May 3, 1960 H. E. ENGLESON ET AL 2,934,869

ARTICLE DETECTING MECHANISM

Filed Nov. 8, 1957 2 Sheets-Sheet 1

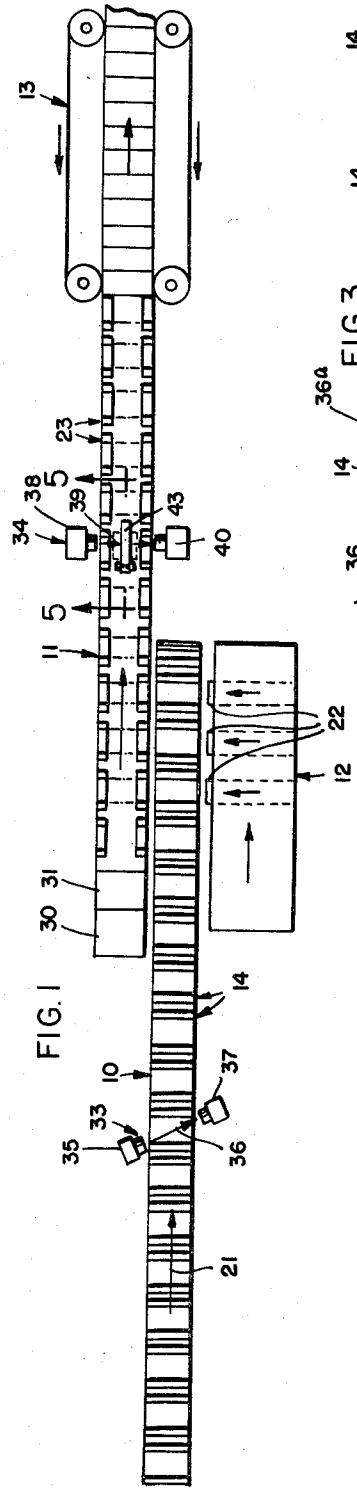


FIG. 1

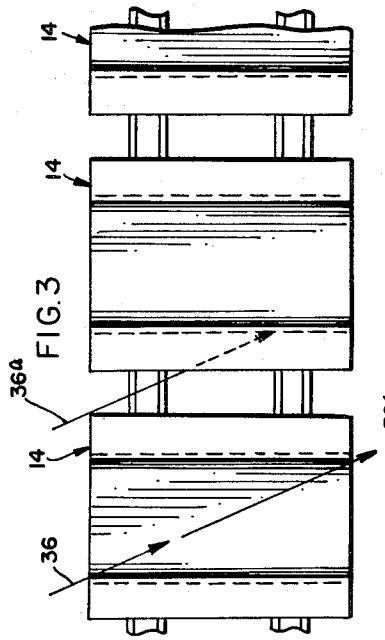


FIG. 3

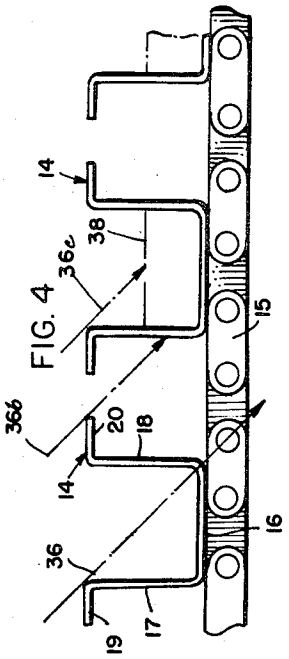


FIG. 4

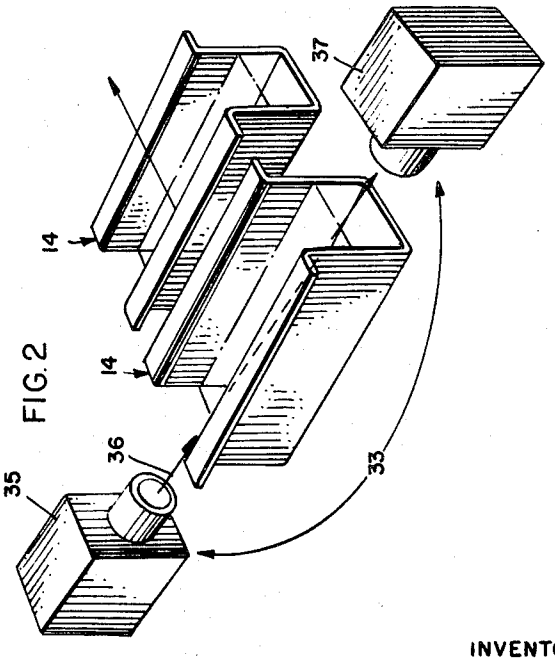


FIG. 2

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Filed Nov. 8, 1957 2 Sheets-Sheet 2

