Dec. 1, 1964 J. K. McBRADY 3,159,164

CONTAINER CLEANING DEVICE

Filed Jan. 2, 1963 2 Sheets-Sheet 1

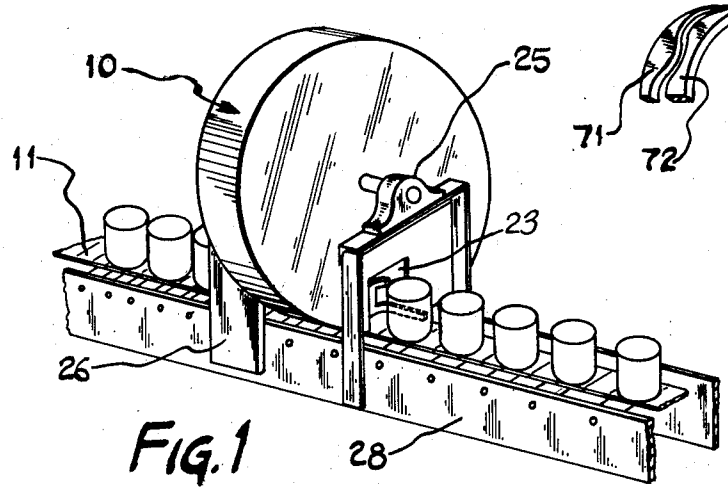


FIG. 1

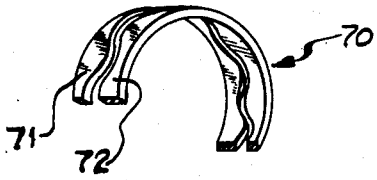


FIG. 4

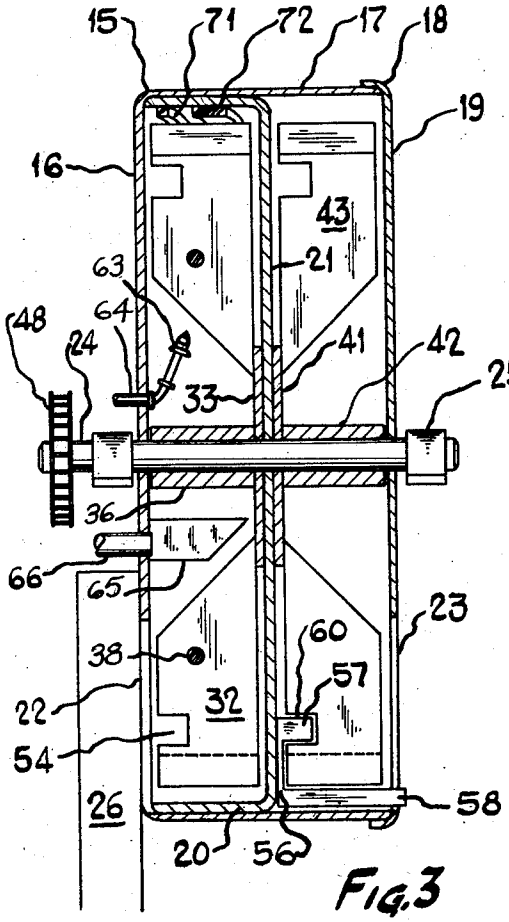


FIG. 3

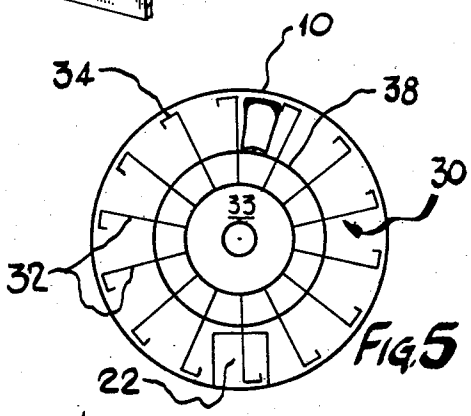


FIG. 5

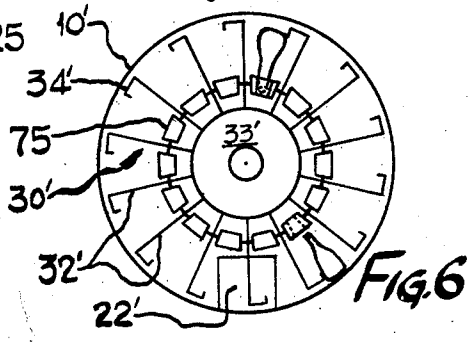


FIG. 6

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CONTAINER CLEANING DEVICE

