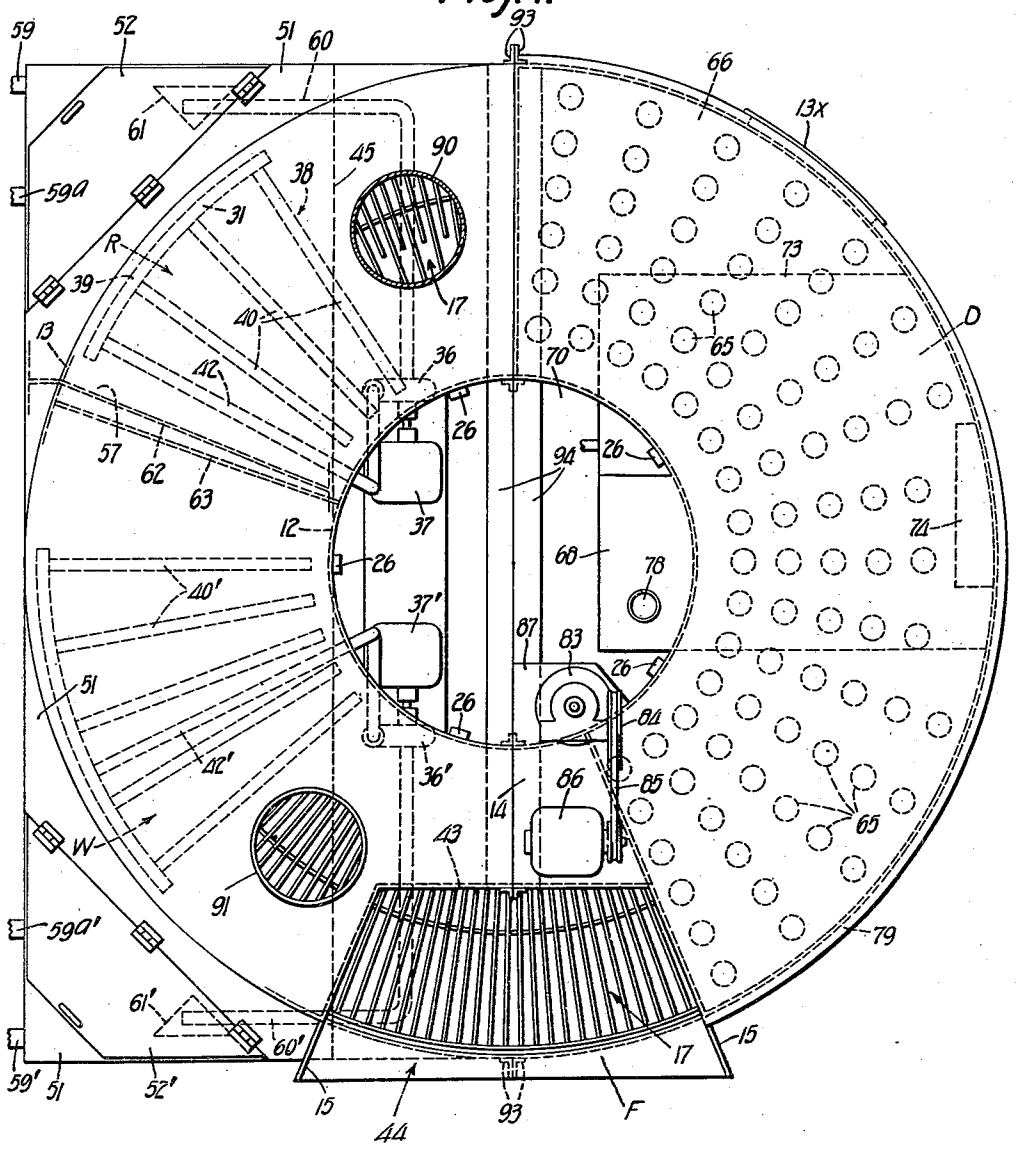
June 8, 1948. E. R. ZADEMACH 2,443,091

CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

Filed Oct. 15, 1940 9 Sheets-Sheet 1

Fig. 1.



