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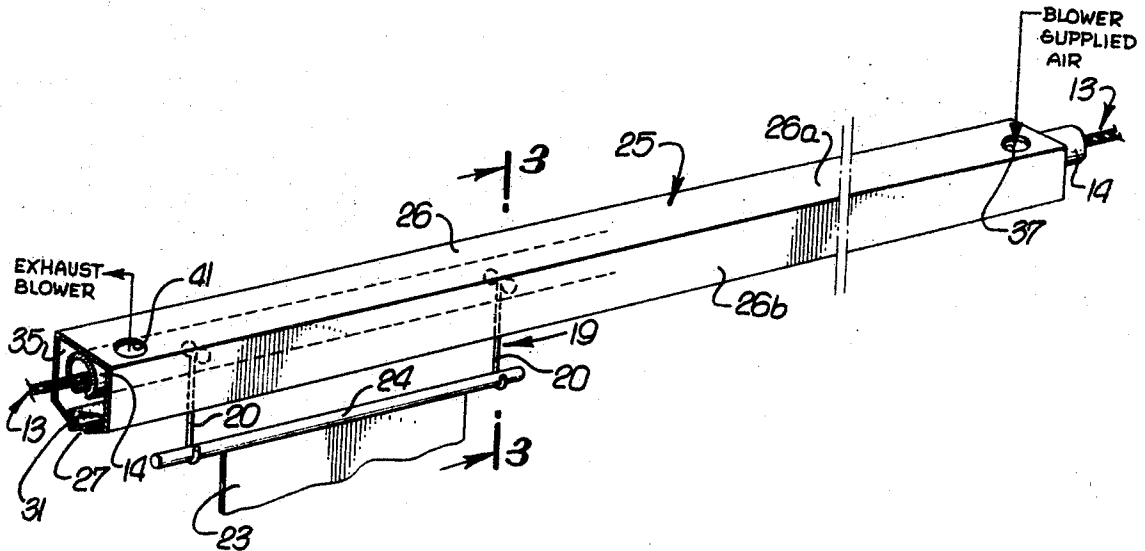
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| [72] | Inventor | Marshall A. Stiltner
Laguna Beach, Calif. |
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| [73] | Assignee | Purex Corporation, Ltd.
Lakewood, Calif. |

