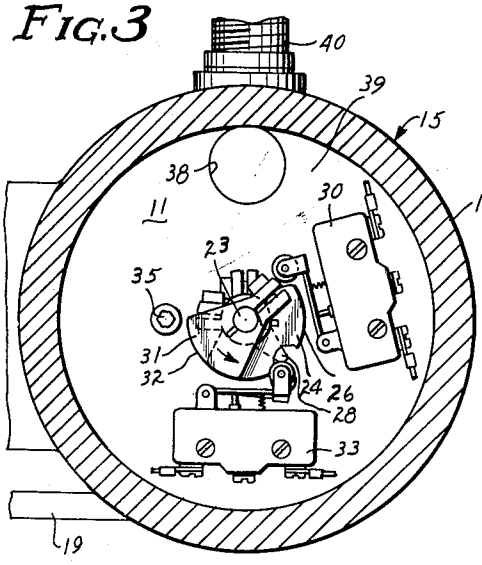
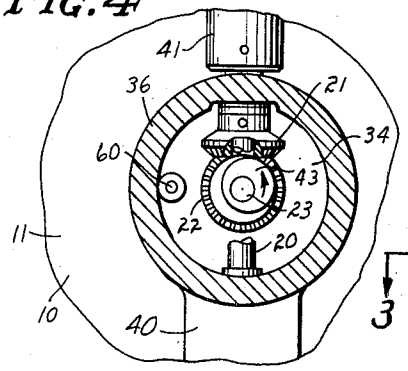
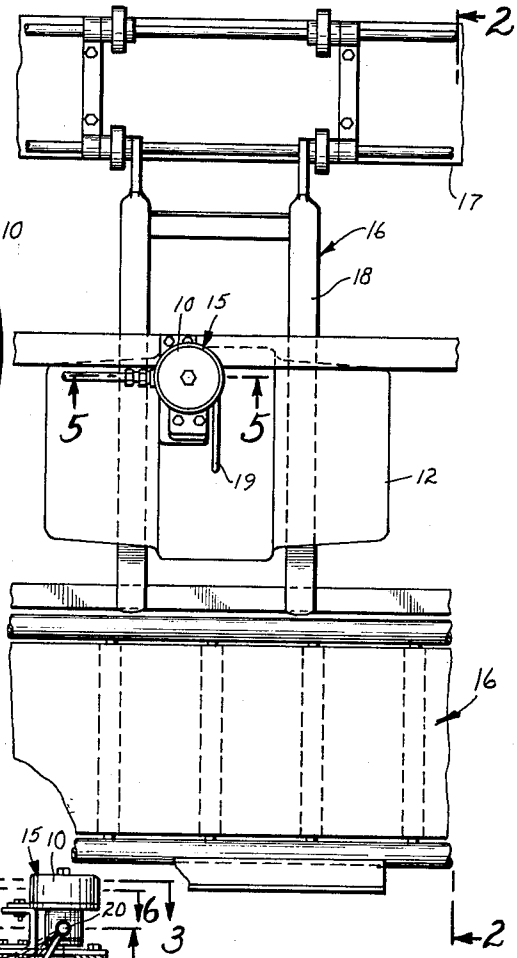


FIG. 4





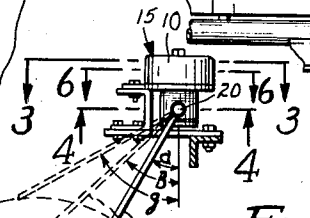
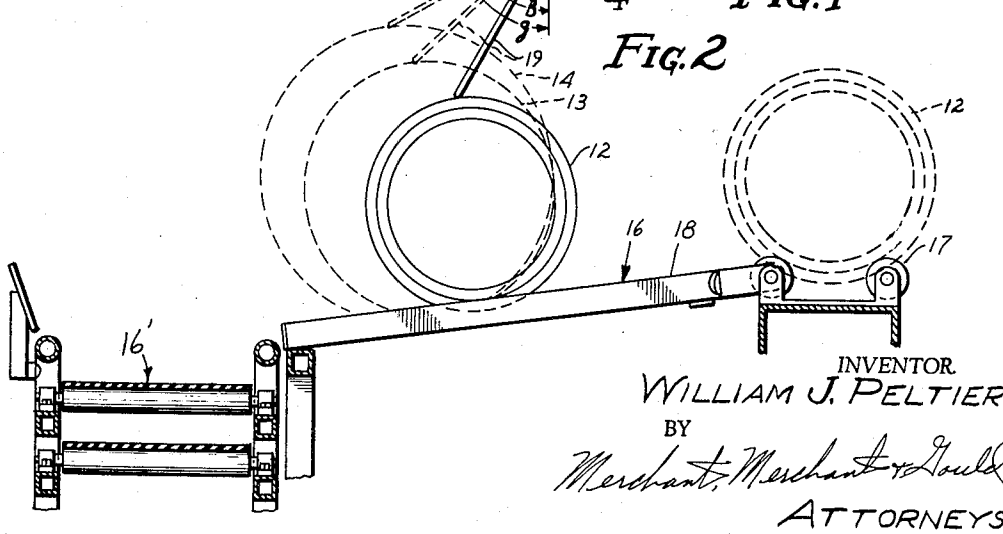