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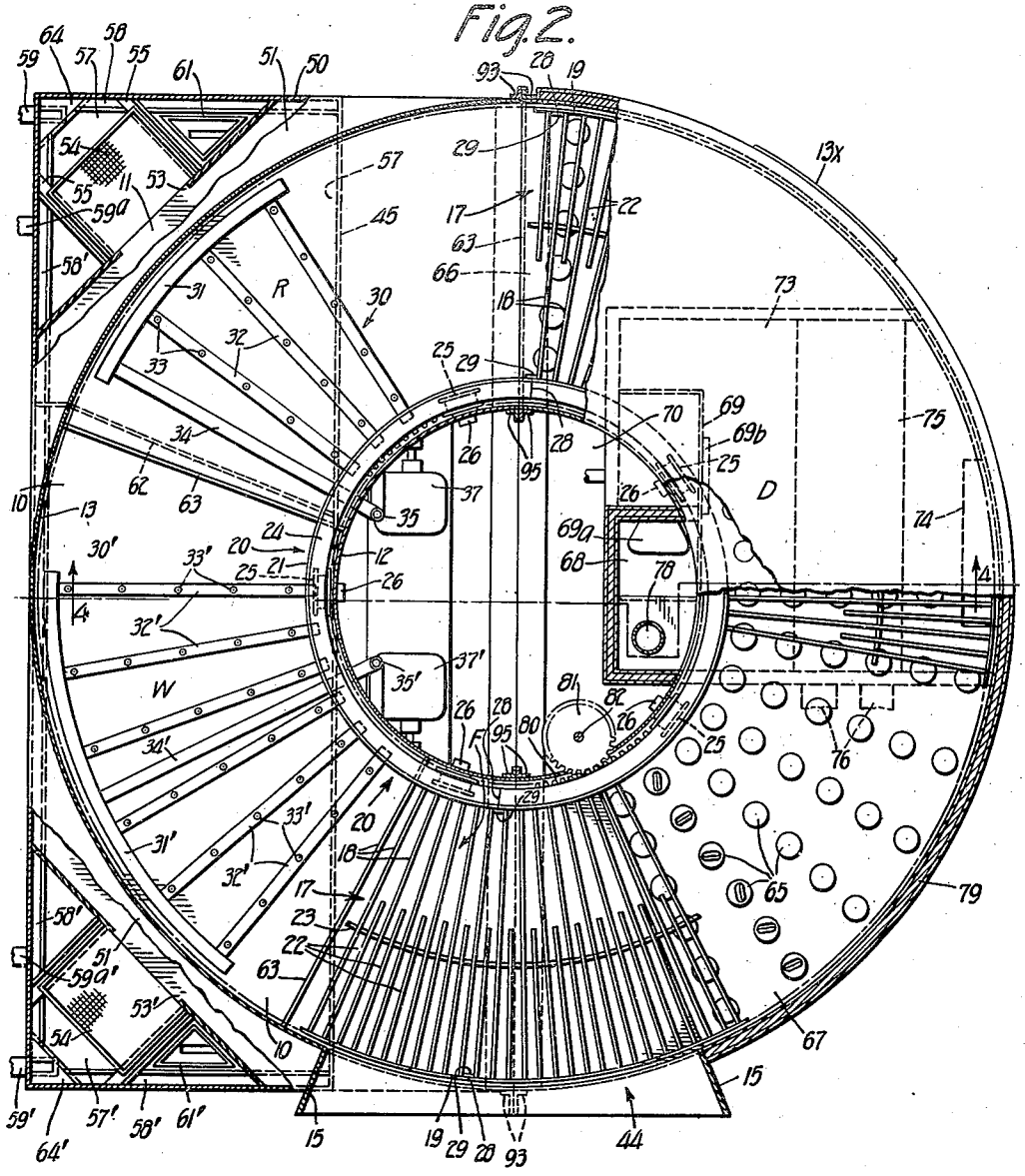
BY Moses & Nolte
ATTORNEYS

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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

Filed Oct. 15, 1940 9 Sheets-Sheet 2

Fig. 2.