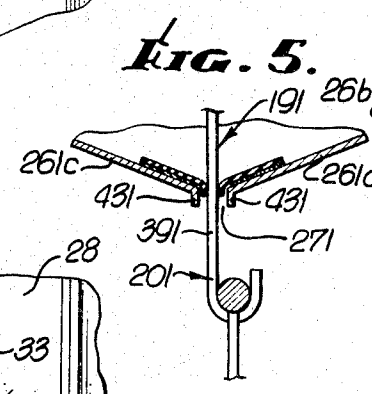
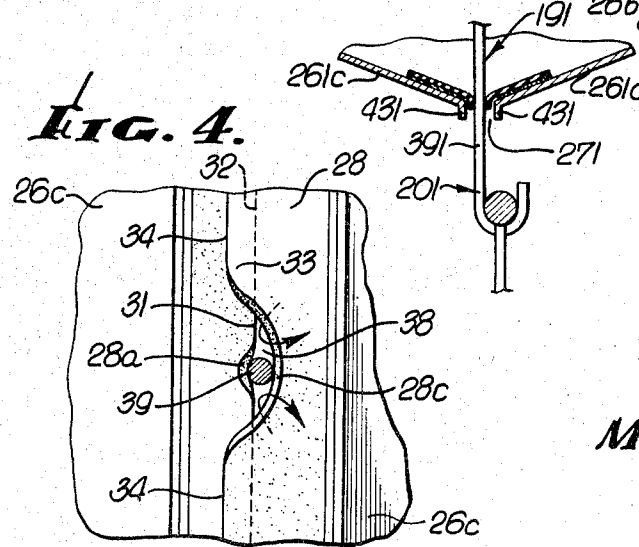
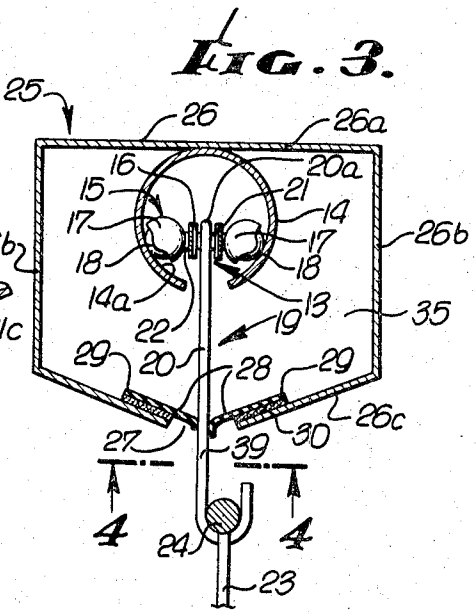
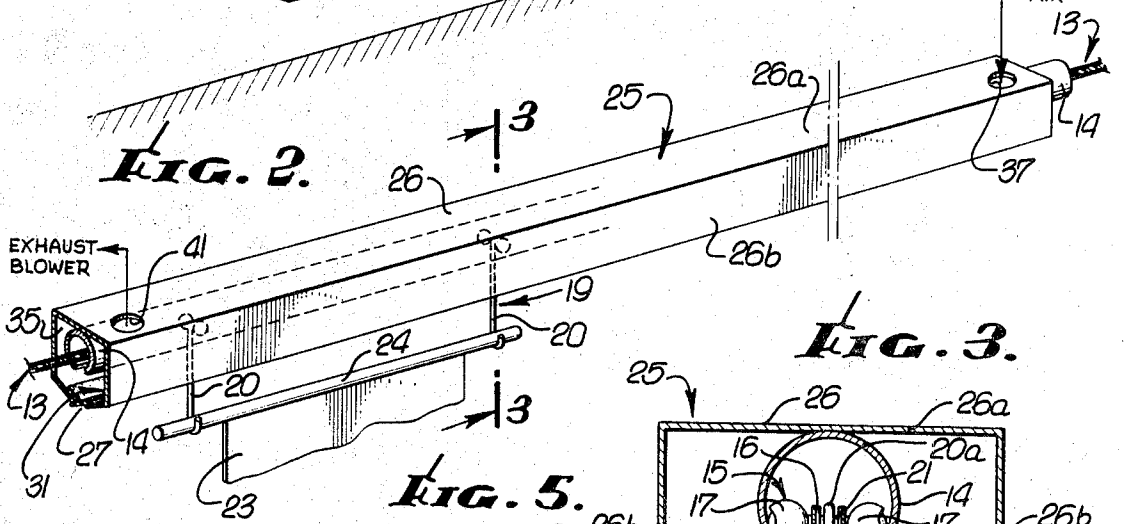
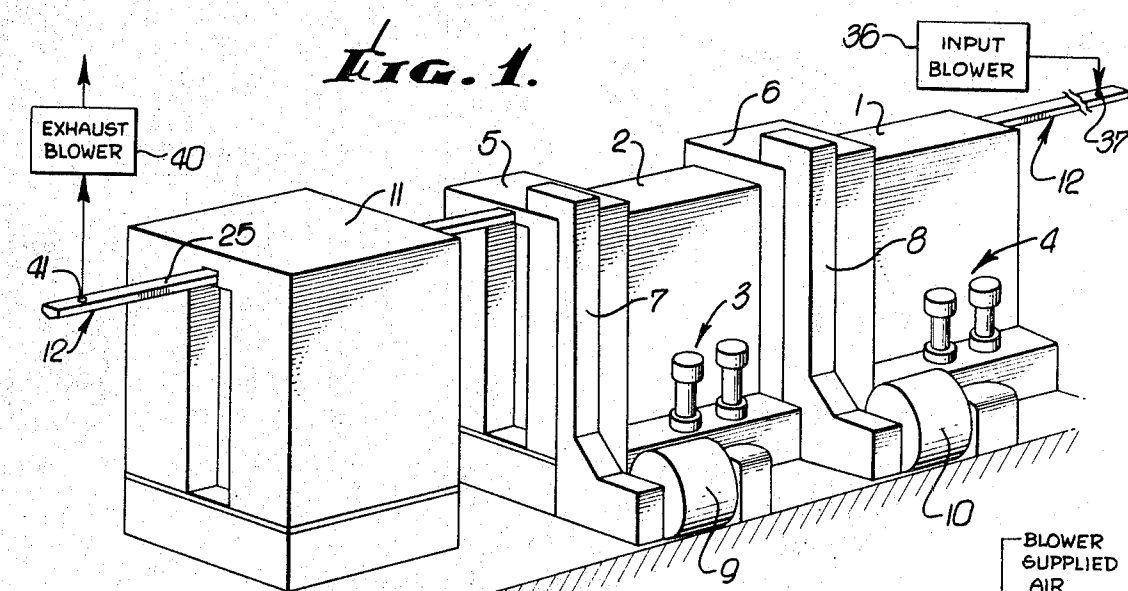
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Primary Examiner—John P. McIntosh
Attorney—White and Haeffliger