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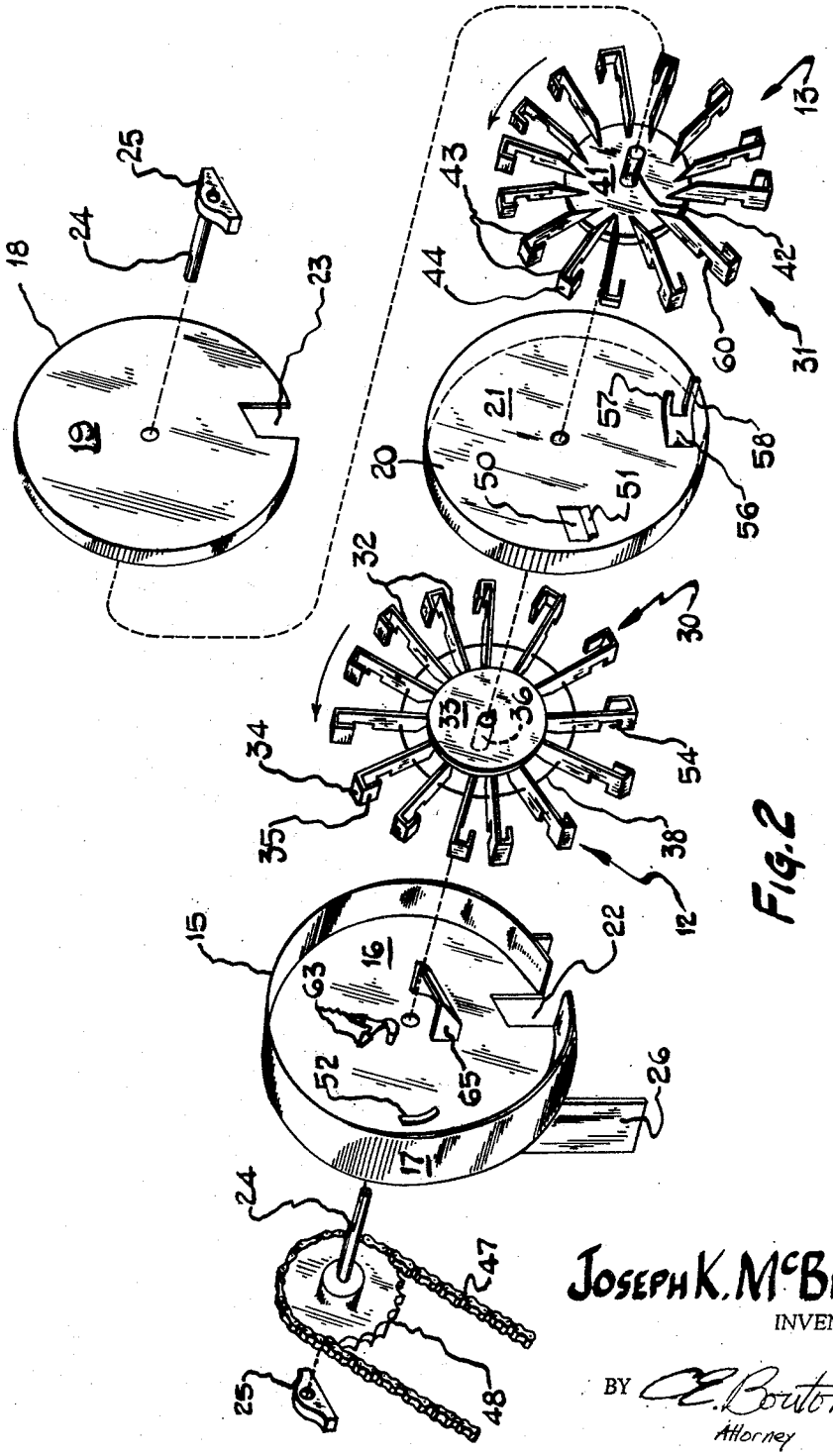


FIG. 2

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CONTAINER CLEANING DEVICE

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The present invention concerns an improved container cleaning device; and more specifically is directed to a rotary machine for flushing debris from jars, or the like, with a jet of fluid such as air.