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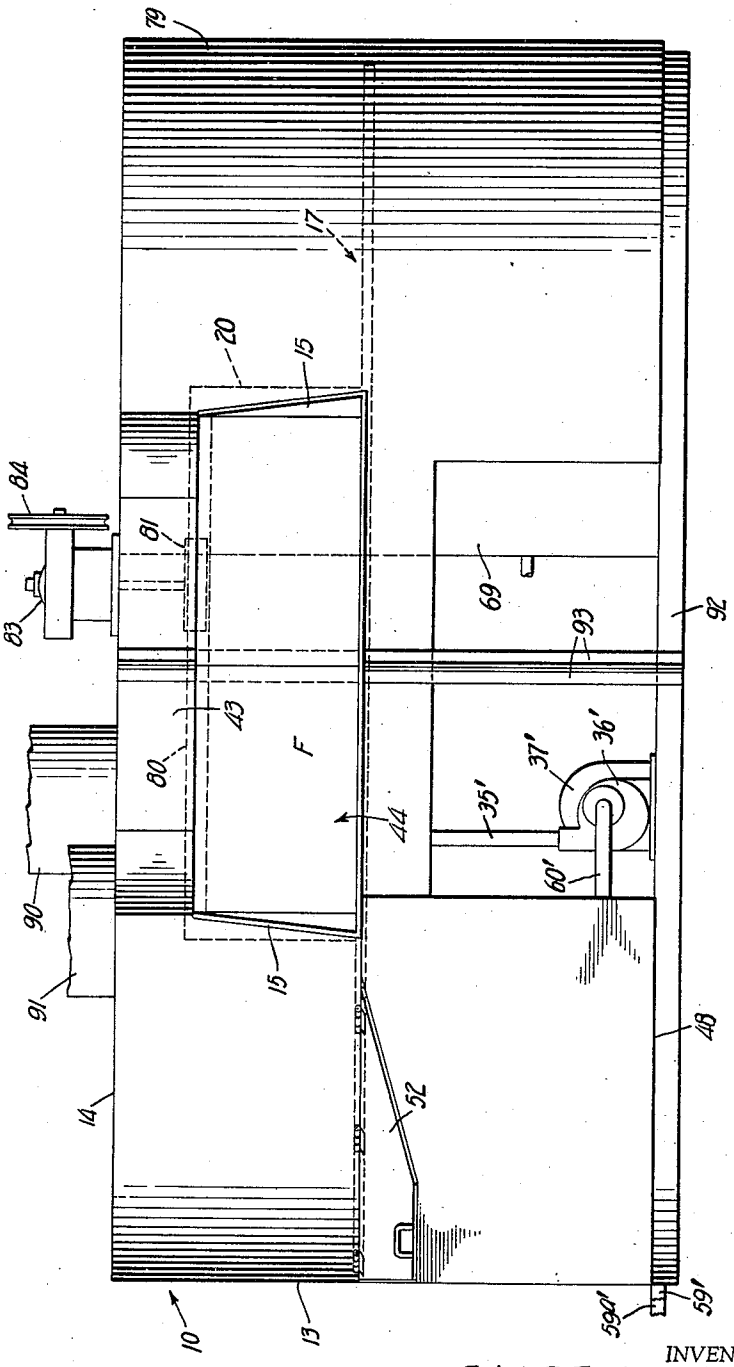
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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

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Fig. 3.