FIG. 5

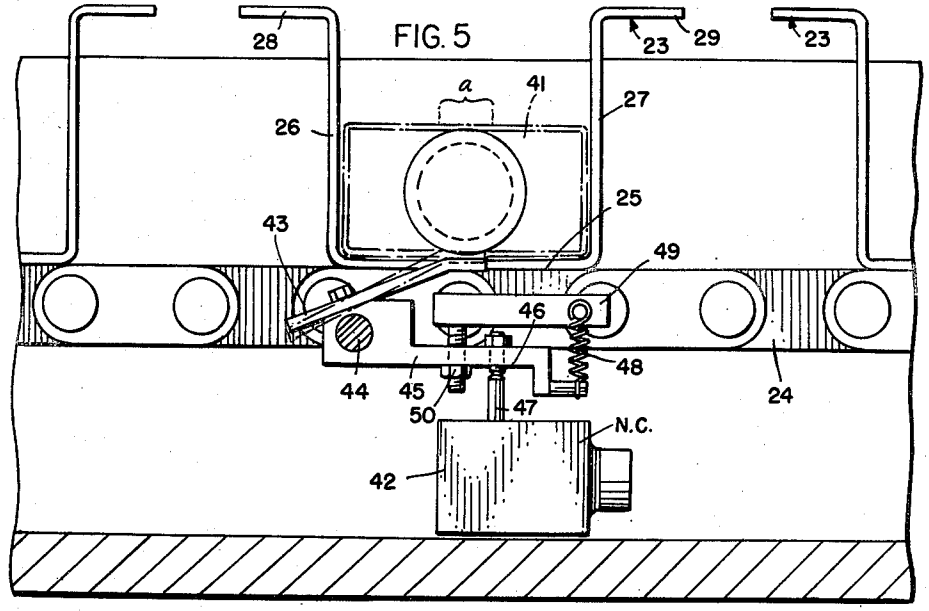


FIG. 6

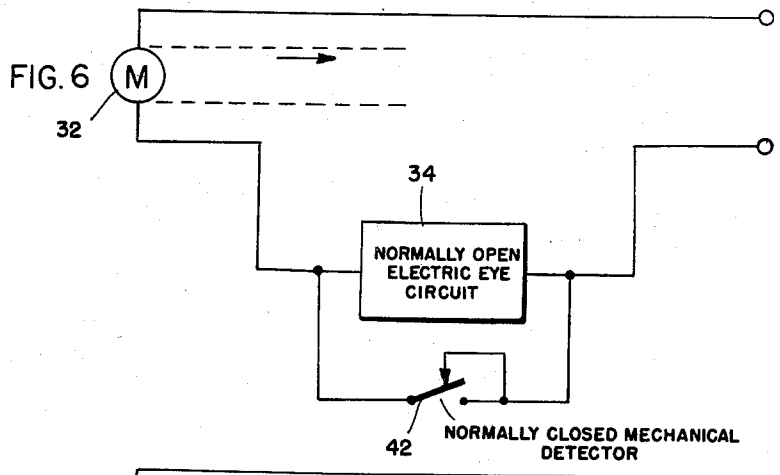
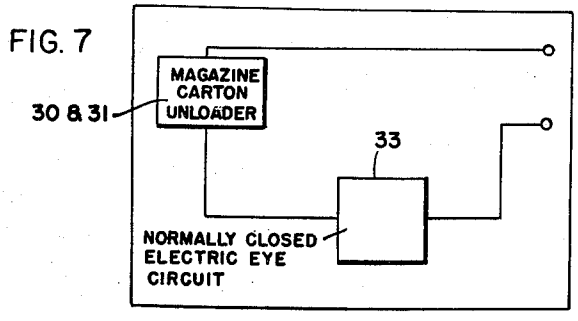


FIG. 7



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ARTICLE DETECTING MECHANISM

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Application November 8, 1957, Serial No. 695,353

4 Claims. (Cl. 53—57)

This invention relates to machine for packaging articles in cartons, and more particularly to a detection device which detects malfunctions of the machine.

