Nov. 8, 1966 M. LONG 3,283,523

METHOD AND APPARATUS FOR PROCESSING FILLED CONTAINERS

Filed Dec. 30, 1963 2 Sheets-Sheet 1

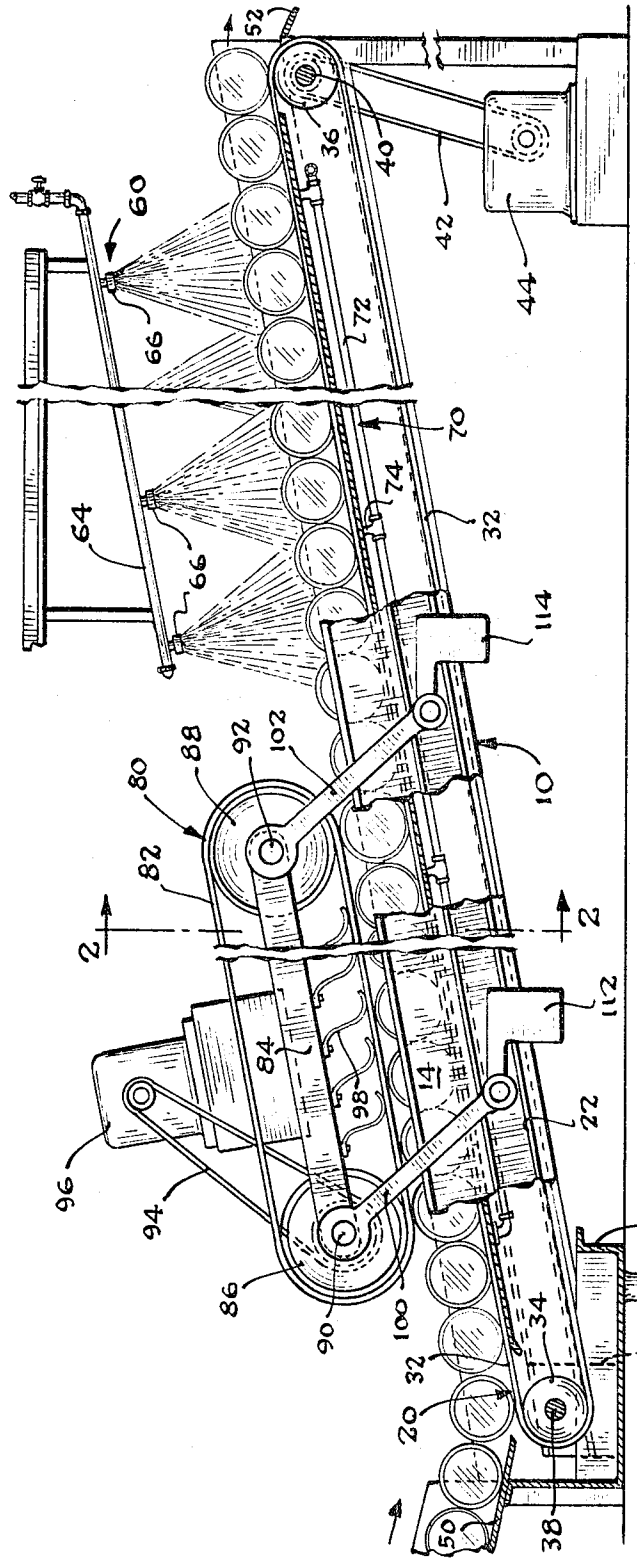


Fig. 1

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Fig. 3

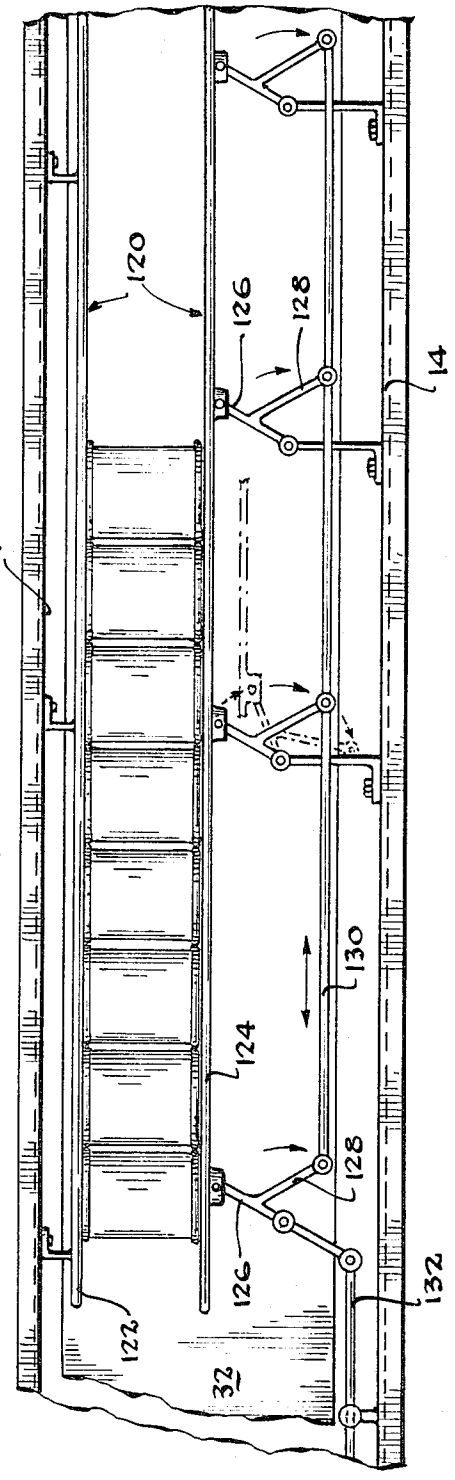
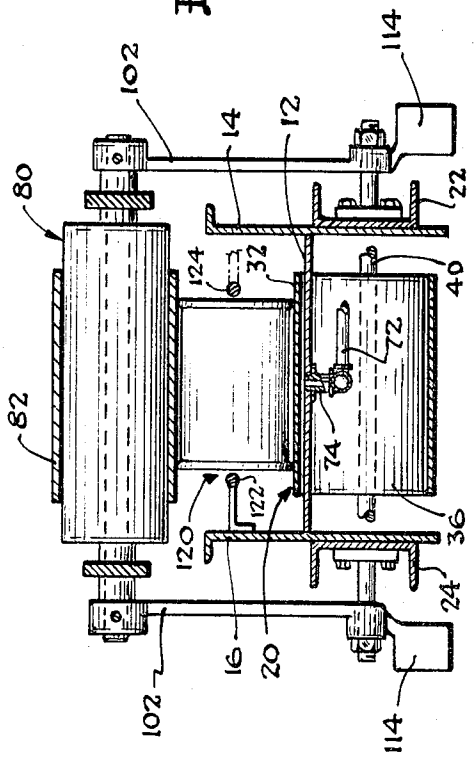


Fig. 2



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METHOD AND APPARATUS FOR PROCESSING FILLED CONTAINERS

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10 Claims. (Cl. 62—63)

The present invention is directed to an improved method and apparatus for flushing circular objects with fluid. More specifically, the present invention is directed to an improved method and apparatus for cooling filled cylindrical containers.

In the food processing industry, many foods are sterilized at high temperature and packed within containers having circular surfaces, principally cylindrical containers such as glass jars and metal cans. As is well known, such containers are available in a wide range of sizes. However, where the food product is sterilized by heat, it is usually necessary that the filled containers be quickly cooled to prevent over-processing and to facilitate further handling of the containers through labeling and casing and the like. Generally, the larger the container the greater is the problem of cooling it since heat must be conducted from the interior of the product to the exterior surface of the container. It has been a practice to rotate or spin such containers while flushing with a cool fluid such as water, so that the contents are constantly agitated and circulated so as to transmit heat faster to the container walls.

Obviously some method and apparatus must be provided to so process the containers. Such apparatus normally operates to roll a continuous stream of the containers along a path exposed to the cooling fluid. However, prior processes and apparatus have involved a fixed relationship between speed of rotation, length of path and total processing time.

The present invention, however, enables the speeds of container rotation and advancement along a path to be independently determined so that the processing time may also be adjusted independent of the speed of rotation and length of path, thereby providing greater flexibility in handling various sized containers and also various food products. It will be understood that under certain conditions a minimum speed of container advancement may be necessitated by the number of containers that must be processed in a given time.

Accordingly, it is a principal object of the present invention to provide a method and apparatus for flushing objects with fluid wherein the objects are rotated and conveyed at speeds substantially independent of one another over a broad range.

