Nov. 19, 1963 W. J. NEKOLA ETAL 3,111,131

BOTTLE WASHING APPARATUS

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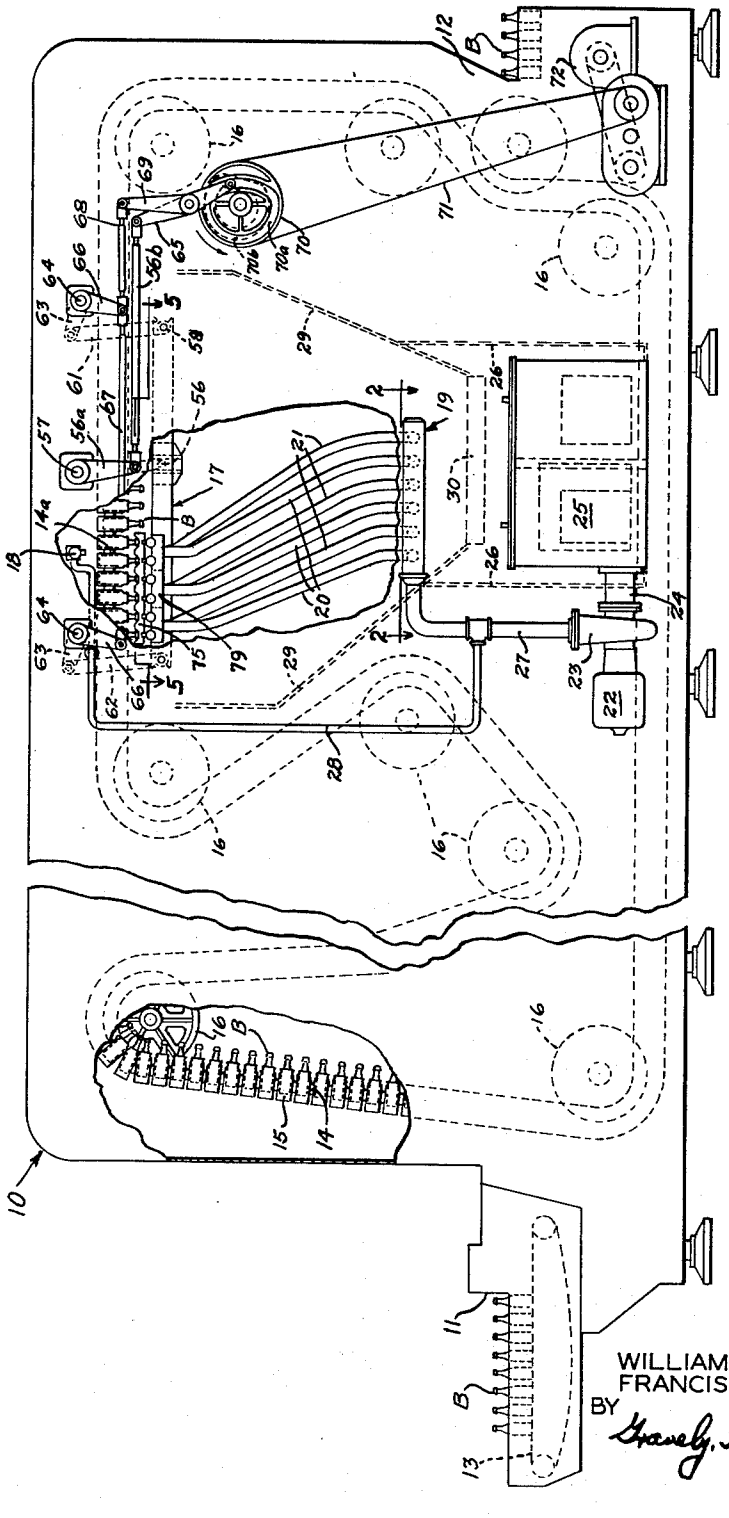

FIG. 1.

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FIG. 2.

