May 6, 1969 H. E. HUDDLE 3,442,708

HANDLING AND CLEANING FRAGILE CONTAINERS

Original Filed Jan. 7, 1965 Sheet 1 of 2

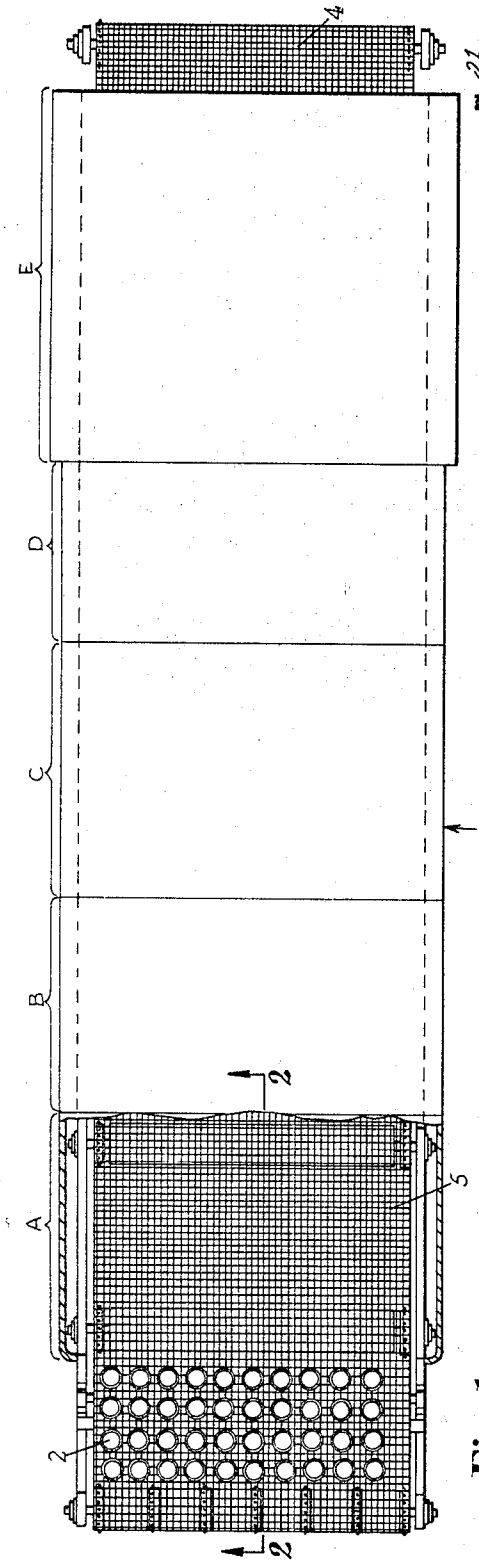


Fig. 1

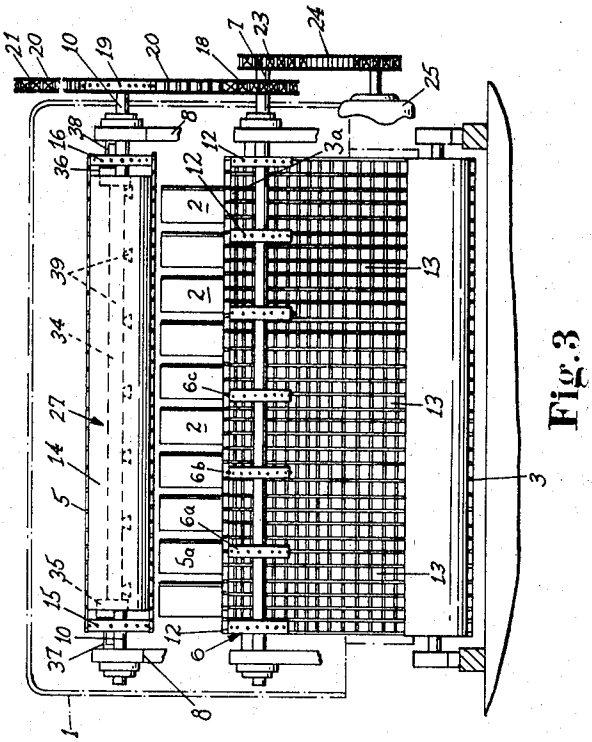


Fig. 3

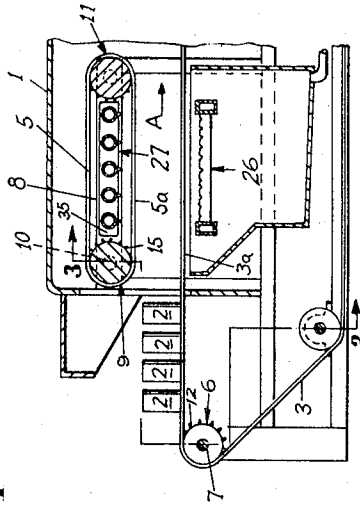


Fig. 2

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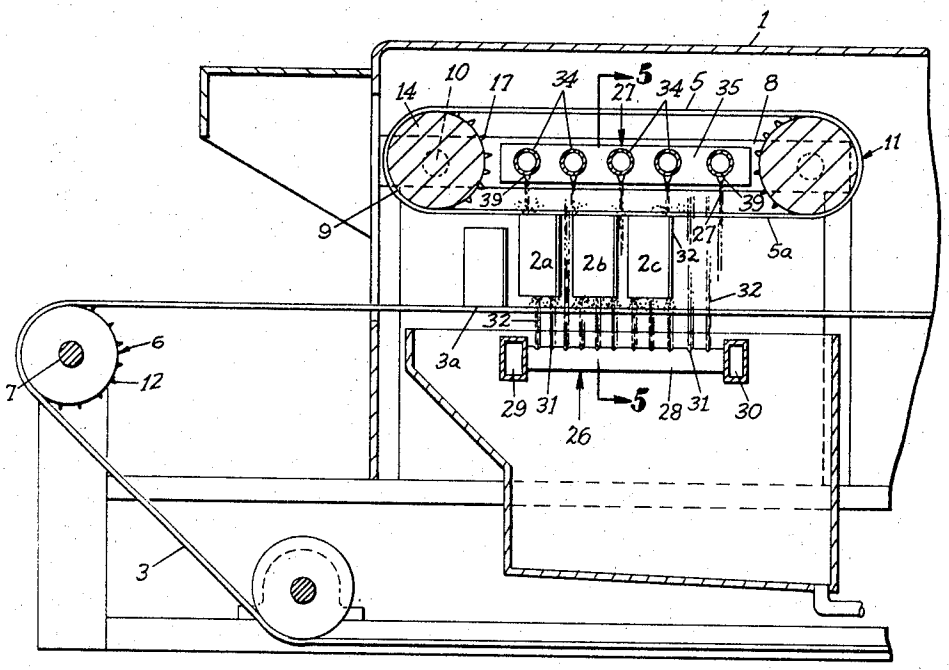


Fig. 4

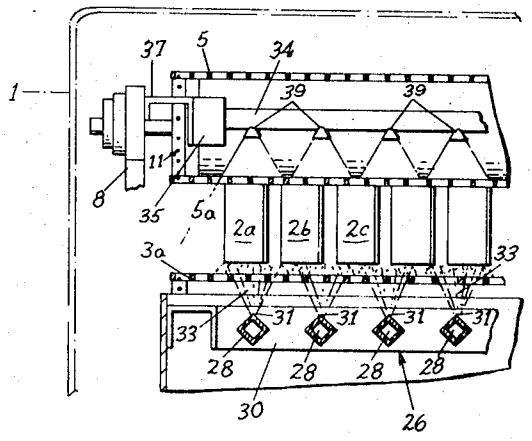


Fig. 5