Basically, the present method involves supporting a continuous stream of circular objects and urging them at a selectable velocity in a given direction, while at the same time engaging upwardly exposed portions of a number of objects in said stream and urging said portions in a direction at a second selectable velocity whereby all of the objects in said stream will be rotated and advanced at speeds dependent upon the magnitude of both of said velocities. While the objects are thus rotated and advanced, they are continuously flushed with a suitable fluid.

An apparatus devised for carrying out the foregoing method basically comprises a supporting conveyor means and an overhead movable engaging means, both of which are provided with variable speed drives by which their relative speeds may be controlled and between which the objects are moved; and fluid delivery means positioned to flush the stream of objects beyond said conveying and engaging means.

Further objects and advantages will become apparent upon reading the following specification in conjunction with the drawings wherein:

FIGURE 1 is a side elevation of a preferred embodiment of the present apparatus, with parts broken away;

FIGURE 2 is a section view of the apparatus of FIGURE 1 taken at line 2—2 therein; and

FIGURE 3 is a partial plan view of the apparatus of FIGURE 1, with parts removed.

The present method, as applied to the cooling of hot filled cylindrical containers, involves the supporting of a plurality of such containers in substantially endless stream arranged in abutting relation with the axes of each container disposed parallel to one another and transverse to the direction in which the containers may move. The containers, so arranged, are urged from the underside at a selected first velocity along a path which extends in an upwardly inclined direction. Accordingly, each container tends to roll downwardly along the path, and would normally rotate in sliding contact with adjacent containers. However, the tendency of the containers to so roll is controlled by engaging a portion of the surface of a number of the containers along a lower increment of said path, preferably by engaging a portion of the surfaces of said containers from overhead opposite the lower points at which they are supported, and applying a directional movement to the upper portions of the objects at the points of engagement and at a second selected velocity. Thus, by regulating both the first and second velocities relative to each other, both the rate of rotation and the forward advancement of the containers may be controlled. Keeping in mind that velocity connotes direction as well as magnitude, advancement of the containers in a given direction will be the average of the two applied velocities, the rotational speed will be one half the difference of the two applied velocities; and the advancement plus the rotational speed will equal the higher of two velocities.

A preferred embodiment of apparatus for carrying out the two velocities.

3. As may be seen in the figures, the apparatus includes an upwardly inclined trough means, generally **10**, having a bottom **12** and sides **14**, **16**, extending its full length. The trough means is supported upon a frame generally **20** comprised of two inclined side channel pieces **22**, **24** supported above a floor on pairs of legs **26**, **28**.

A conveyor means for supporting a stream of cans is disposed in the trough means generally **10**. A preferred form of conveyor means comprises an illustrated endless web **32** trained about a pair of pulleys **34**, **36** which are positioned so that one run of the web, preferably the upper run, is supported upon and slides across the bottom **12** of the trough generally **10**. The pulleys **34**, **36** are rotatably supported on shafts **38**, **40**, respectively, journaled in the side channels **22**, **24** at the lower and upper ends of the trough generally **10**. A drive chain **42** is trained about suitable sprockets on one shaft, for instance shaft **40**, and a variable speed drive means such as electric motor **44**. Containers are delivered in continuous succession to the lower end of the trough **10** and onto the upper surface of the endless web **32** across an infeed track **50**. Similarly containers are discharged from the upper end of the trough generally **10** on a declined discharge track **52**, or other suitable removal means.

The stream of containers advancing through the trough **10** on the conveyor means generally **20** may be flushed with suitable fluid emanating from a fluid delivery means generally **60** spaced above and alined with the troughs. The fluid thus descends upon the upwardly exposed surfaces of the containers and thence flows downwardly

through the trough, past other containers, to a collection tank **62** conveniently located beneath the lower end of the apparatus. Where the containers are to be cooled, the fluid is usually a chilled liquid, such as water, and the delivery means generally **60** preferably comprises a manifold **64** and a pluraity of shower heads **66** spaced therealong. A suitable drain is connected to the collection tank **62**; and the fluid manifold **64** is connected to a suitable source of liquid (not shown) such as a city water supply. In some instances recirculation and chilling equipment may be provided between the tank **62** and manifold **64**.