Great numbers of preformed containers such as jars, cans and bottles are used each day to package consumer products. The number of such products is vast and includes foods, beverages, cosmetics, pharmaceuticals, soaps, detergents, toiletries, paints, lubricants, etc. Many manufacturers of such products obtain their container needs from established suppliers, while some larger manufacturers also produce containers for their own use. However, in either instance, by the time such containers are to be filled with product, they are often found to contain noticable debris or foreign matter in the nature of dirt, dust and particles of the container material itself. For instance, glass jars often contain loose particles of glass.

Substantially all users of such containers will require them to be free of debris. Accordingly, the users of these containers usually find it necessary to clean them just prior to filling with product. The extent of cleaning will, of course, vary considerably with the nature of the product. In the food industry, for example, complete absence of foreign matter and a high degree of cleanliness is required for purposes of pure food and sanitation, although it is often the case that the filling or a subsequent operation such as retorting will provide sufficient heat for sterilization of the containers and contents.

Therefore, the need for a dependable and efficient, yet simple and inexpensive container cleaning apparatus will be obvious. Heretofore suitable apparatus for this purpose has been complex, bulky and relatively expensive. Containers have often been carried on several runs of endless conveyors through sprays of air or liquids, or through liquid baths. Several complex rotary machines have been developed for flushing and washing bottles. However, the latter machines have been very complex and, consequently, expensive to build and costly to operate. These machines usually involve complicated moving feed and discharge mechanisms, and a large number of rotating and reciprocating fluid nozzles which are inserted within the containers.

Accordingly, it is the principal object of the present invention to provide an improved container cleaning apparatus that has a minimum number of moving parts, yet is efficient and dependable.

It is another object of the present invention to provide an improved container cleaning apparatus that utilizes a minimum amount of space and that can be installed directly on existing conveyor systems utilized for delivering containers to filling apparatus.

It is a further object of the present invention to provide an improved rotary type container cleaning apparatus that will remove upright containers from a conveyor, scour and flush such containers with jets of fluid and deposit cleaned containers upright upon the conveyor from which they were first removed.

It is still another object of the present invention to provide an improved rotary container cleaning apparatus wherein each container is exposed to the action of a scouring fluid from the same stationary fluid delivery means.

Basically the present invention comprises at least one, but preferably two, rotary carrier means housed within a cylindrical drum and disposed to rotate above and in a plane transverse to a conveyor for open containers. The

conveyor passes uninterruptedly through the bottom of the drum and the rotary carrier sweeps each successive container therefrom and carries it through a circular path whereupon each container is inverted for a period of time. One, or more, stationary fluid jet means is located within the drum and aimed toward the portion of the circular path where the containers first become inverted. Fluid, such as air or a suitable liquid, is thereby injected successively into each container to dislodge and remove any debris. A single exhaust means is positioned beneath the jet means, and beneath a substantial portion of the path of inverted containers, to collect and remove spent fluid and debris carried from the containers thereby. Preferably a second rotary carrier is located behind the first to receive containers therefrom before the end of the circular path, whereby the containers will be righted and returned to the conveyor at a point slightly downstream from where they are first removed. Further objects and advantages of the present invention will become apparent from the following description and drawings, wherein:

FIGURE 1 is a perspective view taken from the discharge end of the cleaning device assembled in position on an endless jar transport conveyor;

FIGURE 2 is an exploded perspective view of the device of FIGURE 1 showing the internal parts thereof;

FIGURE 3 is a sectional side elevation of the device, with the conveyor removed, including a jar shaker element;

FIGURE 4 is a perspective view of the shaker element removed from the device shown in FIGURE 3;

FIGURE 5 is a sectional rear elevation of the device showing the preferred form of the first rotary container carrier; and

FIGURE 6 is a sectional rear elevation of the device showing a second embodiment of the first rotary container carrier for narrow neck bottles.