Machinery for packaging articles in cartons generally includes a carton conveyer, an article conveyer and a mechanism for transferring the articles from the article conveyer to a carton in the carton conveyer. Should any of these components malfunction, such that a completely packaged end product is not possible, a potential hazard is brought about which may cause jamming of the machine and result in costly shutdowns or cause defective packages to be sold to consumers.

Devices for detecting the presence or non-presence of articles on conveyers or in cartons are generally well known in the field of packaging machinery, but detectors heretofore developed have not been satisfactory for all uses. For example, mechanical detectors have not been satisfactory for use in sensing the presence or non-presence of tissues or soft fluffy material, since the mechanical detectors had to be adjusted too sensitively and were therefore not consistently effective and accurate. Further, it has been found that mechanical detectors slow up the operation of a packaging machine. Wherein it is desired to detect the presence or non-presence of contents in a carton by means of a weight detector, compressed air has been used to blow out an empty carton, but compressed air is rather expensive to produce. Another method of detection heretofore used was to puncture the cartons to feel whether or not contents are therein, this method being unsatisfactory since it not only slowed up the packaging operations, but left puncturing marks in the carton which are not desirable from the standpoint of merchandising.

The present invention as applied to a packaging machine includes a bucket conveyer for conveying articles to be transferred to a second bucket conveyer conveying cartons, wherein a mechanism is provided for delivering cartons to the carton conveyer and transfer means is provided to transfer the articles from the article conveyer to the cartons in the carton conveyer. The absence of an article in any bucket of the article conveyer is detected by an electric eye device which renders non-operative means for delivering a carton to a corresponding bucket in the carton conveyer which would receive the article from the detected corresponding bucket in the article conveyer. A second electric eye device is arranged in association with a carton conveyer beyond the transfer means in order to detect the presence or non-presence of an article in a carton on the carton conveyer, wherein detection of non-presence of an article renders the drive means for the packaging machine non-operative to stop the machine so that the difficulty may be corrected before a jam might be produced by the machine or the ejecting from the machine of a defective package. Since it is not necessary to stop the machine if neither a carton nor an article is detected in the bucket aligned with the second electric eye device on the carton conveyer, a switch detector is provided which renders the

electric eye device non-operative if an empty bucket would be in line with the electric eye device thereby precluding stoppage or shutdown of the packaging machine. Because the article presence or non-presence is detected by an electric eye device, the speed of the packaging machine is greatly enhanced to thereby increase the unit output.

It is therefore an object of this invention to provide an improved detecting device for detecting the presence or non-presence of articles on packaging machinery.

Another object of this invention resides in the provision of an improved detecting device which detects the presence or non-presence of articles in cartons on a packaging machine, wherein the speed of the packaging machine is greatly enhanced.

Still another object of this invention is in the provision of an electrical detecting mechanism for use on packaging machines that detects the absence of the filling article in the article conveyer and the absence of the article in the carton on the carton conveyer.

A further object of this invention is to provide a packaging machine including an article conveyer and a carton conveyer and mechanisms for transferring the article conveyer to the cartons in the carton conveyer, wherein said conveyers and mechanism have a common drive means, and wherein an electric eye device is associated with the carton conveyer to detect the absence of articles in the cartons and render the common drive means non-operative so that a defective package will not be produced by the packaging machine and the situation can be corrected.