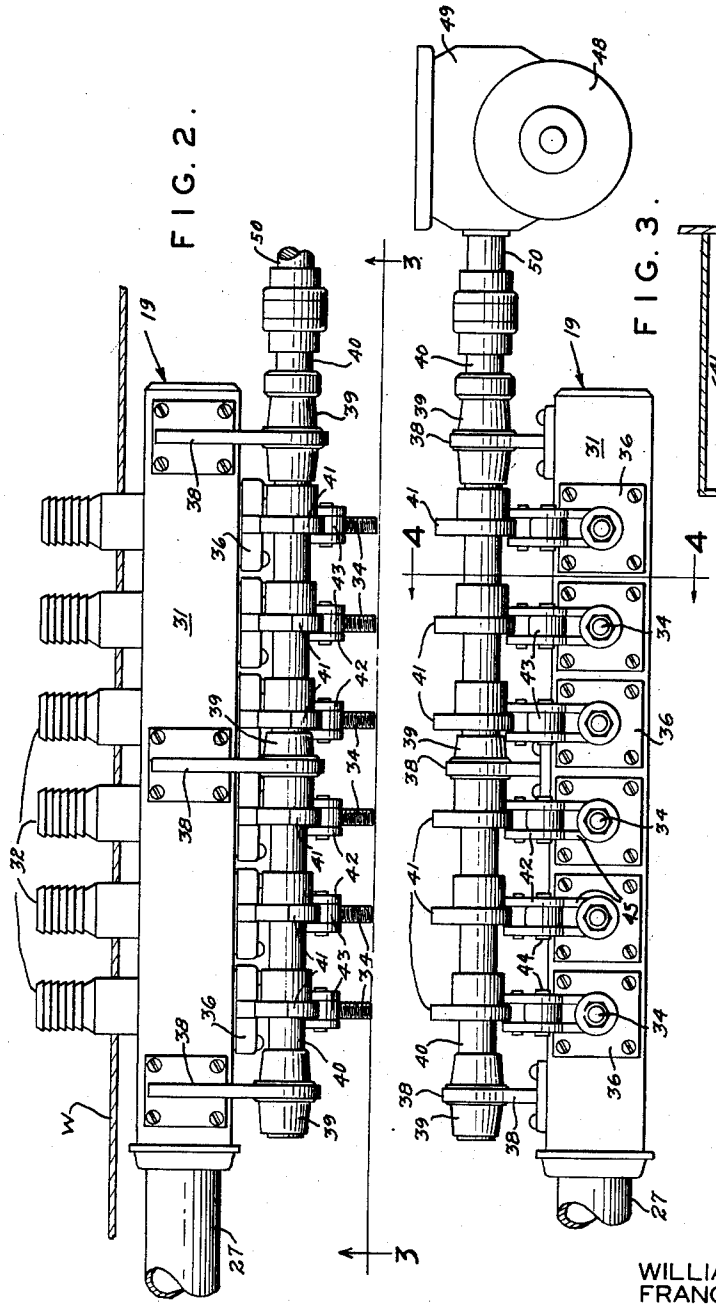

FIG. 3.

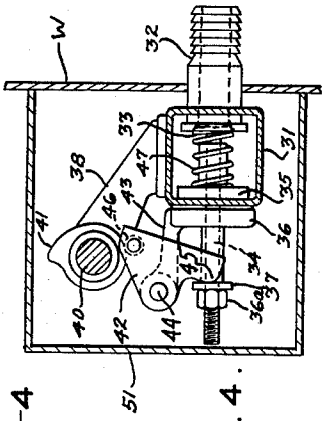

FIG. 4.

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FIG. 5.