Referring to the figures, the present cleaning device is shown as a rotary machine in the form of a drum generally **10** disposed transversely over an endless jar transporting conveyor **11** with its axis in line with the conveyor. The preferred device includes two rotating carrier means generally **12**, **13**, in series within the drum, although it will become apparent that additional carrier means may be added if additional functions are desired. For instance, the preferred apparatus was devised to simply flush the interiors of jars with a single blast of air, water or steam. Accordingly, the first carrier means, generally **12**, sweeps the jars from the conveyor, inverts and transports the jars during the flushing operation; and the second carrier means generally **13**, discharges the jars upright on to the conveyor **11** from which they were originally removed.

However, should it be desired, for example, to wash the jars with a detergent and then rinse with clear water, or fluid rinse and then purge with an inert gas such as CO_2, it would be advantageous to add an additional carrier means in advance of the discharge carrier.

In the preferred device illustrated in FIGURES 1, 2 and 5, the drum **10** comprises a relatively deep forward section **15**, having a front wall **16** and a peripheral wall **17**, and a removable rear cover section **18** having a back wall **19** and a relatively narrow lip that overlaps the peripheral wall **17** of the forward section. A bulkhead **20** fits telescopically within the forward section **15** and forms an internal wall **21** approximately midway between the front wall **16** and back wall **19** of the drum. An entrance opening **22** for containers is provided in the forward section **15**, and a similar discharge opening **23** is provided in the rear cover **18**, both aligned with the conveyor **11**.

All three walls **16**, **19** and **21** have central openings at the axis of the drum through which a drive shaft **24** is ex-

tended. The drive shaft is mounted between a pair of pillow bearings 25 which may be suitably supported on available superstructure or upon the walls of the drum 10 itself. A pair of upright flanges 26 are welded to the forward section of the drum at the sides of the entrance opening 22 and may support the entire apparatus upon the frame 28 of the endless conveyor 11.

Fixed upon the shaft 24 within the drum 10 are the pair of carrier means 12, 13 in the form of paddle wheels generally 30, 31. The first paddle wheel 30 (to the left in FIGURES 2 and 3) consists of a plurality of equally spaced radially extending paddles or vanes 32 mounted upon a disk 33. The disk is preferably about one-half the diameter of drum 10 and the central area of the disk about the shaft 24 is left free. The disk 33 is located adjacent the internal wall 21 with the paddles 32 tapered toward the front wall 16 from points inwardly of the edge of the disk. The main body portion of each paddle, however, is of a depth approximately equal to the distance between the front wall 16 and the internal wall 21 of the drum, and each paddle 32 extends closely to the peripheral wall 17 of the drum. Also, it is preferred that each paddle terminate in a shoe 34, perpendicular to the body of the paddle, having an inwardly turned toe piece 35.

The first paddle wheel 30 includes a sleeve 36 mounted centrally on the disk. A keyed hole extends through the sleeve and disk, and the drive shaft 24, which is slotted, extends therethrough. Also, the preferred form of the first padle wheel includes a container restraining means in the form of a ring 38 concentric with the sleeve 36. The ring 38 is mounted at a distance from the ends or shoes 34 of the paddles 32 approximately equal to the height of containers to be cleaned.

The second similar paddle wheel 31 is disposed opposite paddle wheel 30 adjacent the rear side of the internal wall 21. It is similarly constructed of a disk 41 having a keyed sleeve 42, extending toward the back wall 19 of the drum 10 and mounted on the sloted drive shaft 24, and bears a plurality of equally spaced radially extending paddles 43. These paddles are tapered from the outward portions of the disk 41 toward the back wall 19 and terminate in shoes 44 adjacent the peripheral wall 17 of the drum.

The drive shaft 24 is driven from a suitable power source such as an electric motor, not shown, through a drive chain 47 which is trained about a sprocket 48 fixed to the shaft outside drum 10. The shaft is turned in a direction that will rotate both paddle wheels 30, 31 in the direction in which the shoes 34, 44, respectively, are disposed. The internal wall 21 of bulkhead 20 contains an opening 50, near the peripheral wall 17 of the drum, at a position about 270°, in the direction of rotation, from the conveyor 11. This opening is of a size sufficient to admit the containers from the first carrier means 12 to the second carrier means 13. A lip or flange 51 is welded or otherwise secured to the lower edge of the opening 50 to facilitate the transfer of containers therethrough. Also a stationary transfer means, preferably a cam 52 constructed from a single strip of spring steel, is fastened to the front wall 16 of the drum directly opposite the opening 50. Each paddle 32 on paddle wheel 30 is relieved or notched at 54 to permit passage across the transfer cam 52 without displacing it. Thus as containers are carried between adjacent paddles 32 to a position in line with opening 50, they will be deflected by the transfer cam 52 across the lip 51 and into position between two adjacent paddles 43 of the second paddle wheel 31.

