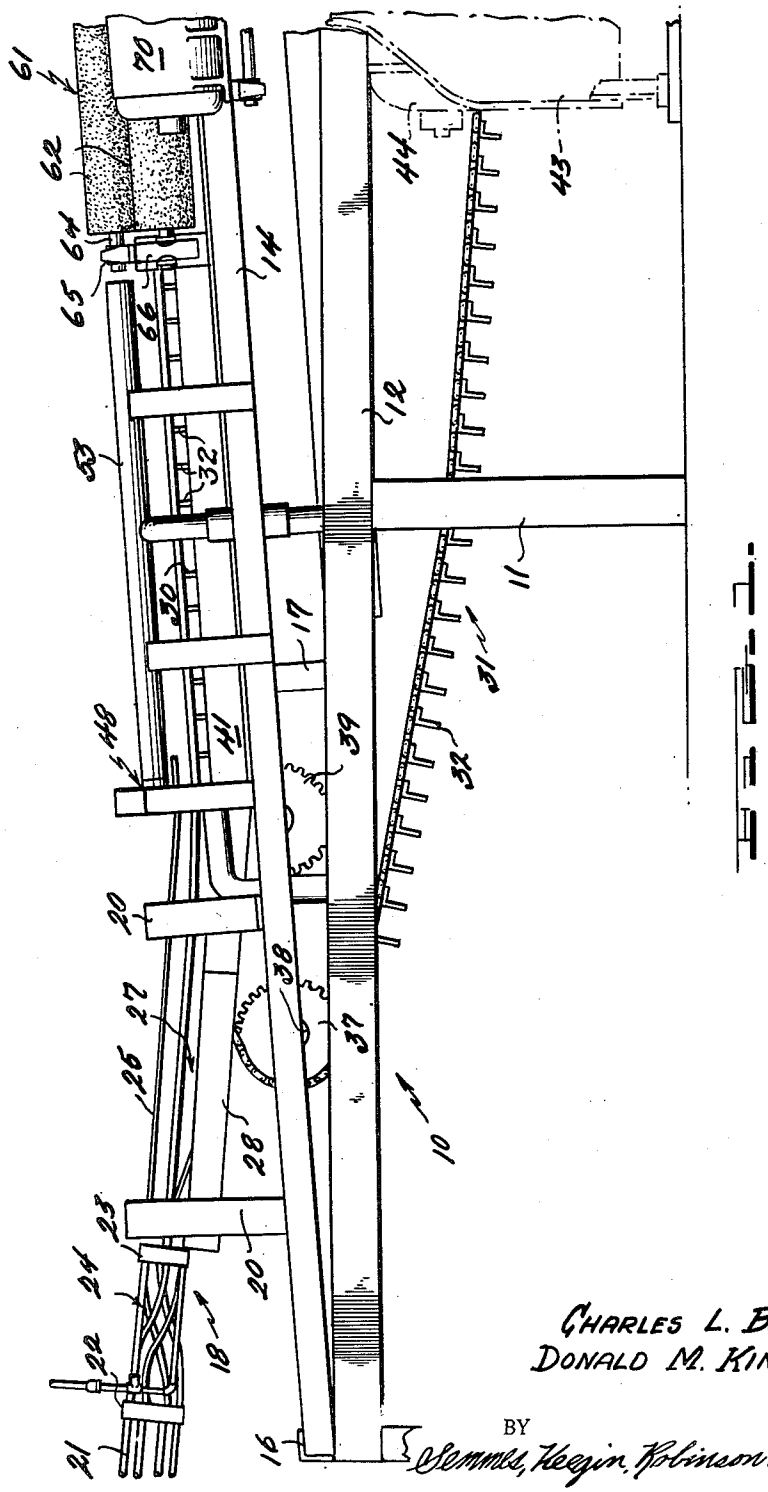
March 9, 1954 C. L. BOWMAN ET AL 2,671,240

WASHING AND DRYING APPARATUS

Filed Dec. 21, 1949 5 Sheets-Sheet 1



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WASHING AND DRYING APPARATUS

Filed Dec. 21, 1949 5 Sheets-Sheet 2

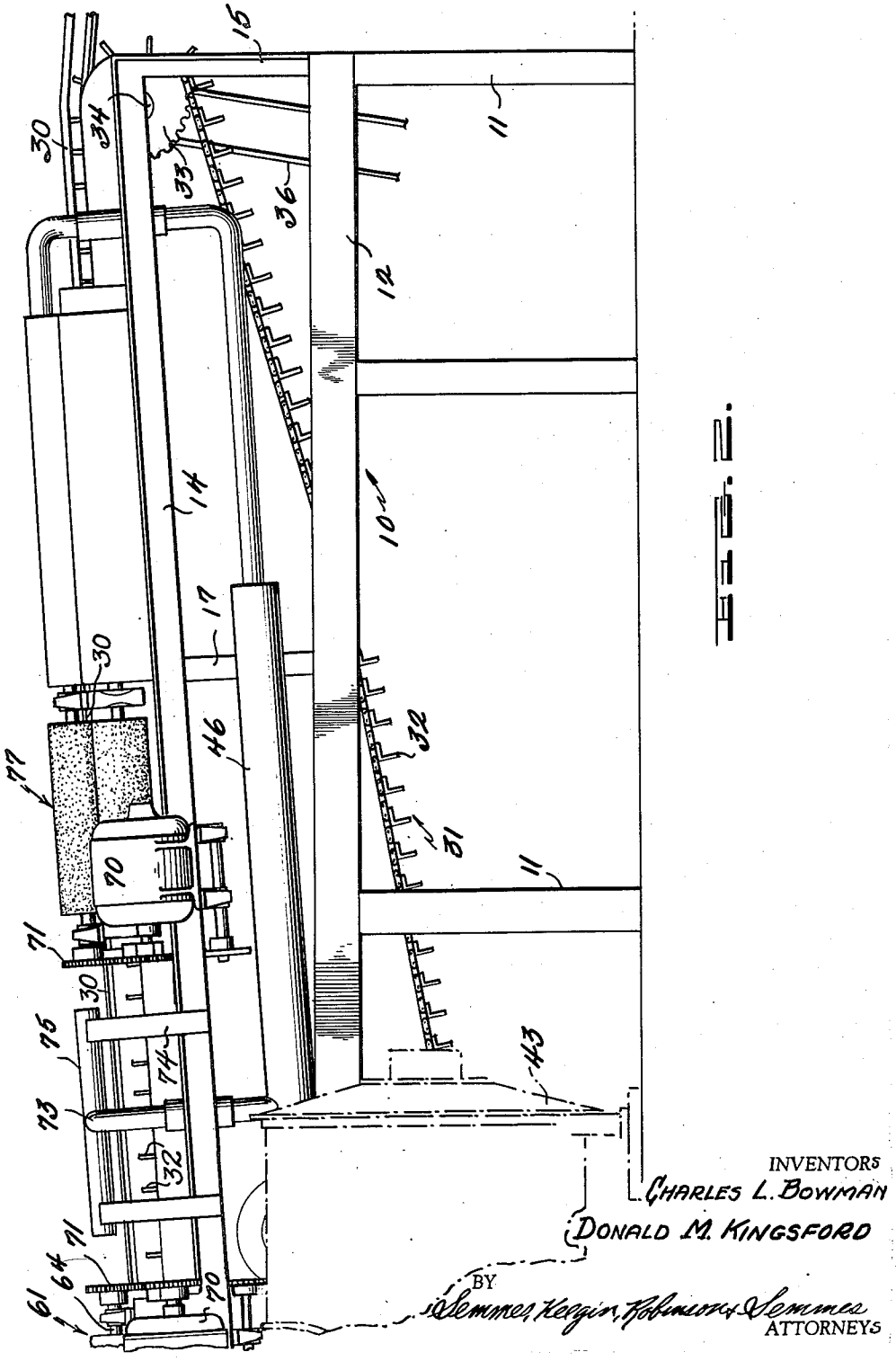


Fig. 2.