FIG. 1

FIG. 2



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SYSTEM FOR COUNTING MOVING OBJECTS OF DIFFERENT DIMENSIONS

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FIG. 5

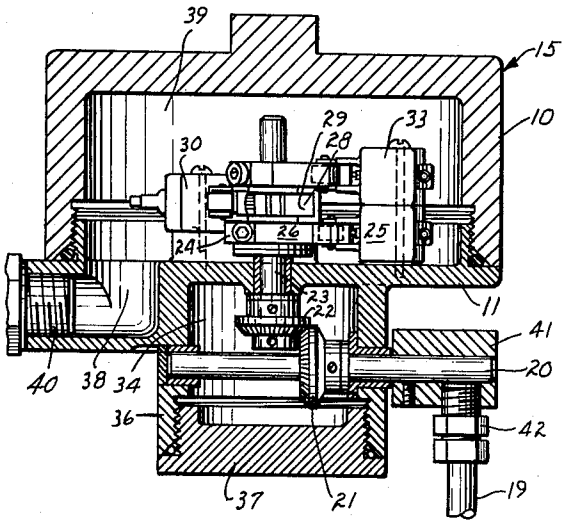


FIG. 6

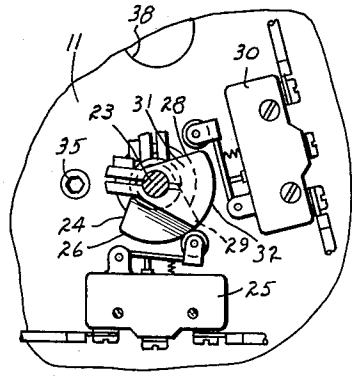


FIG. 7

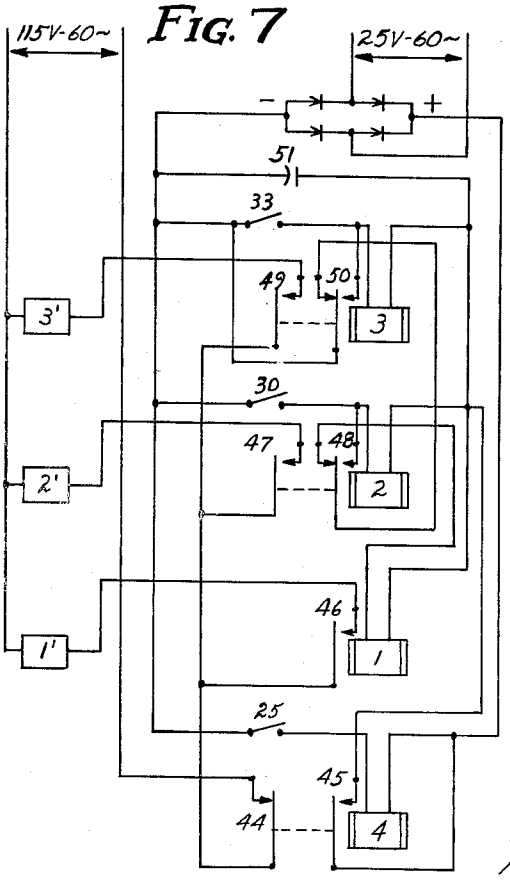
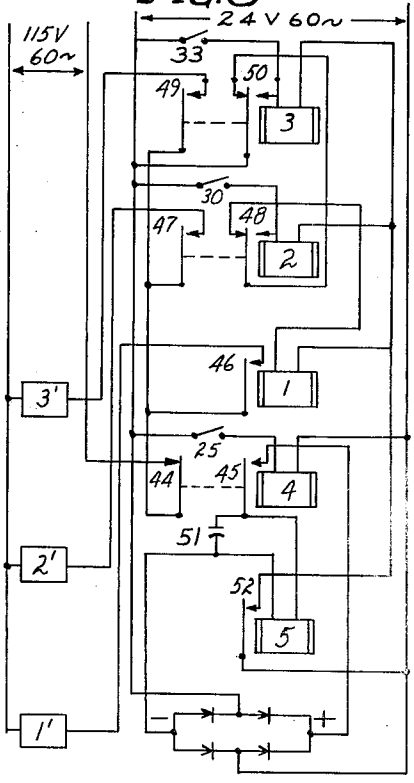