Since the weight of the stream of containers on the endless web **32** may cause a substantial frictional drag between the latter and the bottom **12** of the trough generally **10**, it is highly advantageous, and sometimes necessary, to locate fluid injector means generally **70** between the trough bottom **12** and the under surface of the web **32** to provide lubrication. In a preferred embodiment such means comprises a main fluid conduit **72** and a plurality of connectors **74** connected between the conduit **72** and a plurality of equally spaced ports in the trough bottom **12**. Either air or water is suitable lubricating fluid and the conduit **72** is accordingly connected to a source of such fluid under pressure (not shown).

It will have become obvious that containers, in the attitude normally presented to the trough **10**, will tend to roll downhill as they are conveyed upwardly on the endless web **32**. Thus the containers will normally be rotated beneath the fluid delivery means generally **60**. However, where a stream of such containers extends through the length of the trough the tendency to roll downhill will overcome the ability of the conveyor means **30** to carry them uphill and containers would tend to be forced from the lower end of the apparatus. The motion of the containers is, however, controlled by an engaging means generally **80** which is floatingly positioned above a lower increment of the trough generally **10** and in position to contact upwardly exposed surface portions of a plurality of containers. Preferably an endless surface such as an endless belt **82** is utilized for this purpose. A preferred form of the engaging means, seen in FIGURE 1, is mounted on a floating frame **84** whereon the endless belt **82** is trained about a pair of pulleys **86, 88**. The pulleys are mounted on shafts **90, 92**, respectively, which aline the belt **82** with the endless web **32**. The shafts in turn are journaled in the floating frame **84** and are independently driven by a drive chain **94** trained about suitable sprockets on shaft **90** and an electric motor **96** which is also mounted upon the frame **34**. The lower run of the endless belt **82** is maintained in contact with containers therebeneath and throughout its length by suitable bias means such as a plurality of leaf springs **98**. Also the floating frame **82** is held in position above the trough generally **10** by a plurality of mooring rods **100, 102** which are mounted at pivots on the frame **84** and pivots on the side channels **22, 24** of the trough generally **10**. Preferably suitable counterweights **112, 114** are attached to the mooring rods **100, 102**, respectively, beyond the lower pivots to prevent the entire weight of the engaging means assembly generally **80** from pressing against the containers and web **32** at the bottom of the trough generally **10**. It will be seen that the floating type of mounting thus described permits the engaging means to ride upward and downward to a distance sufficient to allow all sizes of containers to be processed in the equipment.

Also with respect to various size containers, suitable guide means generally **120** is provided within the trough generally **10** to maintain the containers alined with one another and upon the endless web **32** out of contact with the trough sides **14, 16**. A preferred form of the guide means illusrtated in FIGURE 3, comprises a fixed guide rail **122**, within the trough and extending the length thereof adjacent one side **16**. An adjustable guide rail **124** extends in similar fashion adjacent the opposite side **14** and at a variable distance therefrom. The mechanism by which the latter rail may be adjusted and comprises a parallelogram type linkage including a plurality of movable links **126, 128** and **130**, pivotally connected to one another and to the guide rail **124**, and a single adjusting rod **132** connected between one link **126** and a fixed point on the apparatus frame.

In operation, both the rate of advancement of the containers through the trough **10** and the rate of rotation thereof may be regulated over a broad range by controlling the speed of the variable speed electric motors **44** and **96**, which are also preferably reversible, in accordance with the following formulae:

$$A=X+Y/2,\ R=X-Y/2,\ X=A+R,\ \text{and}\ Y=A-R$$

where A=rate of advancement, R=linear rate of rotation, X=velocity of web **32**, and Y=velocity of belt **82**.

For example, where motor **44** is operated to move the web **32** upwardly at 20 feet per minute and motor **96** is operated to move the endless belt **82** in the same direction at the same speed, the containers will be advanced without rotation at 20 feet per minute. If, however, the web **32** is operated at the same speed and direction and the endless belt **82** is driven at 20 feet per minute in the opposite, downward direction, the cans will rotate counter-clockwise at a rim speed of 20 feet per minute, but will not advance at all. Intermediate these extremes, at a web speed of 20 feet per minute, the containers may be made to advance and rotate both at the rate of 10 feet per minute where the endless belt **82** is held stationary. Obviously a wide range of rates of both rotation and advancement may be obtained by controlling the actual and relative speed of both the endless web **32** and endless belt **82**; and in some instances the endless web **32** may be run down the trough **10** and the endless belt **82** run upwardly to advance the containers with clockwise rotation.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof. For instance the invention may be utilized to flush objects with hot liquid for heat treatment with equal facility as flushing to cool them. Therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. An improved method for flushing circular objects, said method comprising: urging said objects along a path in an upwardly inclined direction by applying a directional movement to the lowermost portions of said objects along said path with said objects abutting one another; engaging upwardly exposed portions of a plurality of said objects throughout movement only along the lower increment of said path; applying a directional movement to the uppermost portions of said objects where so engaged whereby both the rate of rotation of said objects and the upward rate of movement along said path may be adjusted to desired values; and flushing said objects with fluid along said path.