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WASHING AND DRYING APPARATUS

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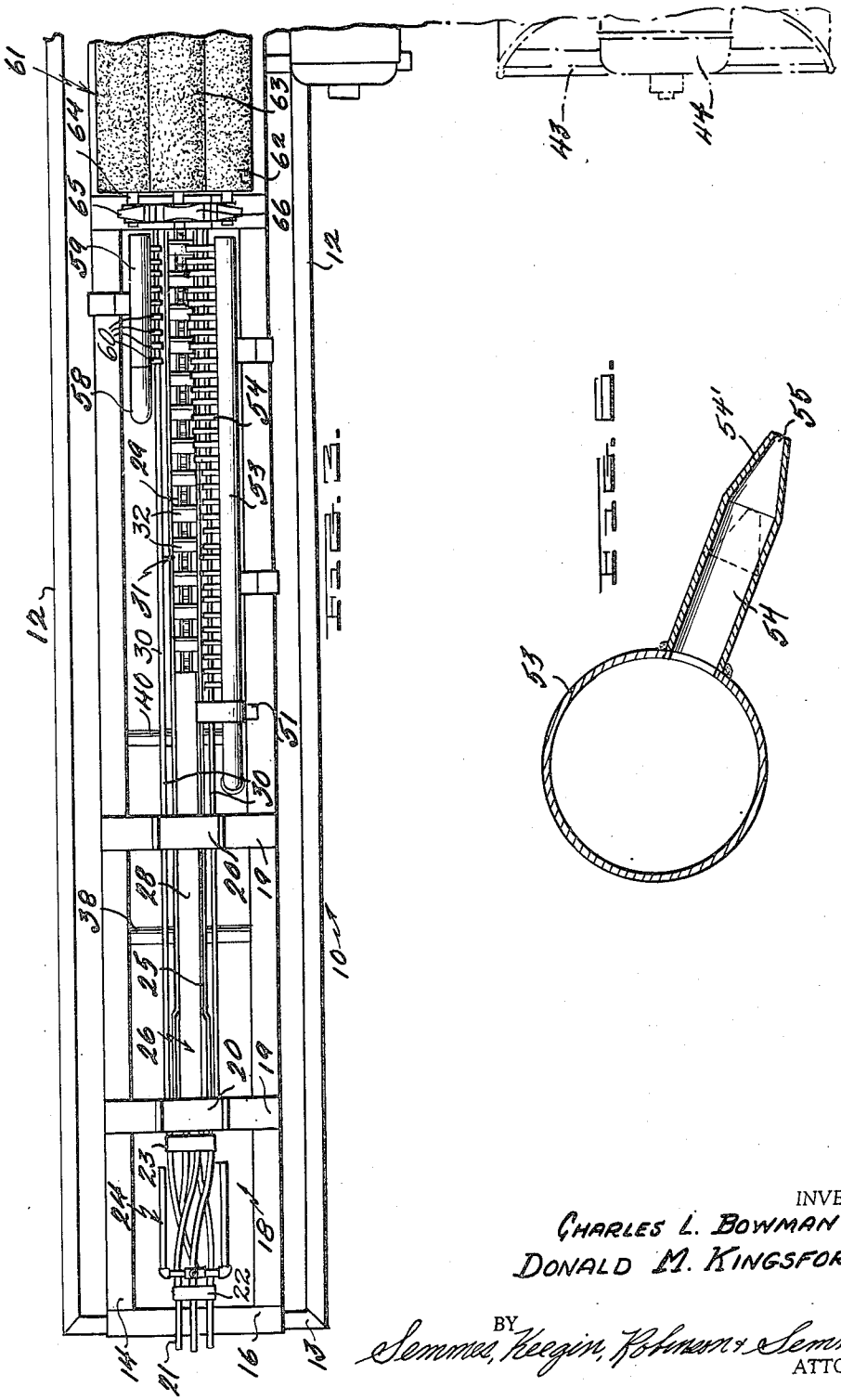


FIG. 2.

FIG. 3.

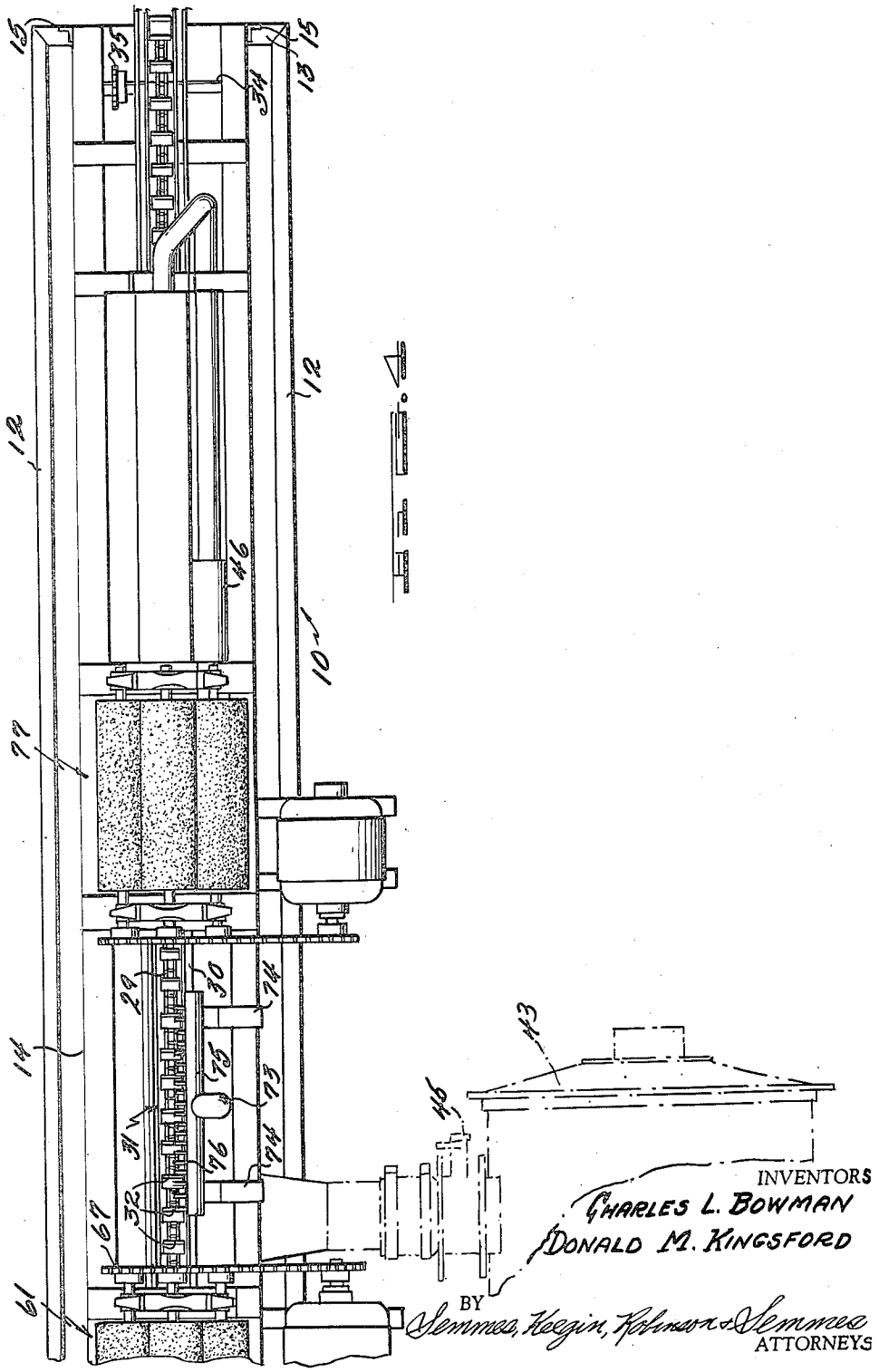
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WASHING AND DRYING APPARATUS