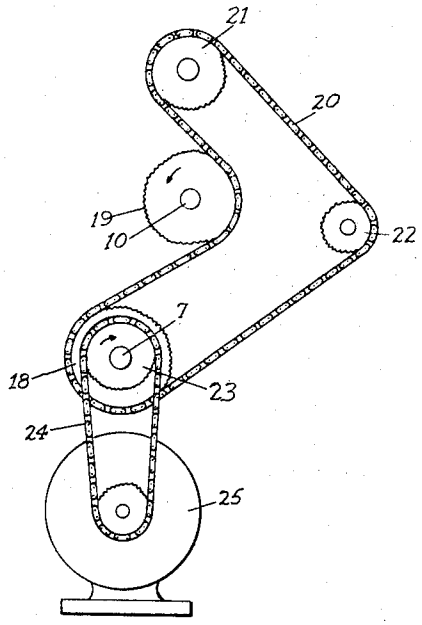


Fig. 6

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HANDLING AND CLEANING FRAGILE CONTAINERS

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Original application Jan. 7, 1965, Ser. No. 424,020, now Patent No. 3,291,143, dated Dec. 13, 1966. Divided and this application Aug. 30, 1966, Ser. No. 565,354
Int. Cl. B08b *11/02*; B67c *1/04*
U.S. Cl. 134—32 7 Claims

