Dec. 30, 1941. P. WEATHERS 2,268,098

BOTTLE INSPECTION APPARATUS

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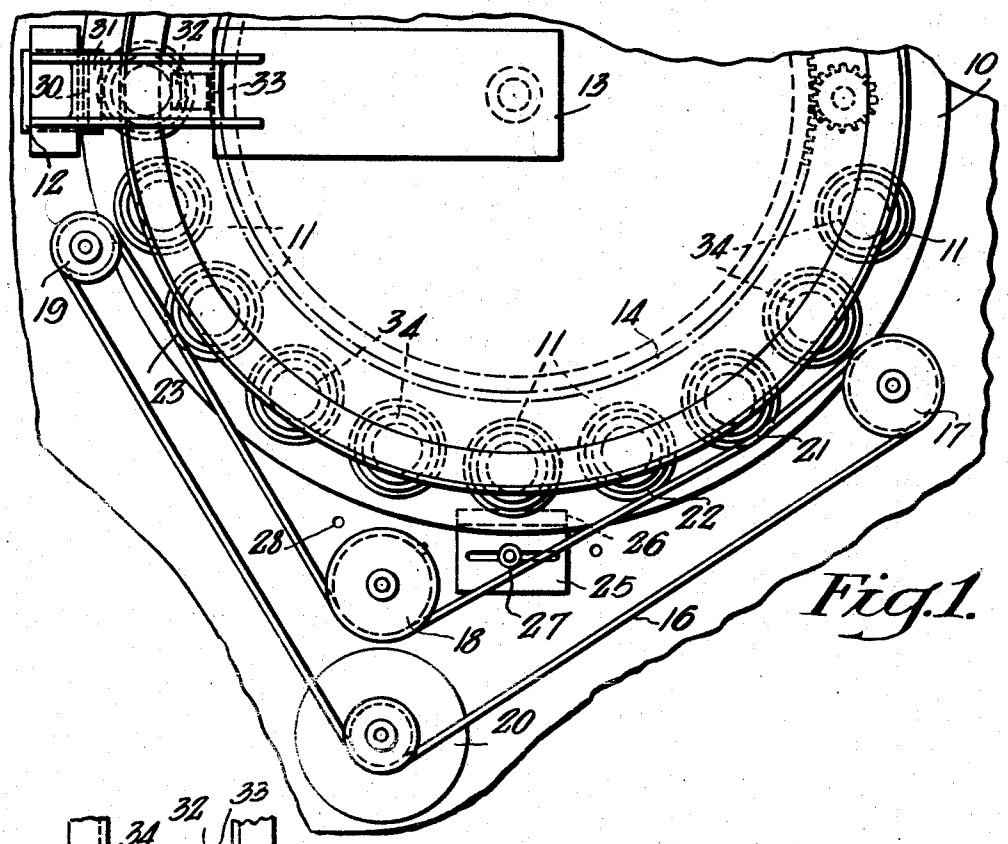


Fig. 1.

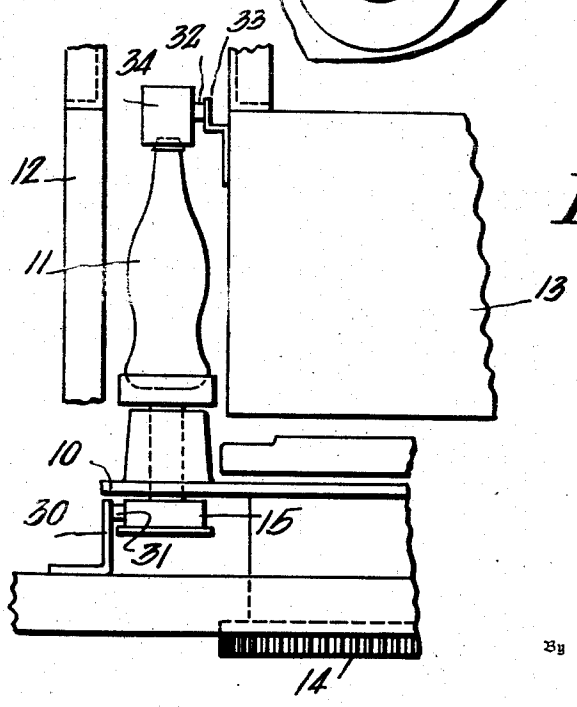


Fig. 2.