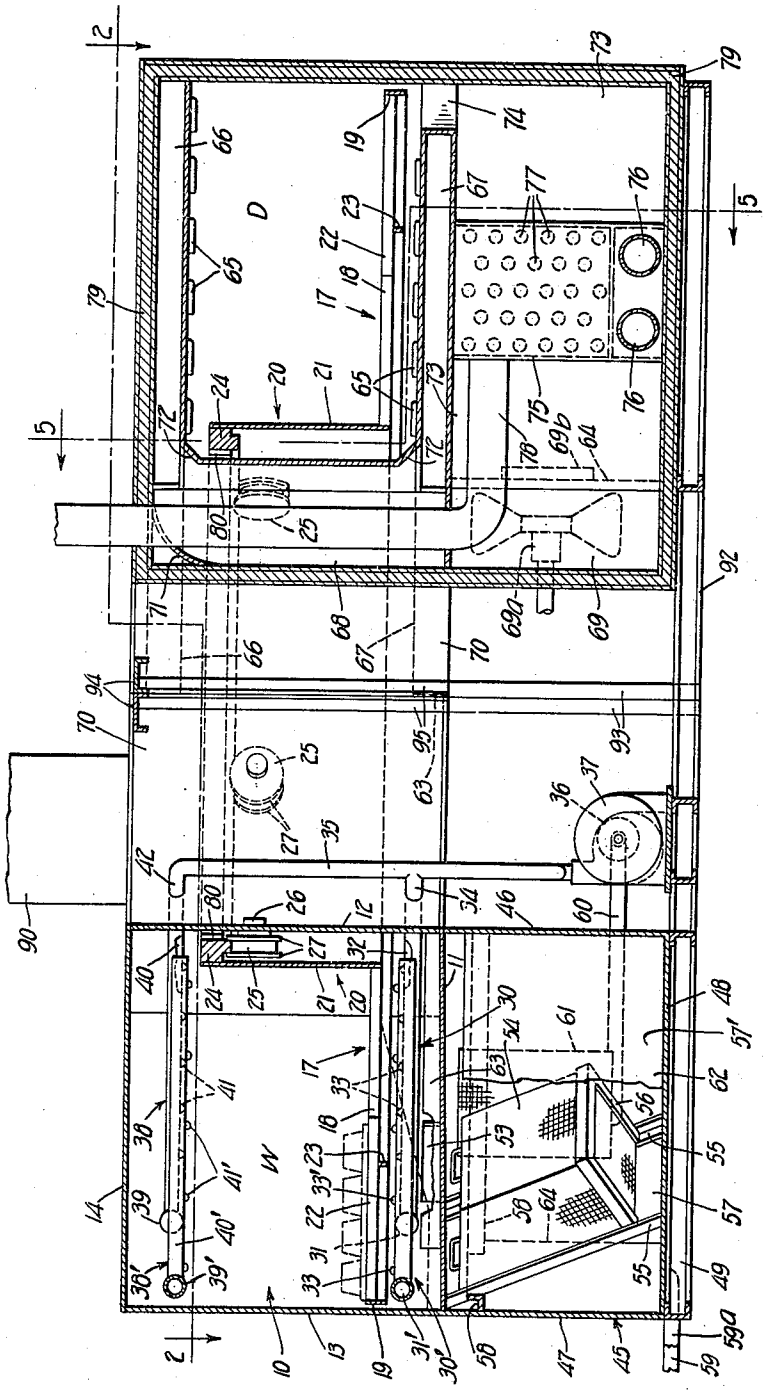
INVENTOR.
Erich R. Zademach
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June 8, 1948. E. R. ZADEMACH 2,443,091

CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

Filed Oct. 15, 1940 9 Sheets-Sheet 4

Fig. 4.



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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

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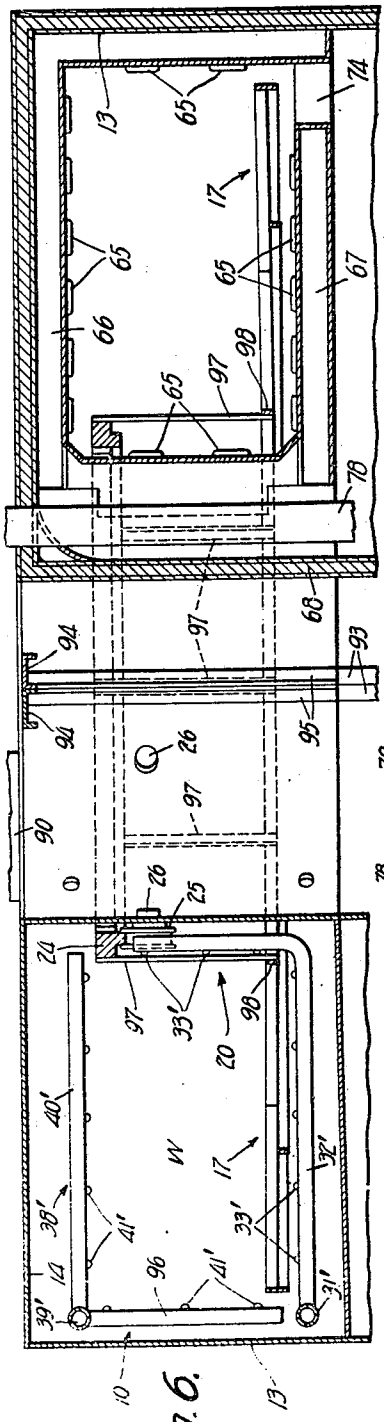


Fig. 6.