- [54] SPRAY CHAMBER APPARATUS HAVING
PROTECTED CONVEYOR MEANS
10 Claims, 5 Drawing Figs.**

- [52] **U.S. Cl.**..... 118/324,
118/326, 198/177
[51] **Int. Cl.**..... B05c 11/16
[50] **Field of Search**..... 118/630,
631, 632, 633, 634, 635, 324, 326;
134/(Inquired); 198/177

ABSTRACT: The problem of corrosive sprayed liquid or vapor-contacting conveyors carrying parts through a spray chamber is overcome by enclosing the conveyor in a duct having resilient sealing lips which are locally deflectable to pass parts supports carried by the conveyor. Entry of spray liquid and vapor into the duct past locally deflected sealing lips is positively prevented by provision of pressurized air within the duct to flow outwardly and progressively at the traveling locus of sealing lip deflection.





INVENTOR.
MARSHALL A. STILTNER
By *White & Hoeligen*
ATTORNEYS.

SPRAY CHAMBER APPARATUS HAVING PROTECTED CONVEYOR MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention has to do with spray chamber apparatus in which parts to be sprayed are conveyed through the spray chamber. More particularly, the invention is concerned with improved spray chamber apparatus in which the potentially corrosive contact of sprayed liquid or its vapors with costly conveyor components used to carry parts through the spray chamber is controlled or prevented.

It is a common practice to treat metal parts with liquid chemicals ranging from cleaners and degreasers to protective coatings such as paints and other specialized coatings. Such treatment can often most economically be done by spraying the treating liquid onto the part. Where many parts must be treated with the same liquid or the same series of liquids in a multistep process, the parts are carried through a succession of treating stations which may take the form of tunnellike spray chambers. The parts to be spray treated are carried through and between the spray chambers by a conveyor. The problem of protecting the conveyor from contact with the sprayed liquid or its vapors is acute, particularly where a sequence of treatments is undergone by each part since the conveyor is repeatedly subjected to this processing. Conveyors typically comprise a chain or cable which is driven remotely and numerous supports or hangers to which the parts to be treated are secured for passage through the spray chambers. The parts supports are relatively simple in form and inexpensive to fabricate, even of chemically resistant material, e.g. stainless steel. The chain or other driven member conveyor component is quite costly to fabricate and may be prohibitively expensive if fabricated of chemically resistant metal.

2. Prior Art

Although providing only incomplete protection, enclosures have been provided for conveyors passing through spray chambers. Protection has been incomplete because there must be provided in the enclosure wall, a slot for passage of the parts support. It has been found that excessive amounts of sprayed liquid and, particularly, liquid vapor enter the enclosure through this slot with consequent undue corrosion of the conveyor components. Moreover, the incursive liquid and vapor condensate collect on the enclosure wall and eventually run out of the slot and onto treated parts in an erratic manner leaving streaks or worse maleffects.

SUMMARY OF THE INVENTION

It is a major objective of the invention to effectively isolate the conveyor from the sprayed liquid and vapor.