2. An improved method for flushing cylindrical objects, said method comprising: urging said objects along a path in an upwardly inclined direction by applying a directional movement to the lowermost portions of said objects along said path with said objects abutting one another and with their axes disposed normal to the direction of movement whereby said objects tend to roll in the opposite direction of said movement; engaging upwardly exposed portions of a plurality of said objects throughout movement only along the lower increment of said inclined path; applying a directional movement to the uppermost portions of said objects where so engaged whereby both the rate of rotation of said objects and the upward rate of movement along said path may be adjusted to desired values; and flushing said objects with fluid along said path.

3. An improved method for cooling cylindrical containers, said method comprising: supporting the lower

portions of said containers; urging said containers along a path in an upwardly inclined direction at a selectable first velocity with said containers abutting one another and with their axes disposed normal to the direction of movement whereby said containers tend to roll in the opposite direction of said movement; engaging upwardly exposed portions of a plurality of said containers throughout movement only along the lower increment of said inclined path; applying a directional movement to the uppermost portions of said objects where so engaged, said movement being at a second velocity selected relative to said first velocity whereby both the rate of rotation of said containers and the upward rate of movement along said path may be adjusted to desired values; and flushing said containers with water along said path.

4. An improved apparatus for flushing circular objects with fluid, said apparatus comprising: an upwardly inclined conveying means for moving said objects upwardly along an inclined path; engaging means for contacting a number of said objects along only the lower increment of said path, said engaging means being positioned parallel to the lower end of said conveying means and above and in contact only with the upper portion of said objects to control the rate at which the objects may be rotated thereon; and fluid delivery means positioned above said conveying means beyond said engaging means for flushing the surface of said objects with fluid.

5. An improved apparatus for flushing cylindrical containers with fluid, said apparatus comprising: an upwardly inclined trough means; conveying means disposed within said trough means for moving said containers upwardly therethrough with the axes of said containers normal to the direction of movement whereby the containers may tend to roll in the reverse direction; engaging means for contacting a plurality of said containers along only the lower increment of said trough means, said engaging means being positioned parallel to the lower end of said trough means and above and in contact only with the upper portion of said containers to control the rate at which said containers may rotate; and fluid delivery means positioned above said trough beyond said engaging means for flushing the surface of said containers with fluid.

6. The apparatus of claim 5 including adjustable guide means within said trough for alining at least one end of said containers.

7. An improved apparatus for flushing cylindrical containers with fluid, said apparatus comprising: an upwardly inclined trough; and endless conveyor disposed with one run thereof along the bottom surface of said trough, said conveyor disposed for continuously moving containers upwardly through said trough in abutting relation with their axes directed normal to the direction of motion whereby the containers will tend to roll in the reverse direction; fluid injecting means located in the bottom of said trough for injecting a lubricating fluid between said bottom and said conveyor run; engaging means for contacting a portion of said containers, said engaging means being positioned parallel to the lower end of said trough and above and in contact only with the upper portion of said containers to control the rate at which said containers may rotate; and fluid delivery means positioned above said trough beyond said engaging means for flushing the surface of said containers with fluid.

8. The apparatus of claim 7 including guide means within said trough for alining at least one end of said containers.

9. The apparatus of claim 7 wherein the engaging means comprises a rotatable endless surface means positioned with its surface parallel to said endless conveyor and in contact with containers on said conveyor.

10. The apparatus of claim 7 wherein the engaging means comprises an endless belt positioned parallel to said conveyor, said belt being floatingly mounted whereby the lower run thereof rests under pressure upon said portion of said containers on said conveyor; and a plurality of variable speed driving means connected to each of said endless conveyor and said endless belt.

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