Other objects, features, and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

Fig. 1 is a more or less diagrammatic plan view of a packaging machine embodying the invention;

Fig. 2 is a greatly enlarged perspective view of a portion of the article conveyer and the electrical detecting mechanism for detecting the absence of an article in any one bucket;

Fig. 3 is an enlarged top plan view of a portion of the article conveyer which illustrates the direction of the light beam for detecting the absence of articles in the article conveyer;

Fig. 4 is a side elevational view of the fragmentary conveyer of Fig. 3 and illustrating the direction of the light beam of the electric eye device;

Fig. 5 is a greatly enlarged longitudinal elevational view taken substantially along line 5—5 of Fig. 1 and illustrating the mechanical detector for detecting the presence or non-presence of a carton in a bucket on the carton conveyer;

Fig. 6 is a schematic electrical circuit of the electrical detecting device on the carton conveyer; and

Fig. 7 is a schematic electrical circuit of the electrical detecting device on the article conveyer.

Referring now to the drawings and particularly to Fig. 1, a packaging machine is diagrammatically illustrated which embodies the present invention. This packaging machine includes generally an article conveyer **10**, a carton conveyer **11**, a transfer mechanism **12**, and a drier **13**.

The article conveyor **10** includes a plurality of open end and closed center buckets **14** equally spaced along and secured to an endless chain **15**, Fig. 4. Each bucket **14** includes a horizontal bottom **16**, upstanding side walls **17** and **18** substantially perpendicular to the bottom **16**, and horizontal flanges **19** and **20** extending outwardly from the upper ends of the upstanding side walls. The

flanged side walls facilitate insertion of articles into the buckets, and articles are inserted into the buckets at the inlet end of the conveyor 10 so that the articles may be conveyed toward the discharge end in the direction of the arrow 21, Fig. 1, and transferred from the article conveyer to the carton conveyer by means of the transfer mechanism 12. It is to be understood that "article" herein refers to whatever might be placed into the carton or the carton contents such as a predetermined number of facial tissues. Further, it is to be understood that the article and the carton are opaque in order to be capable of operating the electrical detecting devices.

The transfer mechanism 12 may be of any desired type such as a filling conveyer wherein pusher members 22 are carried along in coalignment with the buckets 14 and actuated at a predetermined time to transfer articles from the buckets 14 to the carton conveyer 11.

The carton conveyer 11 is similarly constructed to the article conveyer 10 and includes a plurality of equally spaced open end and open center buckets 23, Figs. 1 and 5, secured in equally spaced relationship along an endless chain 24. The buckets 23 include coaligned U-shaped members each of which consist of a bottom 25, upstanding side walls 26 and 27 perpendicularly related to the bottom 25, and horizontal flanges 28 and 29 extending outwardly from the upper ends of the upstanding walls 26 and 27. Open ended and erected cartons are delivered to the carton conveyer 11 by a magazine and carton unloader 30 and a carton erector 31, Fig. 1. Collapsed cartons in the flat are taken from the magazine one at a time by the carton unloader and delivered to the carton erector which erects the cartons and deposits same in buckets on the carton conveyer 11.

The spacing of the buckets on the carton conveyer 11 is substantially identical to the spacing of the buckets on the article conveyer 10 and the conveyers are driven so that the buckets coalign at the delivery or discharge end of the article conveyer and the inlet end of the carton conveyer. Also provided adjacent the carton conveyer 11 and near the discharge end are flap tucking and closing assemblies (not shown) and an ejector (not shown) the latter for ejecting a completely closed carton to the drier 13. A common drive means is provided to drive the conveyers, the transfer mechanism and the mechanism for delivering cartons to the carton conveyer in synchronism so that the various components of the machine operate together. This common drive mechanism is represented as a motor 32 in the schematic diagram of Fig. 6 and will be discussed more fully hereinafter in connection with the detecting devices on the carton conveyer.

Referring again to Fig. 1, the first electric eye device 33 is associated with the article conveyer 10 for the purpose of detecting the presence or non-presence of an article in the buckets 14 as the buckets pass the device. The second electric eye device 34 is provided at the carton conveyer 10 for detecting the presence or non-presence of articles in the carton.

The first electric eye device 33 adjacent the article conveyer 10 is of the conventional type and includes a light source 35 projecting a light beam 36 to a photoelectric cell and relay 37. The relay controls a normally closed switch which opens upon energization of the photoelectric cell and relay in response to receiving the light beam 36. The electric eye 33 is arranged in a circuit with the means for delivering erected cartons to the carton conveyer 11, and especially the magazine carton unloader. In more particularity, a solenoid may be arranged in the circuit, which controls the suction in the suction heads of the carton unloader, wherein deenergization of the solenoid renders the suction in the suction heads to be released and therefore renders the suction heads non-operative. An example of the type of carton unloader which may be employed is more specifically described in the copending application Serial No. 695,621, filed November 12, 1957. Thus, as long as the photoelectric cell 37 is precluded from receiving the light beam 36 or the light beam 36 is continually intercepted, the carton unloader will continue to operate in the usual manner.