Basically, this objective is realized in this invention by minimizing exposure of the conveyor to sprayed liquid and positively preventing the approach of the liquid or vapor, at the points of exposure, to the conveyor. Accordingly, the invention contemplates spray chamber apparatus that includes a tunnellike housing defining a path for parts to be sprayed, and conveyor means carrying parts along the path. The conveyor means includes a driven member and a part support depending therefrom. A duct is provided enclosing the conveyor member against contact with sprayed liquid and sprayed liquid vapors. Resilient sealing means extend across the duct bottom with localized deflectability along its length responsive to progressive passage of the part support through the sealing means. In addition, there is provided means protecting against inflow into the duct of sprayed liquid past deflected portions of the sealing means which includes blower means pressurizing air within the duct for flow outwardly therefrom in response to local deflection of the sealing means and progressively with travel of the part support. The duct bottom may be provided with a lengthwise slot for passage of the part support. The slot-sealing means is typically comprised of opposed and normally interengaged resilient strips which are separable by the deflecting passage of the part support to direct pressurized

air from the duct downwardly around the part support and against incoming liquid or vapor.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective and partly schematic view of spray chamber apparatus arranged for successive treating of parts carried by a conveyor;

FIG. 2 is a detail view of the duct enclosure for the conveyor according to the invention;

FIG. 3 is a view along line 3-3 in FIG. 2, shown enlarged; and

FIG. 4 is a view along line 4-4 of FIG. 3 showing deflection of the sealing means by the part support.

FIG. 5 is a view like FIG. 3 of an alternative embodiment in which guides are provided to limit sideways motion of the part support.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, a progressive spray chamber arrangement is shown including spray chambers 1 and 2. Within each of the spray chambers 1 and 2, banks of spray nozzles (not shown) are provided to traverse parts moving therethrough with treating liquids. Pumps indicated at 3 and 4 pump liquid to the spray nozzles of chambers 1 and 2. Atmosphere-isolating chambers 5 and 6 are provided at the exit side of spray chambers 1 and 2, to limit dispersal of spray-laden atmosphere from these chambers. Air is drawn from each of chambers 5 and 6 along passageways 7 and 8 by individual motor-driven blowers indicated at 9 and 10 respectively. Chamber 11 is spaced from chambers 1 and 2 and is representative of a specialized chamber, such as a drying chamber. Together, the chambers 1, 2, 5, 6 and 11 define a path for spray treatment of parts.

Conveyor 12 extends through and beyond the chambers 1, 2, 5, 6 and 11 for carrying parts to be sprayed along the path. With reference primarily to FIGS. 2 and 3, the conveyor includes a driven member 13 driven by means not shown, a tube 14 providing an axially extended bearing surface 14a and support bearings 15. Driven member 13 may be a cable, or as illustrated may be a horizontally extending chain 16 having at spaced locations outboard support bearings 15 comprising laterally projecting rods 22 carried by the chain and terminating outwardly in bearing cups 17 in which balls 18 are journaled for universal rotation. Tube 14 extends arcuately about the chain 16 providing the bearing surface 14a on which balls 18 ride, supporting the chain in its passage through the tube, with minimum friction. Part supports 19 depend from the chain 16 at horizontally spaced locations conveniently coinciding with a support bearing 15 as illustrated. The parts supports 19 typically comprise hooks 20 fastened at their upper end to the chain 16 as by inserting e.g. a crossmember 21 of the chain 16 through an eye arrangement indicated at 20a on the hook. Parts, such as metal sheet 23, are supported for travel, as best shown in FIG. 2, by hanging the part by a horizontal support bar 24 connected thereto from a spaced pair of hooks 20.

The conveyor 12 including tube 14, and particularly chain 16 and support bearings 15 is desirably protected against corrosion-producing contact with liquids employed in the chambers 1 and 2. The present invention provides means for thus protecting these conveyor components including a duct enclosing the conveyor component against contact with sprayed liquids and their vapors. With reference to FIGS. 1, 2 and 3, the duct 25 is shown extending through and between chambers 1, 2, 5, 6 and 11 in generally radially surrounding relation to the conveyor 12. The duct 25 is formed of sheet metal shaped into a polygonal wall 26. Bearing support tube 14 is welded or otherwise fastened to the top 26a of the duct wall 26. Sidewalls 26b of the duct are vertically disposed and bottom walls 26c slope downwardly and inwardly from the sidewalls to form a longitudinal slot 27 which underlies the conveyor chain 16. The slot 27 is sized to pass part support hooks 20 carried by the chain 16 which hooks are of a length to extend through and below the slot, as shown.