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WASHING AND DRYING APPARATUS

Filed Dec. 21, 1949 5 Sheets-Sheet 5

FIG. 2.

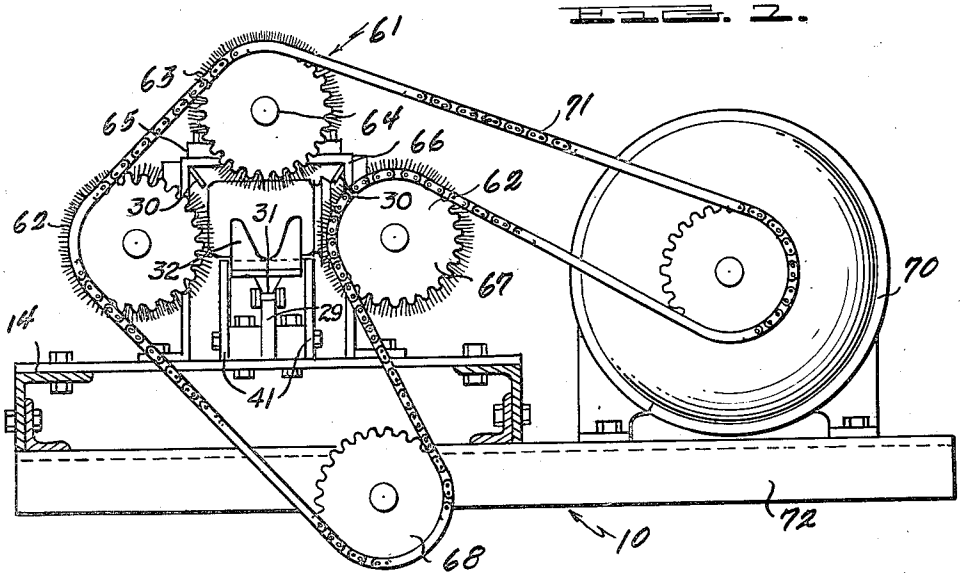
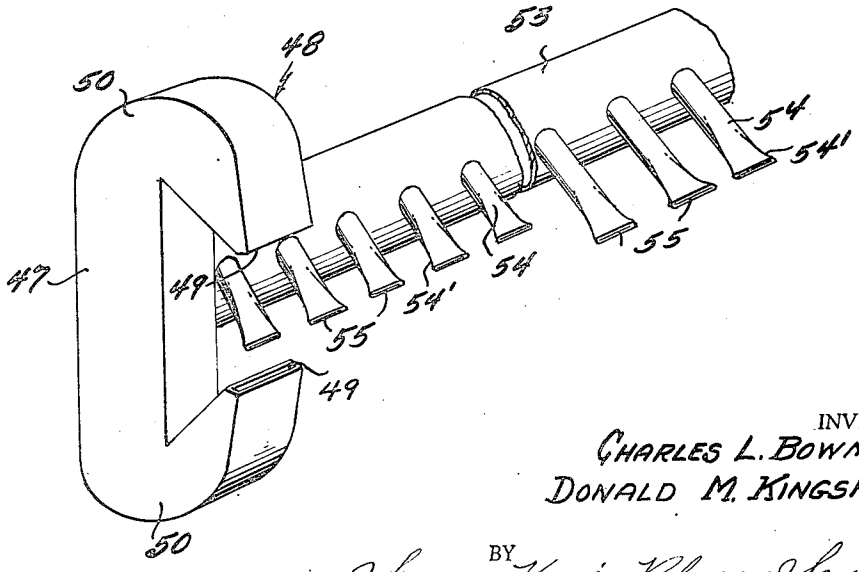


FIG. 5.



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UNITED STATES PATENT OFFICE

2,671,240

WASHING AND DRYING APPARATUS

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Application December 21, 1949, Serial No. 134,236

13 Claims. (Cl. 15—302)

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This invention relates to washing and drying devices, and more specifically to mechanical means for cooperatively advancing, washing, drying and polishing produce containers through combined elements gathered to perform the functions in a minimum of time and with minimal output.

In the manufacture of container washing and drying machines, it is known that conveyor elements may be devised to advance containers through a series of related steps for washing, drying and otherwise treating container surfaces. Elements hitherto employed in devices of this type have been coordinated so that the passage of a container through the series of steps incorporated in the machine effects the functions desired with little or no deviation or halt to process. It is of importance to realize, however, that few if any machines have been devised wherein the timing of the various operating elements of the machine is sufficiently coordinated to enable the rapid advancement of containers through the machine to such an extent that production of the treated containers may be substantially augmented above that production return formerly acknowledged as average. To effect overall cleaning and rinsing, present structures generally employ container cleansing apparatus separate from drying means which drying means often incorporate blotting elements, requiring constant maintenance. The problem of rapidly drying containers prior to labelling has provided difficult of solution, since devices and methods formerly used have been of inefficient and expensive construction. It is well known, for instance, that application of pneumatic pressure to container exteriors cannot of itself completely dry containers unless extreme and prolonged application thereof is made.

It is an object of this invention to provide a unique and unitary structure having varying sources of operational output, each of which is adapted to cooperate with the other to perform washing, cleansing, drying and polishing, wherein the entire effect may be continuously performed within a minimum of space and within minimum time requirements.