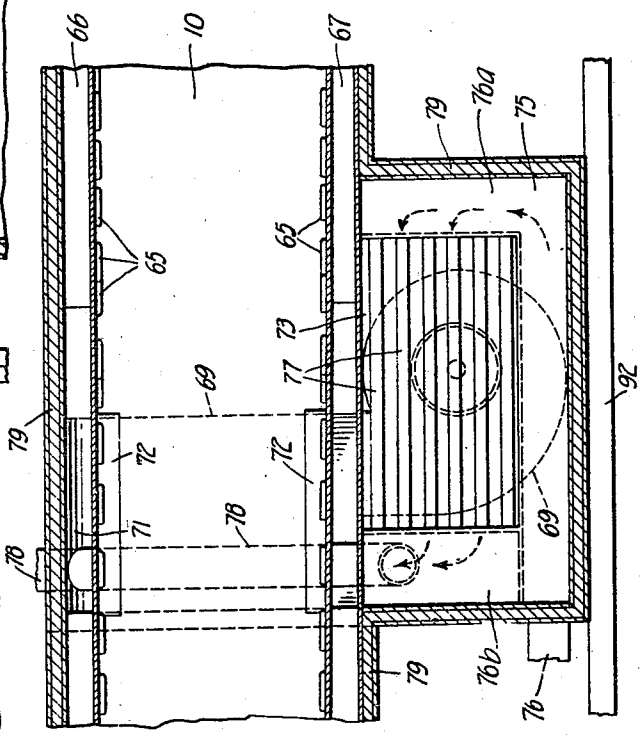


Fig. 5.

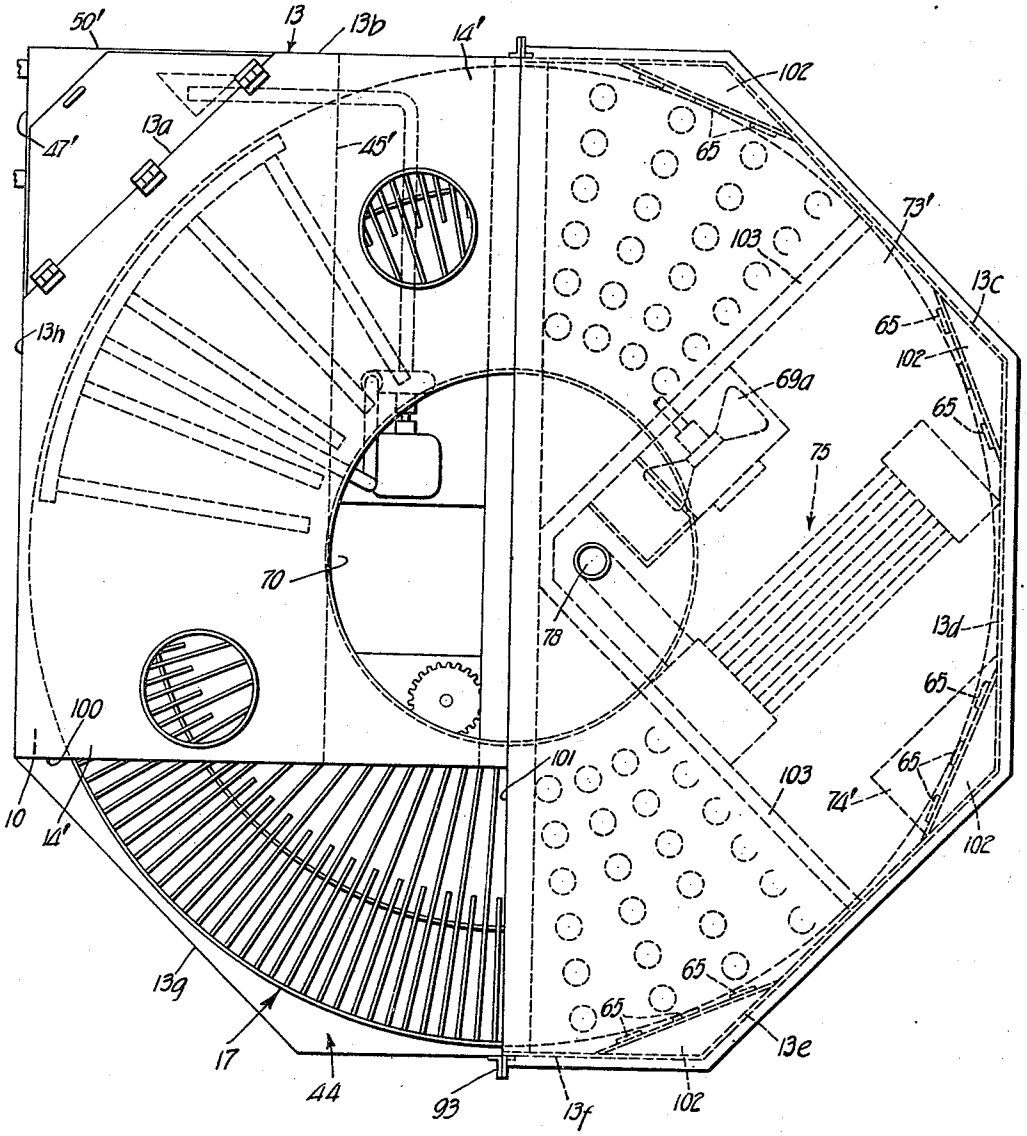
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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