FIG. 8



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3,197,620

SYSTEM FOR COUNTING MOVING OBJECTS OF DIFFERENT DIMENSIONS

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Filed June 25, 1962, Ser. No. 204,868
5 Claims. (Cl. 235—92)

This invention relates to electro-mechanical means for counting moving objects.

More particularly, this invention relates to electro-mechanical means for counting individual members moving past a given locus in each of a plurality of sub-groups.

Still more particularly, this invention is directed to an electro-mechanical system for counting similar articles, at least some of which differ from others in given physical characteristics. The system employs an actuator shaft, an article engaging sensing element mounted on the actuator shaft, means mounted on the actuator shaft for movements toward and away from an inoperative position, means for imparting relative movement between the mounting means and the articles being counted so as to cause engagement of the articles with the article-engaging sensing element, counting circuit means including counters and control switches, and means associated with the actuator shaft for selectively actuating the control switches in response to the given physical characteristics of individual articles relatively moving past the mounting means. The invention also particularly relates to the counting station which senses the known physical differences between objects being counted and selectively actuates switches in response thereto, and it further relates to electrical circuitry usable in combination with the counting station for registering counts.

It is an object of this invention to provide a simple, rugged, dependable, electro-mechanical system for counting moving objects at least some of which differ from others of the group in given physical characteristics.

It is another object of this invention to provide an apparatus for counting individual members of a class in which individual members differ from each other in a definite physical manner.

It is another object of this invention to provide a stationary mechanical means for directly sensing known dimensional differences between moving objects passing such means.

It is another object of this invention to provide a mechanical means for translating sensed physical differences between objects into degrees of angular rotation of a shaft about its axis.

It is another object of this invention to provide in an electro-mechanical counting system, electrical means responsive to angular rotation of a shaft for controlling counting means.

It is an object of this invention to provide circuitry suitable for counting individual objects differing from each other in given physical characteristics, such as length, width, height, density, mass or weight.

It is another object of this invention to provide a combination of a mechanical counting station and an electrical counting circuit.

Other and further objects of this invention will become apparent to those skilled in the art upon a reading of the attached specification and drawings, wherein:

FIG. 1 is a plan view of an embodiment of an apparatus of the invention in which portions are broken away;

FIG. 2 is a view in side elevation taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged horizontal sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged horizontal sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is an enlarged vertical sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is an enlarged horizontal sectional view taken along the line 6—6 of FIG. 2;

FIG. 7 is a schematic representation showing circuitry suitable for use with the embodiment of FIG. 1; and

FIG. 8 is a schematic representation showing a modification of the circuitry of FIG. 7.

In FIG. 2 is shown an embodiment of the invention being used to count three different sizes of beer barrels passing a given point in a conveyor belt system. Ramp 18 delivers barrels from a beer barrel filling machine indicated generally by 16 to an associated conveyor belt system indicated generally by the numeral 16'. In this instance, these barrels are referred to herein as being small, medium and large, and are designated by the numbers 12, 13 and 14, going from smaller to larger, respectively. The sensing and switching means or counting station referred to herein by the general number 15, is positioned above a point on a conveyor belt system 16. Shown in FIG. 1 is a barrel 12 which has come down the conveyor belt apparatus from level 17. As the barrel 12 goes down ramp 18, it passes under sensing mechanism 15. Rod 19, which projects downwardly from the mechanism 15, is bumped in its end region by barrel 12, which causes the arm to swing (see FIG. 2). As the arm swings forward it causes shaft 20 to rotate through a small angle, here termed "Alpha" (α). Similarly, when a medium-sized barrel 13 passes underneath the mechanism 15, rod 19 is moved forward through a greater angle, here termed "Beta" (β), causing shaft 20 to rotate through a correspondingly greater angle; and when the large-sized barrel 15 moves under rod 19 the shaft 20 is caused to rotate through a still larger angle "Gamma" (γ).