Apart from the opening forming the slot 27 the conveyor 12 is shrouded from contact with sprayed liquid. Accordingly, the slot 27 is of minimum width consonant with passage of the hook 20. Resilient sealing means are provided extending across the slot 27 in the duct bottom, such as a longitudinally extended strip of resilient material supported at one long side by the duct bottom wall 26c and extending free of support at its opposite side.

With reference to FIG. 3, resilient sealing means are provided in the form of opposed resilient strips 28 of neoprene or other elastomeric material capable of localized deflection and preferably having good chemical resistance. The strips 28 are supported by duct bottom walls 26c at their inward edge margin 29 to extend into the slot 27 a distance so as to be normally interengaged. The strips 28 may be adhesively bonded to the duct bottom wall 26c as with adhesive 30 or secured with screw fasteners or by other means. The strips 28 project across the slot 27 at an angle generally corresponding to the slope of the duct bottom wall 26c. One of the strips 28 projects into slot 27 less than the other to have edge 31 in abutting line contact at 32 with the free edge margin 33 (FIG. 4) of the other sealing strip. Thus arranged, the strips 28 form a slot sealing means comprising opposed flexible lips which are normally contacting to seal the slot against inward movement of sprayed liquid.

As described, parts to be sprayed, such as metal sheet 23, are carried through the chambers 1, 2 etc. depending from a support bar 24 carried on hooks 20 attached to chain 16, the driven member of the conveyor 12.

It is with the sealing accommodation of the translational movement of hooks 20 through the slot 27 that the invention is principally concerned. The sealing strips 28 part progressively to permit passage of the hooks 20. The strips 28 are resilient and flexible to deflect only locally in response to passage of the part supporting hooks 20. As best shown in FIGS. 3 and 4, the hook 20 deflects localized portions 28a and 28c of the opposed sealing strips 28 while adjoining areas of the strips indicated at 34 before and behind the hook remain in sealing contact with one another along line 32. The deflection of the strips 28 is progressive along the strip length corresponding to translational movement of hook 20 through the slot 27.

Because sealing relation between strips 28 is interrupted, although only locally, the present apparatus provides means for positive exclusion of sprayed liquid and vapor from the duct interior 35. Basically, this means includes a blower pressurizing air within the duct for flow outwardly therefrom in response to local deflection of the sealing strips. With reference to FIGS. 1 and 2, blower 36 is provided, communicating, as schematically illustrated, with the duct 25. Inlet aperture 37 in the duct 25 receives air under a small head to create an overpressure condition within the duct of, for example, 1.1 to 1.5 atmospheres.

The effect of the pressurized condition in the duct interior 35 is to spill air outwardly through the traveling gap 38 formed by deflection of the sealing strips 28 occasioned by passage of the hook 20. This airflow is indicated by the arrows in FIG. 4. The air movement is downward and outward. The airstream issuing from gap 38 moves translationally with hook 20 as the gap is progressively formed forwardly of the hook shank 39 and progressively closed behind the shank. This "zipper opening" effect is achieved as the result of the ready local flexibility of the resilient strips 28, which flexibility enables the strips to have at least partial and transitory conformation to the hook shank configuration as the shank 39 deflectingly passes the strips. The gap 38 travels with each of the hooks 20. The resulting outward airstream envelops the hook shank 39 to continually drive liquid accumulation therefrom. Accordingly, droplets are not formed on the hook 20 to sporadically fall onto parts being processed. The passage of the air pushes liquid spray and spray fumes from the gap 38 and thus prevent entry of liquid and fumes into the duct interior 35. Accordingly, the conveyor 12, and particularly chain 16 and bearings 15 thereof, is protected. The hooks 20 being formed

of chemically resistant material are impervious to attack by the sprayed liquid.