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Fig. 7.



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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

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Fig. 8.

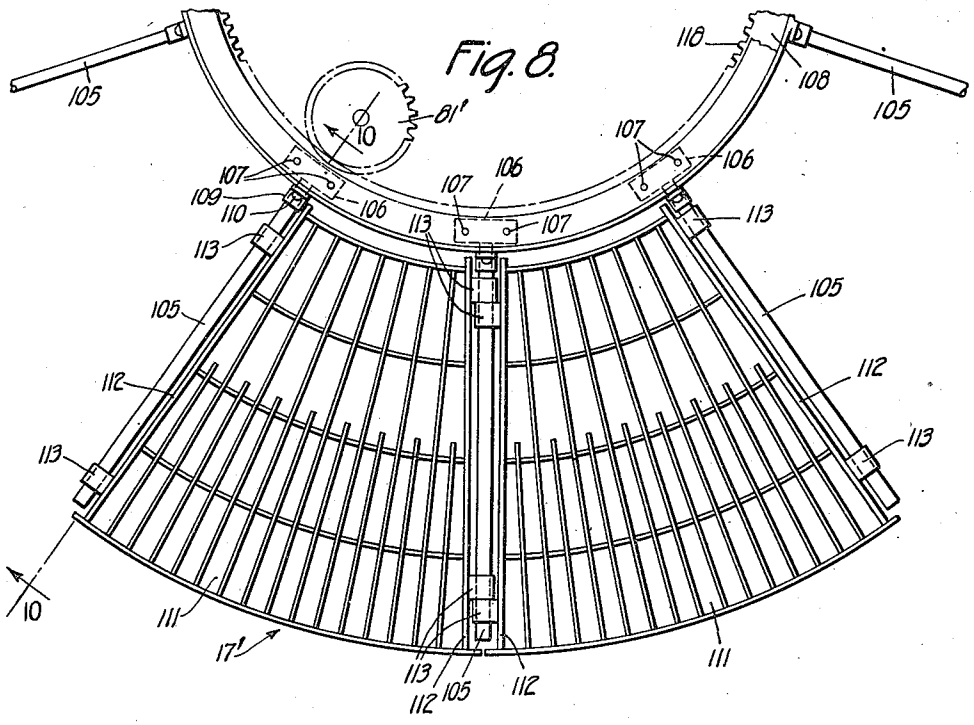


Fig. 9.

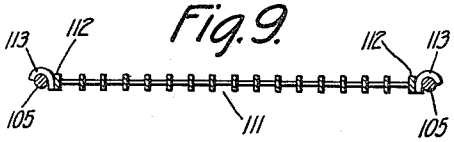


Fig. 10.

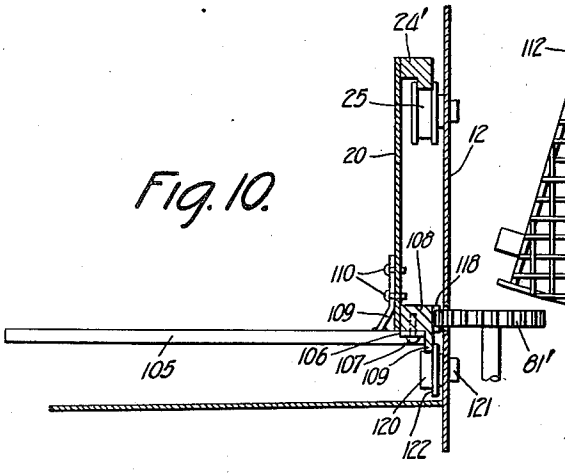
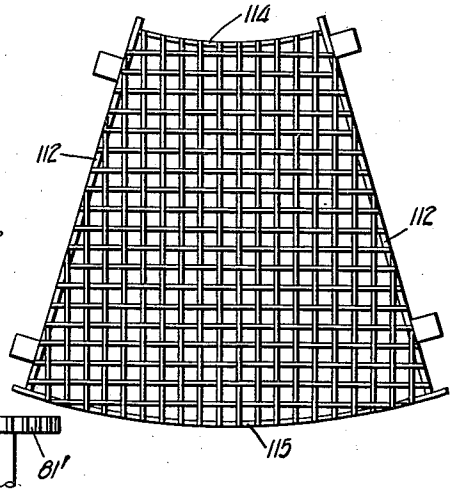