When shaft 20 turns, it causes bevel gear 21 to turn. This, in turn, causes a mating bevel gear 22, set at right angles to bevel gear 21, also to turn. As a consequence, the angular horizontal rotation of shaft 20 is transformed into the vertical rotation of a shaft 23. As shaft 23 rotates through an angle Alpha, it causes an attached cam 24 to contact and close switch 25. Because cam 24 has a wide arcuate surface 26, the switch remains depressed as the shaft 20 continues to rotate (see FIGS. 3, 5 and 6).

Similarly, when a medium-sized barrel 13 causes rod 19 to move through an angle Beta, shaft 23 is caused to rotate. A second cam 28 is positioned adjacent cam 24 on shaft 23 at such an angle that when the rotation of shaft 20 exceeds the angle Alpha in its rotation, the arcuate surface 29 of cam 28 contacts switch 30 and causes the same to close and remain closed as the shaft 23 continues to rotate.

Finally, when the large barrel 14 moves under rod 19 and the same is caused to rotate through an angle Gamma, shaft 23 is caused to rotate through an angle greater than Beta. When angle Beta is exceeded, a new cam 31 is so positioned on shaft 23 that its arcuate surface 32 contacts a third switch 33 and causes the same to close and remain closed.

The cams and switches are mounted upon a base 11 which is enclosed by a housing 10. Shaft 23 is centrally mounted in base 11 through which it passes to enter a chamber 34 wherein the bevel gears operate submerged in lubricant. (Not shown.) Conveniently, a dip stick 60 (not shown in FIG. 5) hangs from a nut 35 into chamber 34. Chamber 34 is enclosed by walls 36 and screw-type base plug 37. A well 38 is positioned near a wide base 11 so as to provide an opening into the base region 39 through which necessary wiring can pass from switches 25, 30 and 33 to a suitable remote point

through a channel 40. Rod 19 is clamped to a sleeve 41 by means of a conventional compression fitting 42.

To the base of bevel gear 22 is attached an eccentric disc or plate 43 whose eccentricity is exaggerated for purposes of this discussion in the horizontal section of FIG. 4. The purpose of eccentric disc 43 is to provide a braking action limiting reactive counterclockwise motion of shaft 20 in a direction backwards to the direction of angular movement employed in counting (here clockwise). This is made necessary by the fact that after rod 19 has lost contact with a barrel due to the latter's forward motion, the rod would normally tend to promptly swing back. If unheaded, the rod 19 would simply tend to oscillate or pendulate, which would cause obvious unwanted side effects in switches 25, 30 and 33. If a mere stopping means were provided to inhibit pendulations of shaft 19 following contact with a barrel, the rod 19 would tend to swing forward again after hitting the stop means. In order to cause, therefore, rod 19 to swing backward to a vertical position and there hold without unwanted pendulations of any sort, an eccentric disc 43 is provided. The operation of this eccentric disc 43 to produce braking motion is as follows:

As rod 19 swings downward to a vertical position (or 0 angle of deflection) the eccentric portion of eccentric disc 43 rotates into contact with the base of a bevel gear 21. The eccentric disc 43 is so positioned that the maximum angle of contact between bevel gear 21 and eccentric disc 43 is achieved as rod 19 reaches its vertical position. This accomplishes the desired braking action, since the squeeze of eccentric disc 43 against bevel gear 21 effects a desired braking action, preventing oscillations or pendulations of shaft 19. In FIG. 4 the action of eccentric disc 43 is shown by means of cutting away shaft 23.

Thus, the sensing and switching means contains shaft means, switch means oriented about said shaft means, physical sensing means for detecting known physical differences between individual members, and means for causing angular rotation of said shaft member so as to selectively actuate said switching means. A fixed horizontal supporting stage, having a housing which sealably encloses the same, contains a vertical shaft journal centrally positioned therein. Vertically spaced cam surfaces are positioned upon said shaft above said stage inside said housing. Switch means are mounted upon said stage inside said housing and are so oriented about said vertical shaft journal that each cam surface successively actuates a switch means as the said vertical shaft journal turns. Fixed to the bottom of the stage is a sealable cage centrally positioned. A horizontally displaced shaft journal is positioned through a wall of said cage, and a pair of engaging, mated bevel gears positioned in said cage translate horizontal rotation of said horizontally displaced shaft journal into vertical rotation of said vertically displaced shaft journal. Outside of said cage, an arm is radially downwardly suspended from the said horizontal shaft, said arm being so oriented that it is moved from a vertical position by objects passing therebeneath in a plane normal to the axis of said horizontal shaft, thereby producing angular rotation of said horizontal shaft as objects pass therebeneath, the amount of rotation of said horizontal shaft corresponding to the height or breadth of an object passing therebeneath. In order to retard shaft rotation and provide a braking action as the arm swings downward after being displaced by an object passing therebeneath, an eccentric disc is axially mounted against the face of one of said bevel gears. The eccentricity of this disc is so located as to engage the face of the other of said bevel gears and thereby retard shaft rotation in the region where the eccentric portion of the disc engages the face of the bevel gear when said arm is in a vertical or near vertical position.