ABSTRACT OF THE DISCLOSURE

The method of cleaning and conveying open top fragile containers, the containers being advanced in inverted position and lifted into contact with a traveling conveyor overlying the containers by means of a series of sprays directed upwardly from beneath the advancing containers, the containers being maintained in contact with the overlying conveyor solely by means of the sprays.

This is a division of copending application Ser. No. 424,020 filed Jan. 7, 1965, and entitled, Conveyor for Handling Fragile Containers in Spray Cleaning Apparatus, now Patent No. 3,291,143 dated Dec. 13, 1966. The invention relates to cleaning of containers and similar articles, and has to do more particularly with procedures for thoroughly cleaning extremely lightweight and relatively fragile containers as the containers are conveyed through a tunnel wherein they are subjected to a series of spray washing and rinsing operations followed by a drying operation so that the containers are discharged from the tunnel in cleaned and dried condition.

Lightweight containers, such as those formed from drawn aluminum, present particular problems in that they cannot be handled employing conventional conveying and guiding mechanism which makes positive physical contact with the containers. For example, a drawn aluminum beer can initially comprising a cylindrical body closed at one end will weigh on the average slightly less than three-quarters of an ounce. Such cans, due to their lightweight, are readily susceptible to being blown about and knocked over by the sprays which are employed to perform the cleaning and rinsing operations. However, if conventional mechanical gripping fingers or hold-down means are employed to retain the cans in proper position, such means will dent or otherwise damage the relatively fragile edges and wall surfaces of the cans.

In a copending application in the names of Harley E. Huddle and Vernon Baldwin, Ser. No. 345,467, filed Feb. 7, 1964, and entitled, Conveyor Type Cleaning Device for Fragile Containers and the Like, now Patent No. 3,262,460 dated July 26, 1966, there is taught a cleaning device for fragile containers which embodies a novel spray nozzle design and arrangement wherein the washing and rinsing sprays themselves act as a hydrostatic hold-down effective to maintain the containers in proper position without the use of mechanical hold-downs, guide fingers, or the like. While such equipment has proven to be highly effective, the hydrostatic hold-down principle imposes limitations on the speed at which the equipment can be reliably operated. This particularly true in the leading section of the equipment wherein the initial washing operation takes place. Since such containers require an exceptionally thorough cleansing due to the dirty residue which results from their formation, whether it be a drawing operation or otherwise, it has been found that such heavy dirt can be best removed by employing high velocity sprays in the washing station, particularly as to those

sprays which impinge upon the inside surfaces of the containers. The use of a higher velocity spray impinging against the inner surfaces of the containers upsets the hydrostatic balance of the sprays in accordance with the teachings of the aforementioned copending application, thereby losing the hold-down effect. If the velocities of both the top and bottom sprays are materially increased, it becomes increasingly difficult to maintain the proper balance between the sprays and again the hydrostatic hold-down is lost.

In accordance with the instant invention, the aforementioned difficulties are overcome by providing a moving conveyor traveling above the tops of the containers being cleaned, with the high velocity sprays underlying the inverted containers arranged to lift the containers upwardly so that the uppermost ends of the inverted containers contact the overlying conveyor and are caused to advance through the tunnel by reason of their contact with the overlying conveyor.

A principal object of the instant invention is the provision of a procedure for cleaning lightweight containers wherein the containers to be cleaned are initially placed in inverted condition on a lower traveling conveyor and wherein an upper conveyor moving in timed relation to the lower conveyor is positioned to overlie the uppermost ends of the containers, the upper conveyor being spaced upwardly by a short distance from the containers so as to be normally free from physical contact therewith. The conveyors are of perforate character and a plurality of spray heads are mounted beneath the lower conveyor so as to direct sprays of cleaning solution upwardly through the conveyor for contact with the inner surfaces of the containers, such sprays serving to lift the containers from the lower conveyor and cause their uppermost ends to contact the overlying conveyor.