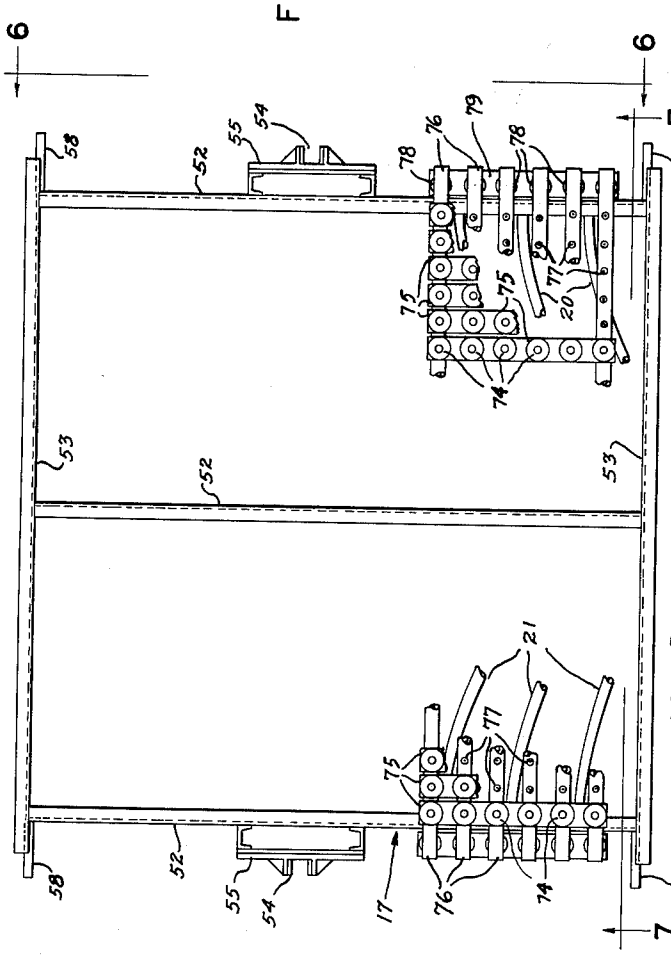


FIG. 6.

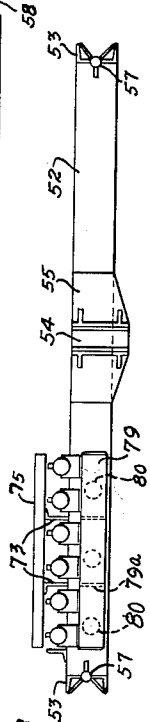
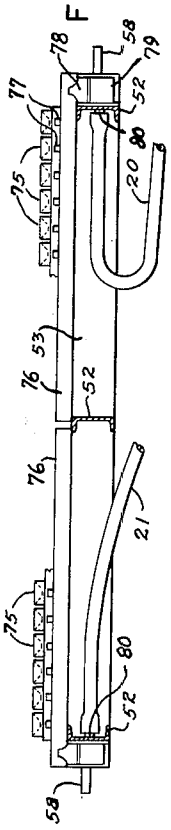


FIG. 7.



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BOTTLE WASHING APPARATUS

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3 Claims. (Cl. 134—129)

This invention relates to apparatus for automatic washing of bottles, containers, and the like, mounted on conveyors, and is particularly concerned with improvements in such apparatus.

Automatic bottle washers of the present types involving spray jets which move in coordinated relation with the bottles conveyed therein are extremely wasteful of the washing solution, require large pump capacity because the spray jets are continuously supplied, and need constant maintenance to keep up reasonable efficiency in cleaning effectiveness. The foregoing constitute disadvantages which add greatly to costs of operation with small gains for the users. For example, the high pump capacity of these prior machines is due to constant supply of the spray jets during the cycling movement thereof, whereas the spray jets are usefully employed only during a portion of the cycle when the jets are moving with the bottles. Continuous spray operation demands small size jet orifices to avoid choking the bottles with washing solution, and this makes the jets highly susceptible to clogging and inefficient due to the limited volume of solution which can be sprayed.

The foregoing disadvantages of the prior apparatus are overcome in the present apparatus in a novel, economical and simple manner by means which introduces cyclic "slugs" or jets of washing solution into continuously moving bottles carried in an inverted position adjacent undershot jets mounted on a traveling carriage which has a portion of its motion synchronized with bottle movement. Throughout this disclosure reference will be made to bottles for convenience of expression, but it will be understood that all types of containers requiring washing may be encompassed in that term of reference.

It is an important object of this invention to provide apparatus of improved construction and operation to overcome the problems of prior apparatus, some of which problems having been enumerated above.

It is an object of this invention to accomplish the foregoing with reduced power demands and more efficient spray handling.

It is also an object of this invention to greatly improve the bottle cleaning results with internal sprays and reduce the maintenance thereof.

A further object of this invention is to provide a compact spray jet arrangement so that substantial reductions in weight and size of machines may be realized.

The foregoing objects and advantages are obtained in large part by providing intermittent spray operation so that power requirements are reduced. By providing intermittent spray larger volumes of washing solution can be injected into the bottles without choking or causing waterlogging conditions since the bottles are given a chance to drain between cycles of spray delivery. This produces superior cleaning action compared to continuous sprays, and the larger spray orifices provided with such systems reduces the susceptibility to clogging, all of which lessens the need for attention and maintenance.

Other objects will be made to appear in the course of the disclosure of a presently preferred apparatus and components thereof depicted in the accompanying drawings, wherein:

FIG. 1 is a side elevational view of apparatus illustrating the principles of this invention, portions being broken away to reveal details and other portions being shown in diagrammatic form;

FIG. 2 is a top view of a control valve assembly as seen at line 2—2 in FIG. 1;

FIG. 3 is a view of the control valve assembly seen at line 3—3 in FIG. 2;

FIG. 4 is a transverse sectional view of the control valve taken at line 4—4 in FIG. 3;

FIG. 5 is an enlarged plan view of the traveling assembly of spray nozzles and bottle alignment means, with portions broken away to reveal details thereof, the view being taken at line 5—5 in FIG. 1;

FIG. 6 is a side elevational view taken at line 6—6 in FIG. 5; and

FIG. 7 is a longitudinal sectional elevational view seen at line 7—7 in FIG. 5.