A further object of the invention is to provide the machine having synchronous relation between the operational elements thereof, each of the elements of advancing, washing, drying, polishing and heating, if employed incorporating a minimum of apparatus for performing the several functions, thereby decreasing cost of operation and manufacture of the machine to a minimum.

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Still another object of the invention is to provide means for the removal of cleansing fluid from containers wherein each of the elements employed in pneumatic removal is related to others and to other mechanical elements of the machine in such a manner that maximum utilization of a single source of thermal blast may be accomplished.

It is another object of this invention to provide a machine which is adapted to wash, rinse, dry and warm, if desired the exterior surfaces of a container wherein rotatable brush elements cooperate each with the other and with pneumatic cleaning fluid removing elements to effect ejection of cleansing fluids from the container surfaces and wherein the rotating brushes may simultaneously centrifugally cleanse themselves.

With a view toward attaining the foregoing objects and others which may be apparent through reference to the ensuing description, drawings and claims appended hereto, a brief description of the general nature of the invention is hereinafter set forth.

Broadly, a rectangularly disposed longitudinal frame structure having inclined upper beams is provided as a base for the working elements of the device. A gravitational introducing ramp is secured at a lower extremity of the frame structure, approximately one-fifth the distance from lowest point of slope upward. Uncleaned containers are set herein for commencement of movement longitudinally of the structure and through a preliminary cleansing or rinsing operation. Each of the elements forming the cleansing station is adapted to thoroughly clean all surfaces of the containers. Upon forcible advancement of the containers through this station, means are provided on the ramp for the removal of misplaced containers which might otherwise foul the means for advancing containers throughout the succeeding stations of operation of the machine.

Succeeding the gravitational ramp, a conveyor is disposed on the frame to receive each of the containers, to separate them into a channel wherein further operation upon the surfaces of the containers is to be effected, and to advance containers longitudinally of the machine.

Several series of pneumatic manifolds are secured at strategic stations on the machine, each of which serves to progressively force cleansing fluids from various surfaces of the containers. Each of the pneumatic instruments, save the first in line, has jets of varying length which cooperate with each other and with other instru-

ments of the machine to force fluids from containers.

Along the path of movement of the containers and in cooperative relation with the aforementioned blower manifolds, is displaced a series of brusher elements, each of which acts upon one of the three main surfaces of the containers as they are advanced through the device. The brushes remove excessive accumulation of fluid not removable by the manifold assemblies. The bruhes cleanse themselves during operation.

Pneumatic means are provided in following line for the final removal of excessive cleansing fluid particles from the containers.

A still further series of brush elements is provided longitudinally of the aforementioned elements and in the path of movement of the containers, the latter series of brush elements serving to engage the exterior surfaces of the container, to polish the same to a high luster.

In the drawings:

Figure 1 is a view in side elevation of forward elements of the invention;

Figure 2 is a view in side elevation of rearward elements of the invention taken along the same continuous line as the elements shown in Figure 1;

Figure 3 is a top plan view of the forward elements of the invention;

Figure 4 is a top plan view of the invention showing the rearward elements of the invention taken along a continuous line from the elements shown in Figure 3;

Figure 5 is a view in perspective of two basic manifolds adapted to remove fluids from containers;

Figure 6 is a horizontal cross-sectional view of a typical manifold showing the particular structure of jet attachment to the manifold; and

Figure 7 is a view in vertical cross-section of a brush assembly showing the interconnection between the brushing elements and the driving means.

A preferred rectangular structure 10 is shown to rest on vertical legs 11 disposed longitudinally thereof and at the four corners of the rectangular frame structure. Extending longitudinally of the rectangle are a pair of beams 12 secured to the legs 11. A pair of transverse beams 13 is secured to the extensions of beams 12 and likewise to the four legs 11 as by nut and bolt attachment. The beams 12 and 13 provide a base for the inclined frame structure on which the working elements of the washing and drying device are supported. An inclined frame 14 is supported by the base 10 at one longitudinal extremity as by the adjustable supports 15, and at the other by a hinge 16 extending transversely of the frame and attached to lower transverse beam 13 by welding or other suitable means. Four or more vertical supports 17 which support the center portions of inclined frame 14 derive support from attachment to the longitudinal beam 12 of the base.

Ramp 18 is inclined oppositely from the frame structure 14 and is adjoined thereto at a horizontal distance sufficient to enable cleansing of all containers and disposal of certain misplaced containers. Normally, the junction of ramp and frame structure is at a point, one fifth the distance from point of lowest inclination to highest inclination. Upon introduction of upright cylindrical containers into the device at the mouth of this ramp, introductory conveyor action forces the containers longitudinally of the device to working elements of the invention. The vertical ramp supports 20 are of inverted U-shaped structure, having extensions which rest upon cross members 19. Each cross member is secured to inclined frame 14. A series of guide rails 21 disposed in rectangular position comprise the introductory channel for containers. These rails generally are six in number, and include container base, cap and twin wall guides. See Figures 1 and 3.

At suitable intervals along the guide rail frame structure a series of rectangular brackets 22 and 23 serve to maintain the guide rails in uniform spaced relation to each other. Peculiar to the invention, however, is the position in which the guide rails are maintained. Twisting of the fixedly spaced guide rails from vertical to horizontal provides a channel which may permit the gravitational movement of containers from normal to lateral position. Such channelling is important to over-all cleansing of containers. Twin series of parallel cleansing fluid jets 24 are placed in juxtaposition to the section of introductory ramp lying between vertical and horizontal brackets 22 and 23. Support for these jets may be obtained from either ramp or exterior introductory piping brackets.

Guide rails originally disposed at vertical side portions of the channel may, following twisting travel provide channel roof and lower rail sections for the lateral rotational movement of containers. At a suitable distance from container axis converter and bracket 23, guide rails 25 are spread laterally of one another to provide an exit opening 26 suitable for the passage of misplaced containers, the axes of which are in alignment with the path formed by the ramp guide.

An auxiliary ramp 27 is provided immediately beneath the aforementioned spaced portion of the trackage and secured thereto. This ramp is of greater declination than that of the introductory ramp. The auxiliary ramp provides for the sliding removal of misplaced containers and gathering of the same into a container receptacle 28 from which the misplaced items may be withdrawn and reinserted into the device.

As shown in Figure 1, the inclined ramp structure terminates course at approximately one-fifth the distance upward the inclined frame 14. Rails 30 continue the course inwardly of frame 14. In order that containers may be further advanced longitudinally of the device, an endless conveyor 31 is provided having spaced plate projections 32 secured about the endless conveyor. The conveyor is of sufficient length to allow travel over four-fifths of the length of the machine and to gather the containers prior to termination of course through the introductory ramp. The conveyor may be motivated through any suitable actuating means having a reduction gear unit contained therein to drive a sprocket as at 33, the said sprocket having keyed attachment with axle 34. A drive linkage 36 is adapted to engage a gear 35 which is likewise in keyed attachment to the axle 34. This driving mechanism is attached at the furthermost extremity of the frame structure and bears in the inclined longitudinal frame 14.