The containers are similarly discharged from the second paddle wheel 31 through the discharge opening 23 by a discharge cam 56 which is fastened to the bottom of the rear side of the bulkhead 20 in line with the conveyor 11. However, since the containers will slide toward the peripheral wall 17 of the drum 10 as they are carried toward the conveyor, the discharge cam 56 is preferably constructed from a broader sheet of spring steel in the form of a J having two outwardly extending fingers 57, 58 and is attached to the bulkhead by the base or interconnecting portion. The upper finger 57 is relatively short, and each paddle 43 is appropriately relieved or notched at 60 so as not to deflect the finger. The lower finger 58 is longer and extends close to the surface of conveyor 11 outside the path of the paddles 43 and through the discharge opening 23. Thus, since the containers will be urged outward mainly by the lower finger, positive discharge of each container on to the conveyor in an upright attitude is assured.

For most cleaning purposes fluid scouring of the containers is sufficient. Air, water, hot water or steam are the usual fluids involved. For this purpose a pair or more of stationary fluid jets are aimed against the upper path of the containers in the first carrier means 12. In the illustrated preferred apparatus a pair of air jet nozzles 63 are mounted on a supply manifold 64 which extends through the front wall 16 of the drum 10 just above the drive shaft 24. The manifold, in turn, is connected to a suitable supply of high pressure air, not shown, externally of the drum 10. Both jet nozzles 63 extend upwardly toward the second quadrant of carrier rotation, preferably toward an area from about 95° to 190° from the entrance opening 22. The jets are aimed at the path of the open mouths of the containers which are always disposed inwardly toward the drive shaft 24. High velocity fluid from the nozzles, air in the preferred embodiment, will enter each container and dislodge any debris such as dust or splinters or the like. Since the containers are either partially or fully inverted throughout the path where exposed to the fluid jets such debris will fall and be carried out of the containers by the spent fluid.

A suitable exhaust means in the form of a pan or collector trough 65 is placed just beneath the drive shaft 24 on the front wall 16 to receive the debris and spent fluid from the containers. Such a pan may take the form illustrated which substantially traverses the free area between the front wall 16, dish 33 and paddles 32. Preferably the pan 65 is connected to a vacuum manifold 66 which extends through the front wall 16 to a suitable source of vacuum, not shown.

Certain additional features illustrated in FIGURES 3, 4 and 6 may advantageously be incorporated in the described device. In FIGURES 3 and 4 a shaker means generally 70 is shown. Such a shaker means comprises two strips 71, 72 of a relatively resilient material, such as rubber or plastic, which are attached to the inner cylindrical surface of the bulkhead 20 between about the position of the entrance 22 and transfer opening 50. These strips have congruent waving edges disposed oppositely and spaced apart a distance slightly greater than the diameter of the containers to be cleaned, to form an oscillatory path for the bases of such containers. The strips 71, 72 may be formed from a single web of material by cutting along a substantially sinusoidal curve. When the strips are positioned, as described, they will occupy the clearance space between the shoes 34 of paddles 32 and the inner cylindrical wall of the device to engage the bottoms of containers carried between adjacent paddles with the mouths thereof resting on the restraining ring 38. Thus as the containers are rotated and inverted they will be shaken from side to side while being subjected to blasts of fluid. This action further enhances the dislodgement of debris.

Additionally the above described device may be adapted to clean relatively narrow mouth containers such as bottles or the like as illustrated in the embodiment of FIGURE 6. In this embodiment only the first carrier means is modified to the extent that the restraining means are in the form of conical or funnel shaped seats 75 positioned between adjacent paddles 32' to receive the necks of such containers. In this embodiment the seats 75 are located a distance inwardly of the paddle shoes 34' sufficient to clear the mouths of the containers entering through the opening 22' on the conveyor. However, as

the containers are rotated and inverted they will slide toward the restraining means 37' and the necks thereof will be received by, and directed into, the seats 75 where they will be held in a path at which the jets of fluid are aimed.