There may be provided in the apparatus a second blower 40 communicating with the outlet 41 from the duct interior 35 to operate as a suction exhaust means for the purpose of drawing air from the duct interior so that the air there within is continually freshened, preventing accumulation of possibly hazardous quantities of vapor within the duct interior 35. The relative volumes of the input blower 36 and suction blower 40 are controlled to provide air movement through the duct and the desired overpressure condition.

The downwardly and inwardly sloping duct bottom walls 26c and correspondingly sloped sealing strips 28 guide any sprayed liquid which may enter the duct interior 35 or which may be formed by condensation of vapors therein, out of the duct interior at the gap 38. The rapid air movement from the gap 38 disperses any such liquid upon its emerging from the duct interior 35 to prevent impingement of droplets on work parts.

In FIG. 5, an alternative embodiment is shown in which the edge portions 431 of bottom wall portions 261c are turned vertically downward at the slot 271 parallel to the plane of advancement of the hook 201 to form guide means for directing the parts support 191. The downwardly disposed portions 431 are spaced widely enough to permit passage of the hook shank 391 along the spray path but narrowly enough to restrain substantial sideways movement, normal to the spray path, such as might occur in the event of a differential force impingement on a part being sprayed, e.g. where one side only of a part is sprayed. In this circumstance the bottom wall portions 431 serve to guide the hook 201 directly along the slot 271. The extension of the duct bottom wall portions 431 relative to the hook shank 391 may be between about 3 percent and 15 percent of the hook shank length with good results, or more or less.

In summary then, the present invention provides spray chamber apparatus in which conveyor parts which are costly to fabricate are protected against contact with sprayed liquids or fumes of sprayed liquids by enclosing the driven member of the conveyor in a duct and providing sealing means across the opening in the bottom of the duct. A blower means is provided to create an overpressure condition within the duct interior so that as the sealing means is deflected by the passage of the part support carried by the conveyor driven member, air escapes through the sealing means into the gap created by the passing part support. In this manner, exposure of the conveyor to the spray chamber does not result in the contact of sprayed liquid with the driven member of the conveyor.

I claim:

1. Spray chamber apparatus that includes a tunnel-like housing defining a path for parts to be sprayed, conveyor means carrying parts to be sprayed along said path, said conveyor means including a driven member and a part support depending from said member, a duct enclosing said conveyor member against contact with sprayed liquids and their vapors, resilient sealing means extending across the bottom of said duct and having localized deflectability along its length responsive to progressive passage of the part support through said sealing means, and means protecting against inflow into said duct of sprayed liquid past deflected portions of the sealing means including blower means pressurizing air within the duct for flow outwardly therefrom in response to local deflection of said sealing means and progressively with travel of the part support.

2. Apparatus according to claim 1 in which said sealing means includes a longitudinally extended strip of resilient material supported at one long side by said duct and free of support at the opposite side.

3. Apparatus according to claim 2, in which said sealing means includes normally interengaged resilient strips between which the part support depends.

4. Apparatus according to claim 3 in which said duct has downwardly and inwardly sloping wall portions carrying said strips.

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5. Apparatus according to claim 1 in which said conveyor means also includes support bearings for said member and an axially elongated tubular bearing surface partially surrounding said member and within said duct.

6. The combination according to claim 1 in which said housing is open at opposite ends for passage of parts, and said conveyor duct extends through the upper reaches of said housing and outwardly beyond the ends thereof.

7. Apparatus according to claim 6 including also means continually sweeping air through the duct interior within the housing comprising air inlet means into said duct communicating with said blower means and air outlet means from said duct spaced from said air inlet means along said duct.

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8. Apparatus according to claim 7 in which said duct bottom has a lengthwise slot for passage of the part support, said sealing means comprising opposed flexible lips normally contacting to seal the slot and separable by deflecting passage of said part support to direct pressurized air from the duct downwardly around said part support progressively with passage of said part support through the slot.

9. Apparatus according to claim 8 including also suction exhaust means communicating with said duct air outlet means.

10. Apparatus according to claim 1 including guide means extending from the duct to direct said parts support along said path.

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