Toward the downward extremity of the inclined frame structure and having bearing therein, an idler 37 is provided for the supported continuation of passage of the conveyor element. Idler unit 37 is secured to an axle 38 which bears in the inclined ramp 14.

As in Figure 1, a timer unit 39, axially mounted

forward of the idler element at 40 and at a point substantially adjacent to the point of convergence of the introductory ramp 24 and the inclined frame structure 14, raises the unsupported section of the conveyor 31. This timing unit is so carefully placed that the conveyor chain may be lifted upwardly from the idler element onto a guide 29 whereon the conveyor may slidably ride throughout its working course. The timing element likewise pulls the spaced plate projections 32 gradually upward so that each projection may engage a portion of a container wall. The unsupported portion of the chain acts as a resilient cushion for containers being gathered from the ramp prior to placement on guides 41. Pusher plate projections 32 are spaced sufficiently to prevent jamming of containers, and further sufficiently to enable rotation of the same throughout the remainder of the course on guides 41.

In the invention it is essential that containers advance rotationally with respect to the working elements of the machine. This phenomenon is especially pertinent when it is realized that a thorough drying, brushing and polishing operation must be effected prior to the ejection of the containers from the device. Thus, spaced projections 32 may be made generally L-shaped, the bases thereof being of width substantially greater than the conveyor. Width of the projections must be at least two-thirds over-all length of containers. Shorter width would cause misplacement. Furthermore, the planular surface of the projections has a V-shaped aperture to enable exposure of cylindrical walls of containers as they roll.

Several of the operational elements of the device include pneumatic manifolds which necessarily demand a source of air flow. A conventional turbo compressor is illustrated in the drawings as at 43, including an electric motor 44. For purposes of regulating the flow of compressed air, a valve 45 is affixed to an exhaust manifold of the compressor. From the exhaust manifold there extends longitudinally of the frame a compressed air conductor 46 from which the various ducts of the device emanate.

Immediately rearward of the timing element of the conveyor and attached to the inclined portion of the frame structure a U-shaped manifold 48 is shown having outlets 49 extending upwardly and downwardly of support rail 29 and between guides 30 at the extremities of arms 50. Figures 1, 3, and 5 illustrate the structure. Each of the outlets is directed toward a portion of a guide rail 41 which provides for bearing of sealing elements of duct 47, through outlets 49, toward the irregular surfaces found at the junction of the cylindrical wall and cap element of containers. Where sufficient width to vents 49 is provided, the removal of accumulations of cleansing fluid from junction of sealing cap and container wall may be physically effected with minimal pressures considering the rotation of the containers during their advance in the machine. Furthermore, the simultaneous blast effect of upper and lower vents on the rotating neck surfaces of containers assures effective fluid removal. This manifold 48 is secured to the frame structure by support bracket 51 as by welding engagement to the frame 14 and the feeder. Duct 47 emanates from conductor 46.

A major portion of fluid having been removed from the neck of a container through a first pneumatic blast, the cooperative disposition of

the second manifold jets is important. Longitudinal manifold 53 being of general tubular configuration is affixed to the aforementioned manifold 48 and is directly in line with the course of travel of the conveyor between guides 41. Tubular jets 54 are welded to the tubular manifold structure at acute angle to the axes of containers, the said manifold having two sections of jets whereon the first section contains jets which are shorter than the second section. The forwardmost jets are therefore shortest in length. The object in varying lengths of the jets is to provide compressed air contact with successive portions of cylindrical surfaces of containers and to gradually dispose of fluids which adhere to those surfaces. Closing of apertures 55 of jets 54 to narrow the same assures breadth of blast which will enable uniform coverage to a maximum of cylindrical surface of containers. Furthermore, this series of jets is peculiarly designed to cooperate with the aforementioned blasting of the irregular surfaces of the caps of the containers, to augment original blast forcing of fluid from the junction of the container, container cap and container throat. Construction of the jet and manifold is best shown in Figure 6. Partial closing and widening of jets 54 is shown as at 54'.

A duct 58 emanates from the conduit 46 to supply manifold 59, which manifold faces oppositely to the aforementioned tubular manifold 53 and is in line therewith. See Figure 3. This latter manifold carries a plurality of tubular jets 60, each of which is of shortened length compared to jets of manifold 53 and subtends an angle substantially more acute than the aforementioned. This third manifold structure is employed to create turbulences at bases of containers to atomize and dispel residual fluid from bases of jars subsequent to the first indicated film removing means. As in the positioning of each of the other manifolds, the disposition of manifold 59 is critical, being directly proportionate to efficiency of operation. The angular relation of jets of manifold 59 is likewise critical.

Although the previously described manifolds are designed to contact the fluid at critical points along the surfaces of containers and to move the same along the surfaces to point of extremity, the particular arrangement is not adapted to effect the complete removal, for accumulations will develop at the curvilinear extremity of the base as well as at the extremities of the circular cap and other surfaces. Due to tendency of fluids to adhere to smooth surfaces of glass, plastic, and metal containers, the total removal becomes difficult in the absence of extreme and costly air pressures. To augment the removal of these excessive accumulations including remaining films, the invention includes a brush assembly comprising a series of rotatable brushes, the axis of each of which is in line with axis of advance of the containers. See Figures 1, 3 and 7. The brush assembly is indicated as at 61 in the drawings, each of the separate brushes of the assembly being shown as at 62 and 63. The horizontal brushes 62 are adapted to effect removal of the excessive fluids from the caps and bases of containers, each of these brushes being arranged to rotate downwardly towards the path of movement of the containers.

The brush 63 may be rotated from top to bottom of the jar as it rotates in the path of movement of the conveyor. The axles 64 of the brushes are shown to bear in bearings 65 dis-

placed in triangular relation over the path of advance of the conveyor. Each of the bearings 65 is secured to an inverted bracket 66, which bracket provides a triangular or preferably U-shaped opening for the passage of the containers therethrough. The brackets 66 are mounted along the base of cross members similar to those shown as at 19, which cross members are secured to the inclined frame members 14. At one extremity of each of the axles 64 a series of sprockets 67 is secured through keyed engagement to axles. Actuation of the brushes may be effected through connection between sprocket and motor 70. The particular arrangement of interconnection between the sprockets and the power source is specifically shown in Figure 7. Here is shown a chain wound about a driving sprocket 69 of the source 70 and over the sprocket 67 of each of the brushes. In order that this particular arrangement may be effected, an idler sprocket 68 is borne under the working surface of the conveyor and brush elements. This idler sprocket 68 provides a path for the chain element 71 under the total arrangement of working parts so that over-all rotation of the elements may be accomplished in the particular manner aforementioned without interference to conveyance of containers. The idler 68 has bearing in cross members 72. The two cross members 72 are secured to the inclined frame structure beneath the guides and working elements and these members form a base for the motor.