In the drawings, FIG. 1 discloses the bottle washing apparatus 10 as an elongated assembly having a suitable housing with a bottle inlet end 11 and an outlet end 12. The bottles B are brought to the inlet 11 upon a suitable conveyor 13 and are deposited in an endless conveyor 14 having receiving pockets 15. The conveyor 14 is trained about sprocket wheels 16 arranged so that the bottles B pass successively through soaking compartments and eventually reach a conveyor pass 14*a* near the outlet 12. The pass 14*a* positions the bottles B in an inverted position in the pockets 15 so that washing fluid may be injected into each thereof from a traveling spray jet device 17 later to be described. The device 17 works in conjunction with a stationary exterior spray head 18, and is associated with a control valve member 19 through a plurality of flexible conduits 20 and 21 as will be described hereinafter.

The valve member 19 and the spray head 18 are connected into a washing fluid system which includes a motor 22 driving a pump 23 which has its suction conduit 24 connected to a filter unit 25 in fluid receiving communication with a sump 26 in the housing. The pump 23 delivers the washing fluid to a conduit 27 connected to the valve member 19, and a second conduit 28 leads from conduit 27 to the spray head 18 as indicated. In a system of the type illustrated the washing fluid discharged at spray head 18 and from the spray jet device 17 is collected in the pan 29 and drained through a strainer outlet 30 to the sump 26 where it is admitted to the unit 25 for the recirculation by pump 23. Other portions of the apparatus are shown diagrammatically for completeness of the present disclosure, but no detailed description thereof is thought necessary since the portions set forth above are deemed sufficient to a general understanding of the present invention.

Turning now to FIGS. 2, 3 and 4, the control valve member 19 includes an elongated manifold 31 open at one end to the supply conduit 27 and having a plurality of discharge nipples 32 (six being shown) extending from one side, which nipples extend through a wall W of the housing for the apparatus 10. Each nipple 32 has a valve seat adjacent its inner end to receive a poppet type valve 33 having a stem 34 extending through the opposite wall of the manifold 31 through a suitable fluid tight gland 35. Each gland 35 is secured by a removable exterior plate 36. The outer end of each poppet valve stem 34 has an adjustment nut 36*a* threaded thereon and a hardened washer 37. The manifold 31 supports spaced brackets 38 which project to the same side and operatively support in suitable bushings 39 a shaft 40 which carries a plurality of cams 41, one for each valve stem 34. Each cam is associated with a rocker arm consisting of a pair of side plates 42 straddling a bracket 43 carried by the plate 36, the pairs of plates 42 are pivoted at 44 on

the brackets 43 and have cooperating fingers 45 which abut the hardened washers 37. Each pair of plates 42 is provided with a cam follower roller 46. The poppet valves 33 are held seated by springs 47 (FIG. 4) and the rocker arm plates 42 open the valves 33 once each revolution of the associated cams 41. The cams 41 are actuated through a motor 48 and reduction gear unit 49 driving a shaft 50 connected to cam shaft 40 as shown in FIG. 3. The manifold 31 and the cam shaft and its operating means is suitably enclosed by a housing 51 on the wall W.

The traveling spray jet device 17 briefly shown in FIG. 1 is disclosed in more detail in FIGS. 5, 6 and 7 and reference will now be had to those views in conjunction with FIG. 1. As shown, the device 17 comprises a principal frame of side channels 52 and an intermediate channel 52 connected to end channels 53 in a rectangular assembly. Each side channel 52 carries spaced angle elements 54 on a roller guide plate 55, which elements 54 receive the operating end of an oscillating drive arm 56 (FIG. 1) disposed in the housing and connected to a shaft 57 extending crosswise of the apparatus. Comparing FIGS. 1 and 5, it is seen that the device 17 is operatively suspended from pins 58 which engage in respective pendulum arms 61 and 62. The pendulum arms 61 and 62 are internally supported from cranks 63 secured to cross shafts 64 carried in the housing of the apparatus 10. The cranks 63 and associated pendulum arms 61 and 62 support the frame of device 17 in such position that the guides 54 on each side channel 52 embrace the end on the internal oscillating arm 56. The arm 56 is fixed to a cross shaft 57 and the outer end of this shaft carries an arm 56*a*. Thus the device is operatively supported and caused to travel in the spray chamber with the conveyor pass 14*a* through arms 56 and 56*a*, while the cranks 63 determine the elevated position of device 17 as shown in FIG. 1 when traveling rightwardly with the conveyor pass 14*a*. At the end of such travel shafts 64 are rotated counterclockwise to lower the device 17 so that it may move leftwardly free of the bottles B to its starting position. The shafts 64 are then rotated clockwise to raise the device 17 toward the bottles B simultaneously or nearly so with actuation of the arm 56*a* to the right so that the device as it rises also begins to move toward the right to match the linear speed of the conveyor.