A further object of the instant invention is the provision of a method for preventing lightweight containers from being knocked over as they are being cleaned, the containers being lifted by and maintained in contact with an overhead conveyor by means of fluid pressure and wherein coacting sets of spray heads overlie the overhead conveyor and are arranged to direct sprays of cleaning solution downwardly through the upper conveyor onto the exterior surfaces of the containers, the upper sprays preferably being of insufficient magnitude and velocity to overcome the force of the fluid pressure acting to hold the containers against the upper conveyor.

The foregoing together with other objects of the instant invention which will appear hereinafter or which will be apparent to the skilled worker in the art upon reading this specification, are accomplished by that construction and arrangement of parts of which an exemplary embodiment shall now be described.

Reference is made to the accompanying drawings wherein:

FIGURE 1 is a schematic plan view of cleaning apparatus capable of carrying out the instant invention.

FIGURE 2 is a vertical sectional view taken along the line **2—2** of FIGURE 3.

FIGURE 3 is an enlarged vertical sectional view taken along the irregular line **3—3** of FIGURE 2.

FIGURE 4 is an enlarged fragmentary vertical sectional view similar to FIGURE 2 illustrating the manner in which the lower sprays lift the invented containers into contact with the upper conveyor.

FIGURE 5 is a fragmentary vertical sectional view taken along the line **5—5** of FIGURE 4.

FIGURE 6 is a fragmentary elevational view taken from the right end of FIGURE 3 illustrating a simplified means for driving the upper and lower conveyors in synchronism.

Referring first to FIGURE 1 of the drawings, the reference numeral **1** indicates a tunnel-like cleaning machine housing enclosing a plurality of individual processing stations at which the various cleaning operations take place. The containers to be cleaned, which are indicated at **2**, are placed in inverted position on the leading end of a continuously moving lower conveyor **3** which advances the containers through a series of processing stations for ultimate discharge at the trailing end of the conveyor, which is indicated at **4**. As the containers pass through the machine they are subjected to various cleaning and rinsing operations and are ultimately dried. The number of washing and rinsing stations may vary depending upon the nature of the containers being cleaned and the degree of cleanliness desired. A typical non-limiting example is illustrated wherein the containers are subjected to an initial washing operation at station A, a first rinsing operation at station B, a second washing operation at station C, which in some instances comprises an acid wash, followed by a second rinsing station station D which may incorporate a deionizing rinse. The washing and rinsing stations are followed by a drying section E in which the containers are usually subjected to currents of heated air which serve to completely dry them. In accordance with the teachings of the aforesaid copending application, drain and blow-off stations may be interposed between successive wash and rinse stations if so desired.

In accordance with the instant invention, an upper conveyor **5** is provided in at least the leading washing station A, the upper conveyor **5** being driven in timed relation to the lower conveyor **3**.

The conveyors **3** and **5** are of open mesh construction, preferably being formed of articulated U-shaped links which are of known character and readily permit the sprays to pass therethrough. As possibly best seen in FIGURE 2, the lower conveyor **3** passes around a leading sprocket assembly **6** having a shaft **7** with its upper flight *3a* traveling horizontally through the machine in the direction of the arrow A. The upper conveyor **5** is suspended from an adjustable mounting bracket **8** by means of which it may be raised and lowered, the bracket **8** mounting a leading sprocket assembly **9** having a driving shaft **10**, and a trailing sprocket assembly **11**, the lower flight *5a* of the upper conveyor extending parallel to the flight *3a* of the lower conveyor and also moving in the direction of the arrow A.

In a preferred embodiment of the invention, the sprocket assembly **6** is actually composed of a series of spaced apart sprockets, such as the sprocket *6a*, *6b* and *6c* extending along the shaft **7**, the sprockets having enlarged teeth **12** which engage in the openings **13** in the conveyor. While the upper sprocket assembly **9** may be of similar construction, in a preferred embodiment of the invention it comprises a cylindrical center portion **14** mounted on shaft **10**, together with outlying sprockets **15** and **16** having teeth **17** which engage the openings in the conveyor. This construction has been found preferable in that it facilitates maintaining the upper conveyor in taut condition; and to this end it will be understood that the leading and trailing sprocket assemblies will be adjustable toward and away from each other to take up slack in the lower flight. Sprocket assembly **6** is driven by means of drive sprocket **18** secured to one end of shaft **7**, and similarly sprocket assembly **9** is driven by drive sprocket **19** secured to the corresponding end of shaft **10**. A preferred driving arrangement is seen in FIGURE 6 wherein it will be seen that the inner side of an endless chain **20** passes around drive sprocket **18** with an outside portion of the chain engaging drive sprocket **19**, the chain returning around idlers **21** and **22**. A second drive sprocket **23** on shaft **7** is connected by chain **24** to the drive shaft of a prime mover **25**. With this arrangement, it will be evident that the sprocket assemblies **6** and **9** will be rotated in timed relation and yet in opposite directions.