As shown in Figure 7, the container rotates along parallel rails 41 as it is slidably engaged by the plates 32 of conveyor 31. A mounted rail 29 gives support to the conveyor where required. Guides 30 secure the containers against lateral movement, an inward slope to the guides 30 permitting unimpeded rotation of the brushes in operation.

The operation of the aforementioned brush assembly is sufficient to effect a complete removal of fluid particles from those surfaces with which it has contact. It is insufficient, however, to complete the removal of fluids from all surfaces since there is normally a dead area as at the curved portion of the base of containers whereon droplets remain due to the actuation of top brushes. The top brush of this first series is preferably offset toward the portion of the guide 41 which bears neck portions of containers. Brushes of the assembly strike surfaces of the container tangentially and eject fluids in a like manner. The dead area lies upon containers between the top cylindrical wall brush and the base brush. Accumulations resulting from tangential ejection effect may be removed through the cooperative positioning of a manifold 75, shown in Figures 2 and 4. Similar to the aforementioned manifolds and jets attached thereto, this manifold 75 has a series of jets 76, each of which cooperates with the other to impart pneumatic blast downwardly to that portion of the containers which is not sufficiently dried by the aforementioned operations, designated as the curvilinear surface. Pneumatic supply to the particular system is channelled through duct 73 emanating from the pneumatic air source 43 through the manifold 46. Support to this entire pneumatic blasting means is derived through the adaptation of the supporting elements 74 which may be secured to the frame structure as by welding or through any other suitable securing means.

It is pertinent to the invention to have all manifold elements and the brushing assemblies placed substantially close in the path so that air drying of the fluids from the containers does not occur otherwise than as provided through the ejection of compressed air from manifolds and jet elements. If the films of fluid on the exterior surfaces of the containers be allowed to dry through normal atmospheric pressure, accumulations of cleansing particles would remain on the containers rendering impossible efficient polishing of the same to any suitable degree. For the aforementioned reason, therefore, the specific arrangement shown has been proved through experimentation and use to be of the utmost efficiency in operation.

Shown in Figures 2 and 4 as in line with the conveyor path and other working elements thereon, a second series of brushes is received. This series of brushes is indicated as at 77, each of the brushes being actuated in a like manner to the aforementioned series of brushes and each being mounted in a similar manner. These elements are shown numbered similarly to the aforementioned first series of brushes. Unlike the aforementioned series, however, the top brushing element 63 is slightly offset toward the base of the jar to particularly assure polishing thereof.

The brushes utilized are of peculiar construction commensurate with maximum efficiency of operation in the machine. They are preferably spiral wound having nylon bristles which are non-absorbent, adapted to wipe the fluid from the surfaces of the containers and to remove the fluid from the bristles of the brush by centrifugal action, ejecting the fluid from the bristles outwardly into the atmosphere, thereby maintaining the brushes in a state of relative dryness. This particular and peculiar action is important, for it is in this manner that the brushes are maintained in a state of utility and that the necessity for exchanging, drying and maintaining the same is minimized.

The device is constructed to thoroughly cleanse, dry and polish from 600 to 1000 containers per minute, the entire operation being conducted without necessity for intervention of human manipulation other than timing of the motivating mechanism. Containers having been subjected to a relatively thorough washing operation, they may be moved forwardly toward the invention through belt movement from a washing tank. One extremity of a belt may be positioned to ride just under the opening of the introductory ramp channel formed by the guides 21. Due to the inclined attachment of this introductory ramp, containers slidably entering the ramp standing on their bases, may be moved downwardly thereof.

Due to the peculiar construction of the segment section of the ramp between the brackets 22 and 23, containers entering the device in upright position are gradually shifted so that were an axis drawn through the center of the cylinder formed by the container, it would be shifted from normal to horizontal position as the container passes through this section. This gradual shifting of the container is necessary in that a thorough cleansing operation may be thereby effected. Jets of cleansing solutions such as a hot soft water fluid may be injected through the parallel fluid injectors 24 upon all surfaces of the containers.

Any containers which are introduced other than upright pass through the aforementioned

section of the introductory ramp and upon passage through this first section of the ramp may be withdrawn upon entrance into the spread portion of the trackage 25 as at entrance 26. Endwise containers will fall through the exit formed by the spread portion of trackage 26 downwardly and will slidably engage a ramp which is designed to move these containers away from the path of movement of the other containers so that the misplaced container may be thereafter replaced in the forward portion of the ramp in an upright position.

Other containers correctly spaced are forcedly moved downwardly of the ramp, each against the other until they arrive at a point just short of junction of introductory ramp and opposed inclined frame 14. As indicated, gathering of the containers for advancement forwardly of the device is effected between the idler 37 and timing idler 39 of the conveyor structure. While the containers are yet on the introductory ramp, they are cushioned through the resilient action of the unsupported section of the conveyor which lies between idlers 37 and 39 to the extent that the pusher plates 32 will engage the cylindrical walls of the several containers in spaced relation, thereby setting them for rotatable advancement. Having been thoroughly gathered adjacent the timing section, the containers are shifted to the path formed by trackage 41 so that they may retain rolling engagement therewith. Pusher plates of the conveyor are maintained in upright position by guides 41 which guides provide a track for the rotatable advance of containers. The maintenance of this rolling action is important, for it is through this rotary action of the containers that complete effect of the working instruments of the device may be carried into operation.

The removal of accumulations of cleansing fluid from the junction of sealing caps of containers and container walls presents a particularly difficult problem. For this reason the pneumatic manifold shown as at 48 has opposed vents directed downwardly and upwardly of the path defined by guide trackage 41. The vents are turned upon the point at which junctions of cap and containers roll past. It has been found that compression of air at approximately two pounds through the manifold and vents will be sufficient to effectively remove accumulations from that section of the containers rotating beneath the vents. If these accumulations were to remain under the surfaces adjacent the overhanging cap portions of containers, they would fall upon removal and upright positioning of the containers, thereby leaving undesirable fluids and cleansing salts and dirt on the surfaces thereof, other drying operations and polishing operations having been conducted.

As the containers are advanced longitudinally of the structure through the actuation of the conveyor element, they are rotated beneath blasts of air from the graduated jets of manifold structure 53. As has been indicated before, these jets are peculiarly designed to remove the fluid from the neck of the containers outwardly toward the base thereof, each of the jets having its outlet extremity tapered to form a narrow orifice for the extrusion of compressed air against a maximum of moving cylindrical surfaces of the containers. The construction of the jets is such that maximum compression will occur at point of extension. Passage under this longitudinal manifold and the jets attached thereto will shift the film of fluid toward the base, which film may be further removed through operation of an oppositely positioned manifold 59. This cooperation between manifolds is essential to operation and wholly dependent upon positioning of the elements.

The jets 60 of manifold 59 are directed to the base portions of containers. These jets extrude compressed air against the bases to slough off the excess fluid accumulations. The positioning of this instrument is critical to the operation, for the effect of removal would be minimized, should this element not be disposed to function following other compressed air operations.