Inventor

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BOTTLE INSPECTION APPARATUS

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10 Claims. (Cl. 88—14)

This invention relates to an improved bottle inspection apparatus, or rather apparatus for inspecting the contents of transparent bottles, and pertains particularly to means for causing the contents of the bottle to spin uniformly at a predetermined rate of speed during inspection.

It was proposed in Stout Patent No. 2,132,447 to cause the contents of a bottle to spin, while the bottle itself remained stationary between the light source and a photoelectric device, in order to determine the presence of foreign material in the bottle. This operation prevented irregularities in the bottle itself from affecting the photoelectric device, while any variations in the contents would affect the indicating apparatus and cause the bottle to be discarded. This arrangement was improved on in my Patent No. 2,192,568, issued March 5, 1940, by the use of an amplifier tuned to a frequency corresponding to the speed of rotation of the contents of the bottle, which arrangement greatly improved the performance of the Stout apparatus.

In the foregoing apparatus, difficulty has been encountered in causing the contents of the bottle to spin at the proper speed. At the bottom of the bottle, both the large area of the bottom and the surface of the sides tend to cause the exterior surface of the contents to rapidly approach the speed of spinning of the bottle. Likewise, in the neck of the bottle, the exterior surface tends to rapidly reach the speed of the bottle. On the other hand, the contents of the bottle is usually of relatively low viscosity and in many instances, such, for example, as in the case of carbonated beverages, while the viscosity approaches that of water, although a certain amount of syrup is used in the solution, when the bottle is whirling, there is a tendency for the release of carbon dioxide, which tends to decrease the viscosity an amount of the same order of magnitude as the increase due to the syrup, but in any case, the viscosity is not great. As above pointed out, the exterior surface of the contents rapidly approaches the speed of the bottle, but the portion of the contents at the center speeds up very slowly. If, therefore, the bottle is spun at a uniform speed and then stopped during the inspection, either one of two undesired results may follow: One result is that the speed of the contents is not high enough for proper inspection; the other result, if the spinning speed is high enough to insure proper speed of the contents, is that the peripheral speed of the contents is so high while the central speed is so low that an extremely deep vortex is formed at the surface of the liquid, preventing the proper surface inspection thereof and, in some instances, the liquid is caused to foam at the upper surface obscuring any surface particles. In addition, the low central speed of the contents may leave a small heavy particle on the bottom of the bottle which happened to be in the middle in its original location, whereas, if the entire contents were rotating at a uniform speed, such a particle would be spun rapidly around the outside of the bottle.

I have discovered that if the bottle is first spun rapidly to cause the contents to rotate and is then suddenly stopped, and is then again spun, the contents will mix sufficiently during the period of stopping of the bottle so that the entire mass will be thrown into a spin and the second spinning, after the stoppage, will overcome any retarding effect caused by the braking effect of the bottle on the contents. The bottle is then again stopped at the inspection point, and the entire contents rotates with a sufficient uniformity of speed to permit a precision of inspection heretofore unattainable.

One object of the invention is to provide an improved apparatus for inspecting the contents of bottles.

Another object of the invention is to provide an apparatus for causing the contents of bottle to spin at a uniform speed throughout, while the bottle is stationary.

Another object of the invention is to provide an improved mechanism for driving and stopping the bottles in an inspection apparatus.

Other and incidental objects of the invention will be apparent to those skilled in the art from a reading of the following specification and an inspection of the accompanying drawing in which

Figure 1 is a partial plan view of a bottle inspection apparatus showing the features thereof involving the present invention, and

Figure 2 is a transverse section through the apparatus of Fig. 1 showing the mechanism for stopping the bottle at the inspection point.

In the drawing, the turntable which carries the bottles past the inspection point is generally indicated at 10. The bottles are placed on and removed from this turntable by an appropriate mechanism such, for example, as that described in the aforesaid Stout patent. The bottles indicated at 11 are carried by the turntable past the inspection point at which light is directed through the bottle onto the photocell 12 by means of an optical system 13. This optical system may be of the type, for example, as that described and claimed in Sachtleben Patent No. 2,192,580,

issued March 5, 1940. Since the table is moved continuously, the optical system is caused to swing with the bottle being inspected about a pivot coaxial with the turntable 10.