The means for actuating arm 56*a* comprises a push-pull rod 56*b* (FIG. 1) connected to a cam actuated crank 65, and the means to drive shafts 64 comprises a pair of arms 66 linked together by a rod 67. The two arms 66 are thus connected together for conjoint operation by a push-pull rod 68 connected, in turn, to a second cam actuated crank 69. Both cranks 66 and 69 are moved by separate tracks in opposite sides of a common cam wheel 70 driven through a sprocket or belt 71 from motor unit 72. The raising and lowering cam track is at 70*a* and the drive cam track is shown in dotted outline at 70*b*. The cam track 70*a* is so shaped and timed that the device 17 is held raised (as shown in FIG. 1) until the end of its rightward travel is about reached. Then the cam rapidly swings arms 66 counterclockwise to lower the pendulum arms 61 and 62, thus dropping device 17 away from the conveyor. Once device 17 and the bottle guides 75 thereon are clear of the bottles B, the cam 70*b* may actuate arm 65 to reverse the travel of device 17 and move it leftwardly to the beginning position where it raises again under response to cam 70*a*. It should be clear that device 17 has a path of motion which is substantially rectangular and that one long side of this path is coincident with the conveyor pass 14*a* and has a linear speed equal thereto by reason of the design of the cam track 70*b*.

Still referring to FIGS. 1 and 5 to 7, it is seen that the device 17 carries a plurality of guides 75 upon suitable supports 73 which extend between the side channels 52 (FIG. 6). There is one guide 75 for each row of bottle holders 15 in the conveyor 14, and the conveyor 14 may be wide enough to have anywhere from 24 to 40 rows of bottles B, without limitation to more or less than this number of rows, as few as one or two rows being sufficient to illustrate the principles hereof. Each guide 75 has conical pockets 74 therein with a bottom aperture in each to register with the mouth of the inverted bottles B. The device 17 is also provided with two groups of headers 76 extending inwardly from the opposite side channels 52 toward the intermediate channel 52 where suitable support is made thereon (FIG. 7). Each group of headers 76 (there being 6 headers in each group in the example illustrated) carries a plurality of spray nozzles 77 spaced along the length thereof and matching the spacing of the guides 75, particularly the bottom apertures in the alignment pockets 74.

The spray nozzle headers 76 in the right hand group of FIG. 5 are each connected by a nipple 78 to a washing fluid distribution manifold 79 carried by the side channel 52. The manifold 79 has inlet nipples 80 extending through the web of the channel 52 to the underneath side of the frame of device 17 and each nipple has a flexible conduit 20 mounted thereon. A similar arrangement is illustrated in FIGS. 5, 6 and 7 at the left side for the left hand group of headers 76. In FIG. 5 the manifold 79, which is typical of each thereof, is shown divided into three compartments by partitions 79*a*, each compartment being provided with a nipple 80. Therefore, in each group of headers 76, pairs thereof are in fluid supply communication with a header compartment, and each compartment has a supply nipple 80 therein. The left hand manifold 79 is supplied, therefore, by three flexible conduits 21, while the right hand manifold is supplied by three flexible conduits 20. Comparing FIGS. 1 and 7, it is seen that the conduits 20 and 21 extend to a fluid connection with the control device 19 upon the respective outlet nipples 32 (FIG. 2). The nipples 32 are supplied with fluid in sequence which is determined by the timing of the respective cams 41 which may be any sequence desired and in this apparatus is set to sixty degree spacing angles about the drive shaft 40 so that, beginning at the left end of the cam shaft 40 in FIG. 2 the washing fluid control poppet valves 33 are sequentially opened to supply fluid to the nipples 32 in regular order whereby the first conduit 20 (at the left in FIG. 1) is supplied, then the first conduit 21, then the second conduit 20, then the second conduit 21, and so on until each is supplied in one revolution of the shaft 40. This cyclic sequence is repeated during each portion of the travel of device 17 with the conveyor pass 14*a* so that all of the bottles B receive injections or "slugs" of washing fluid on the interior surfaces followed by periods when the spray is shut off and the fluid can drain away by gravity. Thus there is no choking of the bottles and the fluid jetted thereto under pressure is effective to strike the internal surfaces and produce an improved washing result.