Due to the inherent adherent nature of cleansing fluids, it is difficult to completely remove all the fluids from the containers without developing extreme pressures of air; rather certain accumulations will normally remain following the above operation. It has been found ineffectual and somewhat dangerous to subject the containers to heat which would sufficiently remove all fluid content from containers, and for this reason several series of brushing elements have been incorporated in the device to carry out the function. As the containers are rotated forwardly from the pneumatic fluid removing means, they are immediately subjected to a brushing operation whereon excessive accumulations of fluids not removed in the first phase of operation are simultaneously removed from cap, base and cylindrical wall portions through the tangential application of rotating brushes to the respective surfaces. The brushes being preferably of spiral wound non-absorbent nylon bristles, such as eject the accumulations of fluids upon the bristle surfaces thereby avoiding continued replacement of brushes which are dried. Operation of the brushes, therefore, serves to not only remove excessive water accumulations from surfaces of containers, but also to cleanse the brushes for continued operation throughout long periods of time.

The positioning of the brushes is particularly important, for if substantial distance exists between the brushing and pneumatic elements, it is possible that air drying of the excessive accumulations of cleansing fluids would result, thus leaving a residue of cleansing fluids and particles of dirt on the container surfaces. If placed as described, the brushing units are directed to dry those container portions normally retaining films of fluid following the pneumatic operations mentioned.

The advantage of this particular arrangement is likewise considered in the positioning of the pneumatic manifold 74. Due to the inherent configuration of certain containers, it is impossible for all of the brushing surfaces of the brushes to reach curvilinear surfaces of the rotating containers. For this reason the proximity of manifold 74 to the first brush assembly is important, for the thinnest films of fluid should be removed prior to normal evaporation. Direction of the various jets 76 of manifold 74 to the curvilinear portions of the rotating conveyors and application of compressed air thereto will effect removal of those accumulations which develop from the aforementioned brushing operation wherein the dead space between upper and lower brush accumulates droplets. As the positioning of brushes must of practical necessity proximate the first series of pneumatic manifolds, so the positioning of the fourth manifold must proximate positioning of the first-mentioned brushing series.

Containers are thereafter passed through a second brushing assembly wherein they are polished to a high luster, each of the brushes of this series being arranged in triangular formation about the guide 41 to impart polishing to all three main surfaces of the container. The uppermost brush 63, however, is displaced slightly to one side of the path of movement of the containers so that the curvilinear portion of the containers may be polished.

The arrangement of the parts of the machine is peculiar to the invention, for it is this factor which allows the facile and rapid removal of accumulations from containers, which accumulations have a tendency to adhere to the cylindrical walls of containers made of glass, plastic and the like. It is this clinging tendency of fluids which makes the removal thereof particularly difficult in an apparatus of this type, and for this reason the specific method of injection of compressed air onto the surfaces of containers throughout their rotating course along the instrument is illustrated together with the cooperative action of the rotating brush assemblies.

Although the invention is most specifically set forth in the succeeding claims and notwithstanding its particular adaptability to the cleansing, drying and polishing of cylindrical containers generally of the size utilized in the packaging of baby foods and the like, it is to be noted that the specific arrangement of the parts might be somewhat altered without departing from the spirit of the invention, and further that the method employed in the application of the working elements to the containers might be duplicated with modifications as to size and formation of elements without escaping the breadth set forth. The invention is to be limited only in accordance with the scope described in the appended claims.

We claim:

1. A device for cleansing and drying cylindrical containers including an inclined frame structure mount defining a path, a declining gravitational container ramp mounted on a lower portion of the frame structure and passing into the path defined by the frame structure, cleansing means attached to the ramp, conveyor means movably mounted upon the frame structure passing along the upper portion of the frame structure in underlapping and complementary working relation to said ramp and in the same path to gather containers from the ramp and to rotatably advance containers on their sides along a path formed by the frame structure, cleansing fluid removal means on the frame disposed in line along a path of travel of the conveyor means.

2. In a device for cleansing and drying cylindrical containers, a frame structure defining a path, cleansing means associated with the frame, conveyor means mounted on the frame, spaced container pusher plates projecting upwardly from the conveyor and extending outwardly from the conveyor, a conveyor support rail, and a pair of elevated rails in the same path as the conveyor support rail, providing a path for rotatable advancement of containers on their sides, said elevated rails providing lateral bearing surfaces for said pusher plates, means for actuating the conveyor to impart rotational advance to containers, pneumatic means and brushing means in joint association with one another along the path to effect successive removal of fluids from rotating containers, the said pneumatic and brushing means being attached to the frame in cooperative relation each to each and to advancing elements of the machine.

3. In a device for cleansing and drying cylindrical containers including a frame structure defining a course, container cleanser means secured to the frame structure in the course defined, conveyor means for rotatably advancing containers on their sides along a course defined by the frame, pneumatic means mounted on said frame adjacent said course for removing cleansing fluid from container surfaces comprising a first pneumatic manifold having vents directed to neck portions of rotating containers to remove cleansing fluids therefrom, a second manifold in line with the first manifold, a series of jets on the second manifold having two sections, each of the jets within both said series being in line with the other, a first section of jets being of reduced length with respect to a second section, said series of jets on said second manifold being adapted to extrude accumulations outward from neck portions of containers to bases thereof, a third manifold opposed to the second and at the termini thereof, the said third manifold having in-line jets directed to base portions of rotating containers having accumulated cleansing fluid excesses thereon.

4. In a device for cleansing and drying cylindrical containers wherein containers are rotatably advanced on their sides along an inclined frame structure following cleansing, the combination for removing cleansing fluid accumulations during such rotation first from the neck of containers, secondly to and away from the bases thereof and of immediate ejection of excesses from exposed surfaces, comprising a frame structure defining a course, container cleansing means secured to the frame structure in the course defined, conveyor means mounted upon the frame structure to pass containers along the course, a series of pneumatic jets disposed along the course in line each with each adjacent said rolling containers and adapted to successive driving off of cleansing fluids from exposed surfaces of containers, a series of rotatable brushes along the course in line with the pneumatic jets and cooperable therewith, the said series of brushes being adapted to consecutive removal of excessive fluid accumulations from container surfaces, compressor means to supply pneumatic compression pressure to the said series of pneumatic jets and means for simultaneously rotating brushing elements.

5. In a device for drying cylindrical containers wet with cleansing fluid wherein containers may be successively rotatably advanced on their sides through treating stations, a frame structure defining a course, conveyor means mounted upon the frame structure to pass containers along the course, a first station of pneumatic manifolds mounted upon the frame structure and along the course to remove cleansing fluid accumulations from exteriors of said rolling containers, a second station secured to the frame structure succeeding the first and in line therewith comprising a plurality of rotatable brushes disposed in complementary relationship each to the other to remove excessive residual cleansing fluids from surfaces of containers, a third station mounted upon the frame structure succeeding the second and in line with each of the other stations, the said third station including a series of pneumatic jets in cooperative relation to the said second brushing station, each of the jets being directed to effect removal of droplets accumulated at sur-

faces of containers exposed during passage of containers through the said second station; a fourth station substantially the same as the second for polishing containers; a source of compressed air to supply the manifolds, and means for actuating the brushes forming the second and fourth stations.