The turntable is driven by an appropriate gear 14 and the bottles are caused to spin or to stop, as the case may be, by appropriate pulleys 15 coupled to the cup supporting the bottom of each bottle. As the turntable rotates in a clockwise direction in Fig. 1, the pulleys 15 connected to the successive bottles are brought in contact with the belt 16 which is carried on the pulleys 17, 18 and 19 and driven by the motor 20. This belt is driven at a speed depending upon the rate of inspection of the bottles and the speed of rotation of the contents desired at the inspection point. At present, I find that a belt speed which will cause the bottles themselves to spin at a rate of 1280 R. P. M. is quite satisfactory. As the bottles come in contact with the belt just a little before reaching the point 21, they are started in a spin and this spin continues to the point where the pulleys 15 connected to the bottles lose contact with the belt. During this time, the entire bottle and its supporting mechanism is brought to a speed of 1280 R. P. M. and is held there for a time of the order of one half a second to one second. This causes the outer portion of the contents to be brought up to the same speed as the bottle and at the same time causes a rather deep vortex at the surface due to the high speed of the periphery of the contents, while the central portion remains practically stationary. The bottle is permitted to spin freely for a moment until the pulley 15 reaches the brake shoe 26 supported by the bracket 25. This brake shoe 26 and the bracket 25 are substantially identical in construction to the brake shoe 31 and the bracket 30 shown in Fig. 2. When the pulley strikes the brake shoe 26, it is suddenly brought to a stop and the bottle, of course, is also stopped.

This causes a braking effect on the periphery of the contents but at the same time it causes the contents to stir around and the rapidly rotating peripheral portion mixes with the central portion causing the central portion of the contents to also start rotation so that at the end of the braking operation the entire contents of the bottle is rotating together, but at a somewhat slower speed than the peripheral portion was rotated previously. After leaving the brake, the bottles pass on to the point 23 where they are given a second spin in the same direction and at the same speed by contact with the belt in order to bring the rotating contents up to the proper speed. After leaving the belt at this point, the contents pass on to the inspection point in alignment with the photocell 12 where they are again stopped by the brake 30 and 31 contacting with the pulley 15. At this point, in order to prevent vibration of the bottle, an additional brake composed of the brake shoe 32 and bracket 33 contacts with the upper member 34 holding the top of the bottle thereby not only preventing rotation, but also preventing oscillation of the bottle relative to the optical system.

The brake 25, 26 is made adjustable as to position by means of the cap screw 27 which fits into a slot in the member 25. This slot permits adjustment of the brake 26 along the path of the bottles. In addition, holes 28 are provided over a considerable distance so that the position of the brake may be adjusted by amounts greater than the length of the slot by placing the cap screw 27 in the appropriate hole. It will be apparent that if the brake is moved farther to the left, the period during which the initial spin is permitted to continue is increased, and vice versa.

It is not necessary for the spin speeds to be exactly or even approximately those given above. The important feature is that there be an initial spin, then a period of retardation or sharply reduced speed of spin, and then a second spin which will bring the contents of the bottle to an average speed approximating that required for the inspection.

I claim as my invention:

1. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, and means for retarding the spin of said bottles between the said two points.

2. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, and means for stopping the spin of said bottles between the said two points.

3. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, and adjustable means for retarding the spin of said bottles between the said two points.

4. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, and means adjustable in position for retarding the spin of said bottles between the said two points.

5. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their paths before reaching said inspection point, means for retarding the spin of said bottles between the said two points, and means for stopping the rotation of the bottles at the inspection point.

6. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, means for stopping the spin of said bottles between the said two points, and means for stopping the rotation of the bottles at the inspection point.

7. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin in the same direction at two spaced points in their path before reaching said inspection point, and means for retarding the spin of said bottles between the said two points.

8. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to

spin in the same direction at two spaced points in their path before reaching said inspection point, and means for stopping the spin of said bottles between the said two points.

9. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin at two spaced points in their path before reaching said inspection point, and means adjustable in position along the path of the bottles for retarding the spin of said bottles between the said two points.

10. In bottle inspection apparatus including means for carrying a series of bottles past an inspection point, means adjacent the said means for causing the said bottles and their contents to spin in the same direction at two spaced points in their path before reaching said inspection point, means for stopping the spin of said bottles between the said two points, and means for stopping the rotation of the bottles at the inspection point while permitting the conents to continue to spin.

PAUL WEATHERS.