Referring now to FIGURES 4 and 5, a lower spray assembly **26** is mounted beneath the upper flight *3a* of the lower conveyor in the area comprising the washing station; and similarly an upper spray assembly **27** is mounted between the flights of the upper conveyor. It will be understood that each of the spray assemblies will comprise a plurality of spray nozzles arranged to direct sprays or jets of washing solution upwardly or downwardly, as the case may be, through the conveyors for contact with the containers. For purposes of illustration, the lower spray assembly may comprise the type disclosed in the aforementioned copending application wherein the individual spray nozzles are formed in elongated tubular members **28** connected at their opposite ends to headers **29** and **30**. The tubular members **28** may be conveniently formed by joining together the legs of two right angle metallic strips in edge abutting relation. The nozzles themselves are formed by milling or otherwise cutting a series of narrow transverse slots **31** through one edge of the tubular members. Nozzles formed in this manner produce thin fan-shaped sprays oriented transversely of the path of travel of the containers, the thin transverse nature of the sprays being indicated at **32** in FIGURE 4, whereas their fan-shaped character has been indicated at **33** in FIGURE 5. It will be understood that washing solution under pressure will be introduced into the header at one end of the spray assembly, such as the header **29**. The header **30** will be closed to the flow of solution therethrough during normal operation of the spray assemblies; although in accordance with the teachings of the aforementioned application, the header **30** is provided with drain conduits which may be opened when it is desired to flush the assembly.

Preferably the spray assembly **27** will be composed of a plurality of tubular members **34** extending transversely of the conveyor, the opposite ends of the tubular members **34** being connected to headers **35** and **36**, as seen in FIGURE 3, the headers in turn being suspended from the adjustable mounting bracket **8**, as by means of arms **37** and **38**, thereby mounting the spray assembly **27** for movement with the upper conveyor and also facilitating its cleaning. The tubular members **34** will mount spray nozzles **39** which, preferably, will also produce transversely disposed fan-shaped sprays, although particularly in the case of the upper spray assembly, the nozzles may be spaced apart by a substantially greater distance and may produce other spray patterns such as a conical spray pattern. It is to be understood that various forms of spray nozzles and assemblies may be employed, the paramount consideration being to provide spaced series of sprays which will impinge on the containers in a direction generally parallel to their longitudinal axes, with the lower sprays effectively serving to lift the containers into contact with the upper conveyor for movement therewith.

In the operation of the apparatus, the upper conveyor **5** will be adjusted relative to the height of the containers being cleaned so that its lower flight *5a* will be spaced upwardly from the uppermost ends of the containers, preferably on the order of one-eighth to one-quarter of an inch. Such spacing assures that the containers will not be physically engaged or clamped between the upper and lower conveyors. At the same time, the distance should be sufficiently small so that the containers will not tip to the extent that they will topple over. The sprays will be operated at a relatively high pressure as compared to the operation of comparable sprays in apparatus embodying the hydrostatic holddown principle. For example, spray pressures on the order of 35 pounds per square inch have been found to be highly satisfactory; whereas where the sprays are utilized to effect hydrostatic holddown, spray pressures of 17–18 pounds per square inch have been preferred. The pressure or magnitude of the underlying sprays will be sufficient to overcome the force of the overhead sprays so as to cause the containers to