6. In a device for drying cylindrical containers wet with cleansing fluid wherein containers are progressively rotatably advanced on their sides from station to station, a frame structure defining a course, a container advancing conveyor movably mounted upon the frame structure and along the course having projections for slidably engaging cylindrical portions of containers and rotating them past their stations, rails extending along the paths defined by frame structure to bear the rolling containers along the path, a plurality of pneumatic manifold means forming complementary stations for the progressive removal of cleansing fluids and rotatable brushing means in line with the pneumatic means forming other stations adapted to discharge excessive cleansing fluid accumulations from surfaces of containers to which accumulations adhere, and to polish containers.

7. In a container washing and drying device having one washing station and a plurality of drying stations assembled on a unitary structure and whereon containers may be rotatably advanced on their sides from one station to another, a frame structure defining a course, a cleansing station secured to the frame structure along the course, a primary drying station along the course wherein pneumatic manifolds contain individual outlets having working disposition complementary to other like outlets in the station and to working elements of a second drying station; a secondary drying station in line with the first said station, having a series of rotatable brushes, the disposition of each of the brushes being suitable for complementary operation on the surfaces of said containers, the disposition of the series of brushes being adapted to augment working disposition of elements of the primary drying station through action on film accumulations; a tertiary drying station wherein at least one pneumatic manifold has a working disposition complementary to the said secondary drying station in line with the second said drying station; and a final station wherein advancing containers may be polished subsequent to drying.

8. In a machine for washing and cleaning cylindrical containers, means for washing the containers and for removing misplaced containers from an introductory ramp, conveyor means for moving the containers longitudinally of the device and for rotating the same on their sides simultaneously with the longitudinal movement, a first pneumatic manifold having upper and lower vents directed to sealed surfaces of containers to remove cleansing fluid accumulations therefrom, a longitudinal pneumatic manifold complementary to the first manifold having series of jets extending the length thereof and of varying lengths, each of said jets being directed to an extended portion of cylindrical wall of moving containers to effect the gradual skimming of films of fluid therefrom, an opposed manifold structure adapted to remove accumulations of fluid from the bases of containers, each of said pneumatic manifolds being disposed in complementary relation to each other and to other working elements of the device, a first brush assembly comprising a series of rotatable brushes each having its axis in alignment with and adjacent to a path formed by the conveyor means, each said brush being adapted to remove excessive accumulations of fluids from exposed surfaces of the containers and from the brushing elements through tangential centrifugal action, a fourth manifold structure aligned with the aforementioned operating means wherein jets are directed to portions of advancing containers whereon accumulations of fluid excesses have occurred due to functioning of the first series of brushes, a second series of brushes comprising an assembly substantially the same as the first qualified only by the offsetting of one of the brush members to reach curvilinear portions of containers not otherwise touched, the said latter brushing series being adapted to polish containers, means for actuating the conveyor element, means for compressing air through the various manifolds, and means for actuating the brushes.

9. A container washing and drying device comprising an inclined frame structure, a ramp of opposed inclination to the frame structure, means on the ramp for shifting containers inserted therein from normal to lateral position, means associated with the aforementioned turning means to cleanse all surfaces of containers, one section of the ramp structure being spread to provide an exit for misplaced containers, an auxiliary ramp structure disposed beneath the exit of the ramp, the said auxiliary ramp structure being of greater declivity than the introductory ramp, receptacle means associated with the auxiliary ramp, conveyor means forming a path longitudinally of the device and overlapping point of junction of introductory ramp structure and inclined frame structure, spaced pusher plates attached to the conveyor for rotatably advancing containers on their sides along said frame structure forwardly from point of junction of introductory ramp structure and inclined frame, guide means forming a path and support for the conveyor means, timing means associated with the conveyor means and attached to the inclined frame structure disposed at point of junction between inclined frame and introductory ramp structure, the said timing means providing for spaced gathering of containers received from the introductory ramp, a first pneumatic manifold displaced forwardly of the timing means and attached to the inclined frame structure, the said manifold having opposed vents each of which is adjacent to and directed toward a path formed by the guide means, the said vents being adapted to remove cleansing fluids from beneath overlapping sealed surfaces of said rolling containers, a tubular manifold in direct alignment with the aforementioned first pneumatic manifold, said tubular manifold having series of jets normal thereto directed toward the path defined by frame guide and conveyor means and adapted to remove fluids from cylindrical surfaces of containers, a third manifold opposed to the first and second having jets disposed at acute angle to the path of movement of the containers, the said opposed manifold serving to remove fluid excesses from bases of containers; a first brushing assembly comprising a series of three brushes, axes of which are in direct alignment with path formed by a guide, each of the said brushes being designed to remove excessive fluids from the surfaces of containers complementary to application of pneumatic pressures and to remove fluids from the brushing elements themselves, a fourth

manifold structure in alignment with the aforementioned fluid removing means containing a series of jets directed to portions of the containers in the path which accumulate fluid particles after passage through the first brushing assembly, a second brushing assembly substantially the same as the first qualified by offsetting of one of the brushing members to enable polishing all curvilinear surfaces of containers, means for actuating the conveyor, means for applying compressed air to the various manifolds, and means for imparting rotation to the brush assemblies.

10. A device according to claim 1 in which the cleansing fluid removal means comprise a pneumatic manifold containing series of complementary pneumatic jet units placed in the path of the rotating containers, a first jet unit having one extension overhanging and another extension underlying the path of the containers to blow cleansing fluid accumulations from the junction of cap and container neck, a second jet series having a plurality of jets directed angularly downward toward the rolling containers to complement action of the first said series of jets and a third series of jets complementary to the second series of greater extension than the said second series to sweep the accumulated cleansing fluids from the walls of the containers.

11. A device according to claim 4 in which the series of pneumatic jets comprises a first jet unit having extension overhanging and underlying the path of rolling containers, a second jet unit complementary to the first for successive displacement of cleansing fluids from walls of the containers and a third jet series complementary to the second to sweep accumulated fluids from the bases of containers.

12. A device according to claim 4 in which the series of brushes comprise horizontally rotating brushes, one said brush being rotatable in one direction against bases of rolling containers, another said brush being rotatable counter directional to the first brush against cap portions of rolling containers and a third said brush being rotatable in the same direction as the first to complement action of the second said brush all said brushes being operable through a common linkage element uniting the brushes to a common actuating means.

13. A device of the type defined in claim 7 in which the preliminary drying station consists of at least four complementary jet units, a first jet unit having overhanging and underlying jet extensions for blowing cleaning fluids from the junction of cap and throat of rolling containers, a second jet unit complementary to the first and directed angularly from the junction of container cap and throat to container walls, a third series of jets complementary to the second to sweep accumulated cleansing fluids from container walls and a fourth jet unit complementary to the third jet unit and having series of jets directed against bases of rolling containers for creating turbulences at container bases to atomize and dispel residual deposits of cleansing fluids from the container.

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