The term "relay" or "relay means" is used herein in its conventional sense to refer generally to an electromagnetic device operated by a variety of conditions in an electric circuit, and which, when so operated or activated operates, in turn in this case, a switch or pole or a plurality of switches and poles, in the same or a different circuit. The phrase "single-pole, single-throw" relay or relay means, has reference to a relay which contains one switch or pole which is opened or closed, as the case may be, when the energizing coil of such relay is energized. The term "double-pole, double-throw" relay or relay means has reference to a relay means which contains a pair of switches or poles which co-act together when the energizing coil of said relay is energized; thus both switches may move from a closed to an open position, or vice versa, or one switch may move from a closed to an open position while the other moves from an open to a closed position, or vice versa. Those skilled in the art will appreciate that certain equivalent structures can also be used herein as relays, although description of the drawings herein is restricted to a particular class of relay means.

The manner in which the sensing mechanism 15 is used to operate counters 1', 2' and 3' is shown in FIG. 7. The electrical circuitry employs one single-pole, single-throw relay or equivalent number 1 and three double-pole, double-throw relays or equivalents numbered 2, 3 and 4, respectively, which are constructed with common movements so that when one pole is thrown or switched, the other pole, being ganged with the first one, is also thrown or switched. Counter 1' counts the number of small barrels 12; counter 2' counts medium-sized barrels 14; and counter 3' counts large-sized barrels 15.

When switch 25 is closed, pole 44 of relay 4 opens and pole 45 closes. When pole 45 closes, it completes a circuit from one side of the 25 v. line to one side of the coils of relays 1, 2 and 3, and it also charges condenser 51. When switch 25 is closed only the coil of relay 1 has a current actually flowing through it, which promptly results in the closing of pole 46.

When switch 25 is opened, pole 45 promptly opens and pole 44 promptly closes. Pole 46, however, does not immediately open because the charge on condenser 51 must leak off through the coil of relay 1 before pole 46 can open. Thus, since switch 25 is opened, the effect is that condenser 51 starts to discharge and holds pole 46 closed until current flow from condenser 51 ceases. Consequently, for a brief interval of time both pole 44 and pole 46 are closed, thereby sending a short pulse of current through counter 1' causing the same to record one count.

When both switches 25 and 30 are closed, pole 44 opens and pole 45 closes, as when switch 25 only is closed. In addition, when switch 30 is closed, the coil of relay 2 is energized, causing pole 48, in a normally closed position, to open and pole 47 to close (poles 47 and 48 being in relay 2). When pole 48 opens, current passing through the coil of relay 1 is promptly cut off and the coil of relay 1 is by-passed, thereby resulting in the prompt opening of pole 46. Since pole 46 is opened as a result of the closing of switch 30, no current can pass through counter 1' after switch 30 has been closed.

When switch 30 is open, along with switch 25, pole 44 promptly closes, and pole 45 promptly opens. Condenser 51 discharges through the coil of relay 2, thereby slightly retarding the time for poles 47 and 48. The result is that a pulse of current travels through counter 2' causing the same to count. Observe that this result is the same even though switch 30 is opened before switch 25 is opened, or vice versa.

In a situation where all three switches (25, 30 and 33) are closed, either simultaneously or in rapid succession, the result is that as soon as the coil of relay 3 is energized by the closing of switch 33, then the coils of relays 1 and 2 are de-energized with the consequence that poles 46, 47 and 48 are opened, thereby preventing any count from recording in counters 1' and 2'. As soon as switches 25, 30 and 33 are opened—singly, successively or simulta-

neously—there results a small pulse of current through counter 3' causing this counter to count, owing to the discharge of condenser 51 through the coil of condenser 51. Observe that even if switch 30 is not ever closed and remains open during the entire time that switches 25 and 33 are closed, the result is the same; that is, only a single pulse is generated and this pulse will only pass through counter 3'.