rise and be held against the overlying conveyor. This action is illustrated in FIGURES 4 and 5 wherein it will be seen that the containers *2a*, *2b* and *2c* have been lifted by the lower sprays so that their uppermost bottom ends are seated against the lower flight *5a* of the upper conveyor. In an exemplary embodiment of the invention the adjoining spray nozzles in the lower spray assembly **26** will be on centers of 2 inches or less, with the nozzles in adjacent rows in interdigitating relationship, thereby assuring that the containers will at all times be under the influence of a plurality of the sprays as they advance through the washing station. In the upper spray assembly **27** the nozzles may be similarly spaced or they may be on much wider centers, such as 6 inches. Once the containers have been elevated into contact with the upper conveyor, they will preferably remain in contact therewith throughout the length of the spray assembly, returning into contact with the lower conveyor only upon their passage beyond the trailing sprays. However, some back and forth movement may be tolerated, depending upon the particular containers being cleaned. Thus, the number of spray nozzles, their positioning, and the magnitude of their sprays may be varied depending upon the conditions of use, the basic prerequisite being the provision of coacting sets of sprays so arranged that the containers will be maintained in contact with one or the other of the conveyors so as to be advanced thereby without undue oscillation which would cause physical damage to the containers as they contact one or the other of the conveyors.

While the use of an overlying conveyor has been described only in conjunction with the initial washing station, it will be understood that such arrangement may be utilized in conjunction with succeeding washing or rinsing stations, if required, although it has been found in most installations that unusually high pressures are not required for subsequent rinsing and washing operations. Where overlying conveyors are employed at a plurality of the stations, they may be jointly or separately driven, in the latter case by separate motors having synchronized speed controls.

It will be understood that modifications may be made in the invention without departing from its spirit and purpose. Various modifications have already been suggested, and others will undoubtedly have occurred to the skilled worker in the art upon reading the specification, and consequently it is not intended that the invention be limited in any manner other than as set forth in the claims which follow.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for preventing lightweight fragile containers from being knocked over as they are advanced through a cleaning machine wherein the containers are subjected to spray washing and rinsing operations, said containers having a generally cylindrical body with a closed bottom and an open top, said method comprising providing upper and lower conveyors the adjacent flights of which are spaced apart by a distance slightly greater than the height of the containers being cleaned, said conveyors being of perforate character so that sprays of washing and rinsing solution may pass therethrough, initially placing the containers on the lower conveyor in inverted position, advancing said conveyors in timed relation and, as the containers are advanced, subjecting them

to a series of sprays directed upwardly from beneath the lower conveyor, said sprays being of sufficient magnitude to displace the containers upwardly into contact with the upper conveyor, whereby the containers are removed from contact with the lower conveyor and are advanced by reason of their contact with the upper conveyor.

2. The method claimed in claim **1** including the step of directing additional sprays downwardly through said upper conveyor for contact with the exterior surfaces of the containers, and controlling the relative magnitudes of the upper and lower sprays so that the lower sprays will maintain the containers in contact with the upper conveyor.

3. The method claimed in claim **2** wherein said sprays are of thin fan-shaped configuration and are transversely disposed with respect to the direction of travel of the containers.

4. A method of cleaning and conveying lightweight fragile containers having a generally cylindrical body with a closed bottom and an open top, which comprises advancing the container in a path of travel in inverted position, lifting the containers into contact with a traveling conveyor overlying the containers by means of a series of sprays emanating from a series of nozzles stationarily positioned along the path of travel of said containers directed upwardly from beneath the advancing containers, and maintaining the containers in contact with the overlying conveyor solely by means of said sprays, whereby said containers are advanced in their said path of travel by reason of their contact with said overlying traveling conveyor.

5. The method claimed in claim **4** including the step of directing additional sprays downwardly onto the containers, and adjusting the relative magnitudes of the upwardly and downwardly directed sprays so that the upwardly directed sprays will maintain the containers in contact with the overlying traveling conveyor.

6. The method claimed in claim **5** wherein said sprays are of thin fan-shaped configuration and are transversely disposed with respect to the direction of travel of the containers, said lowermost sprays at least being arranged in interdigitating relationship and spaced apart by distances such that the containers will at all times be under the influence of a plurality of the said sprays as they advance in their said path of travel.

7. The method claimed in claim **6** wherein said upwardly directed sprays are operated at a pressure of about 35 pounds per square inch.

References Cited

UNITED STATES PATENTS

1,090,845	3/1914	Goss et al.	134—72
2,062,664	12/1936	Kendall	21—79 XR
2,622,608	12/1952	Moore et al.	134—170 XR
2,655,162	10/1953	Zademach et al.	134—129 XR
2,660,513	11/1953	Ball	21—79 XR
2,671,742	3/1954	Cozzoli	134—25 XR
3,107,677	10/1963	Romine et al.	134—127

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U.S. Cl. X.R.

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