Additionally it will be found advantageous, where a liquid agent is employed to flush the containers, to leave openings at the bottom-most portions of all of the drum elements, as illustrated in FIGURE 2, to permit drainage of liquid that may drip from the containers and internal walls of the apparatus.

Operation of the present apparatus will have become obvious from the foregoing description. Containers are fed toward the opening 22 in the drum 10 at a rate which may be accommodated thereby. As each container enters the opening 22 a paddle 32 will move past and the container will be swept from the conveyor. If a container should reach the opening 22 before the preceding container is swept away, it will simply slide on the conveyor surface until the next paddle clears the opening. In turn each container will be swept between paddles around the inner periphery of the drum 10. The toe 35 of the paddle 32 immediately behind a given container will exert the initial force at the base thereof, thereby allowing the container to maintain a position radial to the drum surface and avoiding tipping of the container which would tend to jam the machine. The containers will become inverted as they are moved about the drum and will come to rest against the ring 38. When they reach a position where their mouths are tilted downwardly they will intercept a continuous stream of fluid from the jets 63. After passing the uppermost point of their path the containers leave the area covered by the fluid jets and the last of the fluid and debris will fall therefrom into the pan 65 from whence it is evacuated from the appartaus.

During the aforementioned path of the containers they may be shaken by being confined to follow a wavy track established by the strips 71, 72. Shaking of the containers aids in dislodging foreign matter.

After passing approximately 270° upon the first carrier means 12 the containers are transferred from between paddles 32 so as to clear the areas therebetween for the following containers approaching opening 22 on conveyor 11. It will be apparent that the containers may be fully removed from the machine at this point if either a second conveyor is utilized or if the containers may be slid on a chute to the conveyor 11. In such an application the second carrier means could be eliminated. However, it is preferred that the containers be transferred to the second paddle wheel 31 which carries them approximately 90° to an upright posture on conveyor 11 where they are diverted through the discharge opening 23 by cam 56.

The preferred apparatus of the present invention has proved to be a highly reliable cleaning apparatus, particularly for wide mouth jars. It is relatively simple in that it is constructed with a minimum of moving parts and is therefore trouble-free and easily serviced and cleaned by removing the rear cover. The apparatus may be installed in a minimum space on existing handling lines and is capable of continuous operation at a substantial rate of production.

One installation of the preferred machine was designed specifically to air clean wide mouth glass jars three inches in diameter and four and one-half inches high. In that installation two paddle wheels, each comprising fourteen paddles, were contained in a drum approximately 27 inches in diameter and 8 inches deep. The apparatus was installed directly in a filling line across an existing endless belt conveyor. The machine satisfactorily cleaned jars at an operating speed of approximately 10 r.p.m., processing 140 jars per minute, with the speed being limited only by the ability of the existing conveyor to discharge the cleaned jars. The same apparatus will process over 200 jars per minute where a positive drive discharge conveyor, such as a screw type discharge, can be installed. Higher rotational speeds may result in insufficient exposure periods for adequate cleaning of the jars.

Obviously, many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. An improved apparatus for cleaning containers, said apparatus comprising: a drum having front, back and peripheral walls and a central axis, the front and back walls of said drum having oppositely disposed openings for the entrance and exit, respectively, of upright containers in a direction parallel to said axis; a plurality of rotary carrier means positioned in successive zones within said drum to carry containers around said drum; an internal wall between each adjacent pair of said carrier means within said drum, said internal wall being parallel to said front and back walls of said drum and containing a transfer opening through which containers are moved between said pair of carrier means; fluid jet means extending through said front wall into said drum, said fluid jet means being directed outwardly toward the peripheral wall of said drum adjacent the first carrier means to inject fluid into said containers; a container shaking means positioned with said drum adjacent said first carrier means to shake the container thereon from side to side while exposed to said jet means; fluid exhaust means positioned below said fluid jet means to catch and remove fluid and debris from said containers; transfer means adjacent said transfer opening to move containers therethrough; and discharge means positioned adjacent the exit opening to discharge containers therethrough from the last of said carrier means.