In summary, when a small barrel 12 passes under sensing and counting mechanism 15 and is counted by the counting circuit, the procedure is as follows (referring to FIG. 7): Switch 25 closes, energizing relay 4. Pole 44 opens in the counter circuit and pole 45 closes in the relay selector circuit of relay 4. Relay 1 now becomes energized. When the sensor rod 19 drops back, switch 25 opens, de-energizing relay 4. Pole 45 of relay 4 opens in the relay selector circuit and pole 44 of relay 4 closes in the counter circuit. Relay 1 drops out at the end of the condenser 51 discharge, thereby de-energizing counter 1'.

When a medium-sized barrel 13 passes under sensing and counting mechanism 15 and is counted by the counting circuit, the procedure is as follows: Switch 25 closes, energizing relay 4. Pole 44 opens in the counter circuit and pole 45 closes in the relay selector circuit of relay 4. Relay 1 now becomes energized. Next, switch 30 closes, energizing relay 2. As a result, pole 48 switches, thereby locking in relay 2 and de-energizing relay 1. Pole 47 closes. When sensor rod 19 now drops back, switch 30 opens, then switch 25 opens, de-energizing relay 4. Pole 45 opens in the relay selector circuit and pole 44 closes in the counter circuit. Relay 2 is now held in by condenser 51 discharge for a short time. As a result, counter 2' is energized. Finally, relay 2 drops out and counter 2' is de-energized.

When a large barrel 14 passes under sensing and counting mechanism 15 and is counted by the counting circuit, the procedure is as follows: Switch 25 closes, energizing relay 4. Pole 44 opens in the counter circuit and pole 45 closes in the relay selector circuit of relay 4. Relay 1 now becomes energized. Next, switch 30 closes, energizing relay 2. As a result, pole 48 switches, thereby locking in relay 2 and de-energizing relay 1. Pole 47 closes. Switch 33 now closes, energizing relay 3. Pole 50 switches, locking in relay 3 and de-energizing relay 2, and pole 49 closes. When the sensor rod 19 now drops back, switch 33 opens first, followed by switch 30, de-energizing relay 2 and, in turn, followed by switch 25, de-energizing relay 4. Pole 45 opens in the relay selector circuit and pole 44 closes in the counter circuit. Relay 3 is now held in by condenser 51 discharge for a short time. As a result, counter 3' is now energized and relay 3 drops out at the end of condenser 51 discharge. Finally, counter 3' is de-energized.

A modification of the circuit of FIG. 7 is shown in FIG. 8. Basically, the same circuit is employed except that a new relay 5 is used to control flow of electricity into the relay selector circuit. The operation of this modified circuit can be summarized as follows (referring to FIG. 8): Switch 25 closes, energizing relay 4. Pole 44 opens in the counter circuit and pole 45 closes in the rectifier circuit, thereby energizing relay 5. Pole 52 of relay 5 closes in the relay selector circuit. Relay 1 is now energized and its pole 46 closes in the counter circuit for counter 1'. When switch 30 now closes, relay 2 is energized and the pole 48 switches, thereby disconnecting relay 1 and locking in relay 2. Pole 47 closes. When switch 33 closes relay 3 is energized, pole 49 closes in counter 3', and pole 50 switches, thereby de-energizing relay 2 and locking in relay 3. When the sensor rod 19 now drops back opening switch 33 and switch 30 (thereby de-energizing relay 2) and finally switch 25, relay 4 is de-energized. Pole 44 closes in the counter circuit and opens the rectifier circuit. Condenser 51 discharge now holds relay 5 energized for a limited time, which in turn keeps pole 52 of relay 5 closed. The result is that the counter 3' is energized for a short period of time. Finally, relay 5 drops, with the result that a count is recorded on the counter 3'.

The time of discharge for condenser 51 is, of course, a function of the particular circuit and the particular condenser employed and can be chosen so as to best suit the needs of a particular situation in which the circuit is employed. The total number of double-throw, double-pole relays and associated condensers used in a particular circuit is immaterial, as those skilled in the art will appreciate, as virtually any desired number of such relays and associated counters can be employed (i.e., *n* number of counters and associated relays can be used in the circuit described) within the spirit and teachings of this invention.

Similarly, while the circuitry of this invention has been described with reference to 25-volt rectified alternating current for use in the switching circuits involving switches 25, 30 and 33, any convenient source of electricity can be employed depending upon the particular electrical values for the circuit elements chosen. Similarly, while a 115-volt, 60-cycle alternating current is used in the counter circuit, any suitable source of electricity can be employed depending upon the type of counting equipment and circuit considerations involved.