Bottle washing apparatus of the foregoing character has proved to be exceedingly effective with marked reduction of horsepower and a high rate of bottle cleaning. For example, apparatus having as many as 24 rows of bottles B has attained a rate of cleaning of 500 bottles per minute using approximately 5.3 horsepower as compared with approximately 14.8 horsepower required for the older types of washers with continuous spray operation at nozzles 77. The improved apparatus with the spray nozzle headers arranged in groups, as shown, is effective with about 40% smaller diameter headers and almost three times larger nozzle orifices, since the fluid in the divided header system is able to reach all nozzles faster and the larger nozzle orifices reduce the tendency to clog up. These advantages are obtained, in large measure, by the imposition of the sequence control valve 19 having the quick acting poppet valves 33 and a cam rotation of approximately 30 r.p.m. driven by a one-half horsepower motor. Other advantages will be appreciated from an understanding of the foregoing description of the presently preferred character of apparatus.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

In the claims:

1. Apparatus for washing containers comprising a conveyor continuously movable through a container washing station in the apparatus, container holding means on said conveyor to position the containers in inverted position, washing fluid jets adjacent said container holding means, alignment means for said jets and containers to effect alignment between said jets and containers, fluid flow controlling means including normally closed valve elements and members cyclically opening said valve elements to supply fluid intermittently to said jets such that containers jetted with fluid drain free of fluid in the intervals of no fluid supply, and means to movably support said washing fluid jets in the washing station, said support means having a movement from a starting position to bring said alignment means into jet and container alignment and advance said jets with said containers through a substantial part of the washing station, and a movement to disalign said alignment means from said jets and containers and return to said starting position.

2. Apparatus for washing containers while in motion comprising a conveyor movable continuously along a substantially fixed path including a washing station, means on said conveyor supporting containers in row alignment and in inverted position while being continuously moved through said washing station of the conveyor path, a movable carrier operably positioned adjacent said conveyor in said washing station, spray jet means mounted on said carrier, means on said carrier adapted to engage groups of containers at a time and align said spray jet means, spray jet supply regulating means including normally closed valve means preventing flow of the washing fluid and motor means operating said valve means to intermittently open the same such that washing fluid jetted into containers is drained therefrom during periods of valve closure, and means to operate said carrier in a predetermined path of motion with and opposite to said conveyor and relatively toward and away from said conveyor, said carrier operating means moving said carrier toward said containers adjacent a beginning portion of the washing station, holding said carrier closely adjacent said conveyor through the greater portion of the movement in said station and moving said carrier away from and opposite to said conveyor to the beginning portion of said washing station.

3. Apparatus for washing containers comprising a conveyor continuously movable in a horizontal path, means on said conveyor for supporting rows of containers in inverted position; and means to wash the containers internally while in continuous motion and to avoid choking the containers with washing fluid including a washing fluid distribution controller, a plurality of groups of washing spray jets adjacent said conveyor path, fluid conduit means connected between said controller and each group of spray jets, separate valve means in said controller to normally close each of said conduit means, cam means for each valve adapted to open the associated valve to deliver washing fluid to the connected group of spray jets, means to operate said cam means in a predetermined order to intermittently supply the spray jets, and movable means supporting said groups of washing spray jets adjacent said conveyor, said movable means having a first motion registering said spray jets with rows of containers and moving the latter along with said conveyor, and having a second motion removing said spray jets from registration and reversing the movement of said means to repeat its first motion.

References Cited in the file of this patent

UNITED STATES PATENTS

1,144,023	Beutlich	June 22, 1915
1,466,141	Miller	Aug. 28, 1923
1,655,941	Dawson et al.	Jan. 10, 1928
1,796,878	Watson	Mar. 17, 1931
1,879,770	Simonsson	Sept. 27, 1932
2,551,140	Ladewig	May 1, 1951
2,604,896	Cozzoli	July 29, 1952
2,735,794	Pletcher	Feb. 21, 1956

FOREIGN PATENTS

482,871	Great Britain	Apr. 6, 1938