The electric eye 33 is so situated that its light beam 36 is angularly arranged relative to the article conveyer 10 which eliminates the need for closing the open spaces between the buckets or for providing a shutter to work at times when the open spaces pass the light beam if the light beam were transversely arranged for the necessity of rendering the electric eye inoperative during the time when the open spaces pass its light beam. As seen most clearly in Figs. 2, 3, and 4, the electric eye is so situated that the light beam will project, when aligned properly with a bucket, from the upper trailing corner of the bucket on one side to the lower leading corner of the bucket on the other side, or at the intersection of the horizontal flange 19 and the side wall 17 at one end of the bucket and the intersection of the bottom 16 and the side wall 18 at the other end of the bucket. The buckets in Fig. 3 are empty and it may be seen how the light beam 36 passes through the bucket while the light beam 36*a* will not pass through the line of buckets when the light beam is projected into an open space between buckets. Similarly, Fig. 4 illustrates the left hand bucket as being empty and wherein the light beam 36 may pass all the way through to complete operation of the photoelectric cell, while the light beam 36*b* will not pass completely through the buckets when the light beam projects into the open spaces therebetween. Further, the light beam 36*c* is seen to be intercepted when an article 38 is arranged in the bucket adjacent to the left hand bucket. Accordingly, when the light beam is allowed to project entirely through the bucket, it will render the carton unloader 30 non-operative to deliver a carton to the corresponding bucket on the carton conveyer 11 which would align with that empty bucket on the article conveyer 10.

The second electric eye device 34 similarly includes a light source 38 projecting a light beam 39 to a photoelectric cell and relay 40, Fig. 1. The second electric eye device 34, being associated with the carton conveyer 11 is situation to project this beam transversely of the carton conveyer at a level aligned with the cartons 41 as seen in Fig. 5 so that the beam may project through an empty carton. In order to detect presence or non-presence of an article within the carton, the relay associated with the photoelectric cell of the electric eye device 34 operates a normally open switch in the circuit of Fig. 6 which is closed on detection by the electric eye device of an article in a carton. Thus, upon detection of non-presence of an article in a carton, the electric eye device will hold the switch open in the circuit and stop the common drive motor 32 which operates the entire packaging machine and thereby prevents the discharging of a defective package from the machine.

Since it is only desirable to stop the packaging machine when an empty carton is passed through and not when a completely empty bucket in the carton conveyer is passed through, a mechanical switch 42, Fig. 5, is also provided in the circuit of Fig. 6 and operated by the detection of a carton in the bucket passing thereover. The switch 42 is normally closed and opens upon detection of the carton in the bucket passing thereover by means of a sensing lever 43 pivoted to a shaft 44 arranged between the opposite end portions of the open center buckets 23 on the carton conveyer 11, Figs. 1 and 5. Movement of the lever 43 is transmitted through an arm 45 to the switch 42. A set screw 46 is mounted on the arm 45 and arranged to engage an acuating pin 47 of the switch 42. The lever 43 is normally biased to the dotted line position as seen in Fig. 5 when not engaged by a carton by force of a spring 48 connected at one end to the free end of the arm 45 and at the other end to a stationary frame member 49. The set screw

50 is mounted on the frame member 49 and associated with an opening in the arm 45 to locate the detector lever 43. The mechanical switch 42 is electrically connected in parallel to the switch of the electric eye device 34 as seen in Fig. 6, and accordingly will keep the conveyer motor 32 operating when not detecting the carton such as when the detecting lever 43 is in the open spaces between the buckets 23 on the carton conveyer 11. When a carton is detected, the switch 42 opens and if an article is arranged in the particular carton, the electric eye device will be operated to close its associated switch and maintain the circuit to the motor 32 closed and continue operating the packaging machine. The sensing lever 43 is so sized and arranged relative to the electric eye light beam 39 that it will be depressed by a carton in a certain bucket after the light beam has been intercepted by that bucket and will be released by that carton before the bucket has moved from the area of the light beam.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is claimed as follows:

1. In a packaging machine, an article conveyer having spaced open end buckets each adapted to carry an article, a carton conveyer having spaced open end and open center buckets each adapted to carry a carton, the buckets of said conveyers being spaced a substantially like distance apart and the discharge end of the article conveyer being arranged parallel to the inlet end of the carton conveyer, the conveyers being continuously driven and in synchronism so that the buckets at the discharge end of the article conveyer align with the buckets at the inlet end of the carton conveyer, means for delivering open ended erected cartons to the buckets of said carton conveyer, the open ends of said cartons aligning with the open ends of the buckets, transfer mechanism for transferring the articles from the article conveyer to cartons on the carton conveyer, an electric eye device arranged adjacent said article conveyer to detect the absence of articles in the buckets, and control means responsive to said electric eye device for selectively rendering the carton delivery means non-operative so that no carton will be inserted in the bucket on the carton conveyer which will align with the detected empty bucket on the article conveyer.

2. In a packaging machine, an article conveyer having spaced open end buckets each adapted to carry an article, a carton conveyer having spaced open end and open center buckets each adapted to carry a carton, the buckets of said conveyers being spaced a substantially like distance apart and the discharge end of the article conveyer being arranged parallel to the inlet end of the carton conveyer, the conveyers being synchronously driven so that the buckets at the discharge end of the article conveyer align with the buckets at the inlet end of the carton conveyer, means for delivering open ended erected cartons to the buckets of said carton conveyer, the open ends of said cartons aligning with the open ends of the buckets, transfer mechanism for transferring the articles from the article conveyer to cartons on the carton conveyer, common drive means for synchronously driving said conveyers, said transfer mechanism and said carton delivering means, a first electric eye device arranged adjacent said article conveyer to detect the absence of articles in the buckets thereof, and control means responsive to said electric eye device for rendering the carton delivery means non-operative so that no carton will be inserted in the bucket on the carton conveyer which will align with the detected empty bucket on the article conveyer, a second electric eye device arranged adjacent said carton conveyer beyond the transfer mechanism for detecting the absence of articles in the cartons, and control means responsive to said second electric eye device for rendering said common drive means non-operative to stop operation of the machine.

3. In a packaging machine, an article conveyer having spaced open end buckets each adapted to carry an article, a carton conveyer having spaced open end and open center buckets each adapted to carry a carton, the buckets of said conveyers being spaced a substantially like distance apart and the discharge end of the article conveyer being arranged parallel to the inlet end of the carton conveyer, the conveyers being synchronously driven so that the buckets at the discharge end of the article conveyer align with the buckets at the inlet end of the end of the carton conveyer, means for delivering open ended erected cartons to the buckets of said carton conveyer, the open ends of said cartons aligning with the open ends of the buckets, transfer mechansm for transferring the articles from the article conveyer to cartons on the carton conveyer, common drive means for synchronously driving said conveyers, said transfer mechanism and said carton delivering means, a first electric eye device arranged adjacent said article conveyer to detect the absence of the articles in the buckets thereof, and control means responsive to said electric eye device for rendering the carton delivery means non-operative so that no carton will be inserted in the bucket on the carton conveyer which will align with the detected empty bucket on the article conveyer, a second electric eye device arranged adjacent said carton conveyer beyond the transfer mechanism for detecting the absence of articles in the cartons, and control means responsive to said second electric eye device for rendering said common drive means non-operative to stop operation of the machine, and switch means for rendering the second electric eye device non-operative upon detection of the absence of a carton normally being detected for being filled by said second electric eye device to prevent rendering the common drive means non-operative.

4. In a packaging machine, an article conveyer having an endless flexible bucket supporting member, a plurality of open ended buckets mounted on and equally spaced along said bucket supporting member, and detecting means for detecting the presence or absence of articles in said buckets, said detecting means comprising a light source for projecting a light beam and a photoelectric cell and relay, said light source and photoelectric cell positioned angularly of the axis of bucket travel, whereby the light beam will project when aligned with a bucket from the upper corner of the bucket on one side to the lower corner of the bucket on the other side.

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