The counting circuit above described as suitable for use with the electro-mechanical counting system of this invention contains, as minimum components, at least two pulse-actuated alternating or direct counters plus a corresponding number of control switches and double-pole, double-throw relay means or equivalent means, a single-pole, single-throw relay means or equivalent means, a condenser means, a suitable source of electrical energy and associated wiring means. The electrical energy can be in the form of two different types such as alternating and direct. Also, the wiring can be conventional copper wiring or in the form of printed circuitry.

In summary, the circuitry above described as being suitable for use with the electro-mechanical counting system of this invention contains: a plurality of counters, a plurality of normally open switches, one each for a different one of said counters, first parallel circuit means comprising each of said counters and their respective switches, a normally closed switch connected in series with said first parallel circuit means, counting switches equal in number to the number of said counters each of which is so successively connected with said first parallel circuit means as to close when actuated by one of said normally open switches, a first one of said counting switches also being so connected with said first parallel circuit means that, when actuated, it opens said normally closed switch, normally closed control switches connected with each one of said counting switches after said first one of said counting switches each of which is opened when its connected counting switch is closed, thereby reopening any of said normally open switches which has been previously closed, electro-magnetic means positioned near each of said normally open switches which, when energized, holds said normally open switches closed, means for storing a charge when said first counting switch is closed and for discharging such charge when said first counting switch is opened whereby to briefly energize said electro-magnetic means, a parallel circuit comprising said charging means and said electro-magnetic means, a source of electricity, and one of said counters being energized to register a count responsive to closing of at least said first counting switch and subsequent opening thereof.

Perhaps a simpler way of viewing this counting circuit is to summarize it by saying that it contains a first and a second counter, a normally open switch connected in series with each one of said counters, a parallel circuit comprising each of said counters and their respective connected switches, said parallel circuit being connected in series with a normally closed switch, a first and a second

counting switch means each of which when actuated closes one of said normally open switches, said first counting switch means when actuated also opening said normally closed switch, said second counting switch means when closed also opening a normally closed control switch which, when opened, opens that one normally switch closed by said first counting switch means, electro-magnetic means positioned near each of said normally open switches which, when energized, is capable of holding said normally open switches closed when closed, charging means for storing a charge when said first counting switch is closed and for discharging such charge when said first counting switch is opened to briefly energize said electro-magnetic means, and a parallel circuit comprising said charging means and said electro-magnetic means so that when at least said first counting switch is closed and then opened, one of said counters counts once.

The apparatus of this invention is particularly valuable for the counting of barrels of different sizes passing a given point, particularly beer barrels, although as those skilled in the art will appreciate, the invention is useful in counting any repetitive operation where only a finite number of physical variations enter into the units passing a given point. While the foregoing apparatus has been described with reference to a sensing and counting apparatus which is useful in the determination of differences in height, it will be appreciated that slight modifications of the sensing and switching mechanism would render the system of this invention useful for counting differences in weight, density, mass, or the like, the only important criterion being that sensing means must be so coupled with the switching means as to accurately detect the physical variations in units passing a given point.

While the invention has been described in detail with reference to particular embodiments thereof, those skilled in the art will appreciate that other equivalent embodiments can be constructed to produce systems and structures within the spirit and scope of this invention, and I do not wish to be limited in the reasonable scope to be accorded by invention to the particular embodiments described in detail above.

What is claimed is:

1. A combined sensing and switching structure containing:
   (a) a horizontal supporting stage having a housing which sealably encloses the same,
   (b) a first shaft journal centrally positioned in said stage,
   (c) spaced cam surfaces positioned upon said first shaft above said stage inside said housing,
   (d) switch means mounted upon said stage inside said housing and so oriented about said first shaft journal that each cam surface successively actuates a switch means as said first shaft journal turns,
   (e) a sealable cage fixed centrally to the bottom of said stage,
   (f) a second shaft journal positioned in a wall of said cage,
   (g) a pair of engaging, mated bevel gears positioned in said cage for translating rotation of said first shaft journal into rotation of said second shaft journal one such gear being mounted on said first shaft, the other on said second shaft,
   (h) an arm radially connected with said first shaft outside of said cage, said arm being so oriented that the same is movable by objects passing therebeneath, thereby producing angular rotation of said first shaft as objects pass therebeneath, the amount of rotation of said first shaft corresponding to the physical differences of objects passing therebeneath,
   (i) a circumferentially eccentric disc axially mounted against the face of one of said bevel gears, said disc's eccentricity being so positioned as to engage the face of the other of said bevel gears and thereby retard shaft rotation in the region where the eccentricity engages the face of the bevel gear when said arm is in a generally inactive position.