2. The apparatus of claim 1 wherein the container shaker means is a wavy track disposed about the inner periphery of the drum for guiding the bottom portions of the containers to thereby shake said containers from side to side while exposed to said jet means.

3. An improved apparatus for cleaning containers, said apparatus comprising: a drum having front, back and peripheral walls and a central axis; a continuously rotatable shaft through said drum concentric with said axis; a plurality of paddle wheel members mounted upon said shaft within said drum for continuous rotation in a given direction, each of said paddle wheel members including an equal number of radial paddles extending close to the peripheral wall of said drum; an internal wall within said drum between each adjacent pair of paddle wheels; an entrant portion of the front wall of said drum containing a first opening through which containers may be inserted in a direction parallel to said axis between said paddles of the first paddle wheel; an exit portion of the back wall of said drum containing a second opening through which containers may be discharped from between paddles of the last paddle wheel in a direction parallel to said axis; a transfer portion of said internal wall containing a transfer opening spaced in the direction of rotation of said paddle wheel from said first opening and in the reverse of said direction from said second opening; means proximate said transfer opening to eject containers from between paddles of said first paddle wheel to between paddles in the next paddle wheel; stationary fluid jet means extending through the front wall of said drum and mounted upon the interior surfaced said wall, said jet means being positioned to direct a jet of fluid toward the peripheral wall of said drum and into containers carried by said first paddle wheel in an area between said first and second transfer openings; fluid exhaust means extending through said front wall of said drum to catch and remove fluid and debris from containers carried by said first paddle wheel; and container discharge means positioned proximate said second opening to discharge containers in a direction parallel with said axis from between paddles of

said last paddle wheel through said second opening and out of said drum.

4. The apparatus of claim 3 wherein a wavy track is disposed about the inner periphery of said drum for guiding the bottom portions of the containers to thereby shake said containers from side to side while exposed to said jet means.

5. An improved apparatus for cleaning jars adapted to be placed on an endless conveyor which normally transports the jars in a given direction, said apparatus comprising: a drum having front and back walls having aligned openings therein for the passage of jars, and being mounted transverse across the conveyor with the latter extending through said openings; a rotatable shaft extending through said drum concentric with said axis; an internal wall within said drum parallel to and between said front and back walls, said internal wall having an opening therein disposed at an angle from the openings in said front and back walls; a first disk fixed to said shaft within said drum adjacent said internal wall; a plurality of first paddles extending radially from the edge of said disk and disposed between said disk and said front wall forming transport pockets for jars entering on said conveyor through the opening in said front wall, said paddles terminating in shoes adjacent said peripheral wall and extending in a given direction normal to said paddles; a jar retaining ring extending through said paddles concentric to said disk whereby jars are maintained between said paddles and between said ring and said peripheral wall; a stationary jar transfer cam mounted on said front wall within said drum opposite said opening in said internal wall to divert jars therethrough from between said first paddles, said paddles being relieved to permit said cam to extend into

the path of said jars; fluid cleaning jets mounted on said front wall within said drum opposite said first disk between said shaft and said retaining ring, said jets being aimed generally upwardly to inject fluid into inverted jars; a fluid exhaust pan mounted on said front wall beneath said fluid jets to catch and remove fluid and derbis falling from said inverted jars; a second disk fixed to said shaft adjacent said internal wall at the side opposite said back wall; a plurality of second paddles, similar to said first paddles, extending radially from the edge of said second disk and disposed between the second disk and said back wall, said second paddles forming pockets to receive jars from said first paddles as they are transferred through the opening in said internal wall; and a stationary discharge cam fixed to said internal wall in the path of said jars directly above said conveyor, said second paddles being relieved to permit said discharge cam to extend into the path of said jars to divert them in said given direction outwardly through said opening in the back wall of said drum and on to said conveyor.

6. The apparatus of claim 5 including shaker means disposed about the periphery of said drum to shake the jars while exposed to said cleaning jets.

7. The apparatus of claim 5 wherein said retaining ring includes conical seats positioned between paddles to receive the necks of bottles.

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