2. A counting circuit suitable for use with an electro-mechanical counting system of the class described containing:
   (a) a plurality of counters,
   (b) a plurality of normally open switches, one each for a different one of said counters,
   (c) first parallel circuit means comprising each of said counters and their respective switches,
   (d) a normally closed switch connected in series with said first parallel circuit means,
   (e) counting switches equal in number to the number of said counters each of which is so successively connected with said first parallel circuit means as to close when actuated one of said normally open switches,
   (f) a first one of said counting switches also being so connected with said first parallel circuit means that, when actuated, it opens said normally closed switch,
   (g) normally closed control switches connected with each one of said counting switches after said first one of said counting switches each of which is opened when its connected counting switch is closed, thereby reopening any of said normally open switches which has been previously closed,
   (h) electro-magnetic means positioned near each of said normally open switches which, when energized, holds said normally open switches closed,
   (i) means for storing a charge when said first counting switch is closed and for discharging such charge when said first counting switch is opened whereby to briefly energize said electro-magnetic means,
   (j) a parallel circuit comprising said charging means and said electromagnetic means,
   (k) a source of electricity, and
   (l) one of said counters being energized to register a count responsive to closing of at least said first counting switch and subsequent opening thereof.

3. A counting circuit suitable for use with an elecro-mechanical counting system of the class described containing:
   (a) a first and a second counter,
   (b) a normally open switch connected in series with each one of said counters,
   (c) a parallel circuit comprising each of said counters and their respective connected switches,
   (d) said parallel circuit being connected in series with a normally closed switch,
   (e) a first and a second counting switch means each of which when actuated closes one of said normally open switches, said first counting switch means when actuated also opening said normally closed switch,
   (f) said second counting switch means when closed also opening a normally closed control switch which, when opened, opens that one normally open switch closed by said first counting switch means,
   (g) electro-magnetic means positioned near each of said normally open switches which, when energized, is capable of holding said normally open switches closed when closed,
   (h) charging means for storing a charge when said first counting switch is closed and for discharging such charge when said first counting switch is opened to briefly energize said electro-magnetic means, and
   (i) a parallel circuit comprising said charging means and said electro-magnetic means so that when at least said first counting switch is closed and then opened, one of said counters counts once.

4. An electro-mechanical system for counting similar articles at least some of which differ from others in given physical characteristics, said system comprising:
   (a) an actuator shaft mounted for rotational movement and biased to a normal position,

(b) damping means associated with said shaft for substantially preventing any oscillatory movement of said shaft,

(c) an article-engaging sensing element mounted on said actuator shaft for causing limited rotation of said shaft from the normal position upon engagement of said element with an article,

(d) means for imparting relative linear movement between said shaft and said articles to cause engagement of said articles in succession by said article-engaging sensing element,

(e) spaced cam surfaces attached to said shaft and rotating therewith,

(f) counting circuit means including counters and control switches, and

(g) means mounting said control switches in juxtaposition to said shaft so that said switches are selectively actuated by said cam surfaces in response to a predetermined amount of rotation of said shaft from the normal position, said control switches being further positioned with respect to said cam surfaces so that the order of control switch activation is reversed when said control switches are deactivated upon said shaft returning to the normal position and each control switch activated remains activated until deactivated.

5. An electro-mechanical system for counting similar articles at least some of which differ from others in given physical characteristics, said system comprising:

(a) an actuator shaft mounted for rotational movement and biased to a normal position,

(b) damping means associated with said shaft for substantially preventing any oscillator movement of said shaft,

(c) an article-engaging sensing element mounted on said actuator shaft for causing limited rotation of said shaft from the normal position upon engagement of said element with an article,

(d) means for imparting relative linear movement between said shaft and said articles to cause engagement of said articles in succession by said article-engaging sensing element,

(e) spaced cam surfaces attached to said shaft and rotating therewith,

(f) counting circuit means including counters and associated control switches,

(g) means mounting said control switches in juxtaposition to said shaft so that said switches are actuated in sequence by said cam surfaces in response to a predetermined amount of rotation of said shaft from the normal position, said control switches being further positioned with respect to said cam surfaces so that the order of control switch activation is reversed when said control switches are deactivated upon said shaft returning to the normal position and each control switch activated remains activated until deactivated, and

(h) means adapted to be supplied with power connecting said counters and said associated control switches so that only the counter associated with the last control switch in the sequence to close will receive power from the supply.

References Cited by the Examiner

UNITED STATES PATENTS

1,172,921	2/16	Yost	235—98
2,881,975	4/59	Bower	235—32
3,018,038	1/62	Grant et al.	235—29

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