Fig. 11.



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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

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Fig. 12.

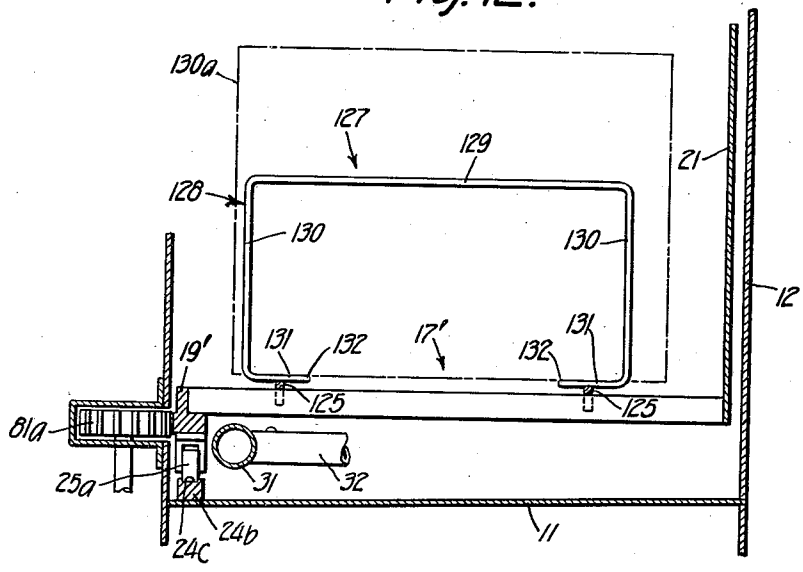


Fig. 13.

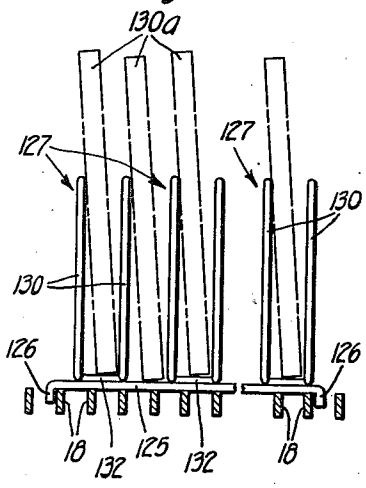
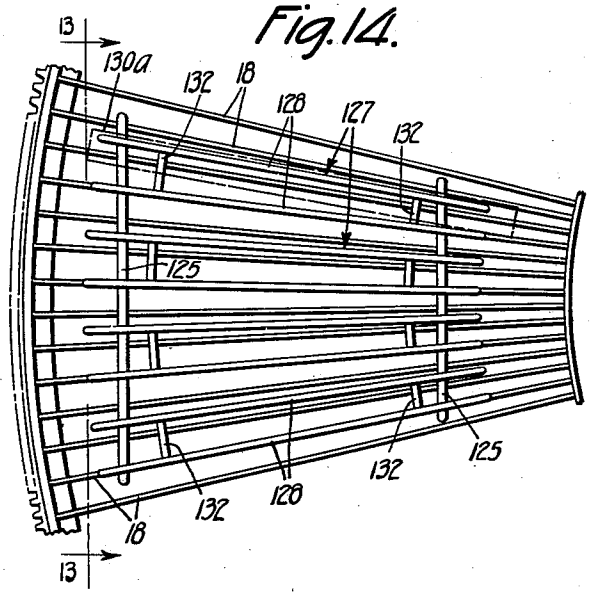


Fig. 14.



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CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEM

Filed Oct. 15, 1940 9 Sheets-Sheet 9

Fig. 15.

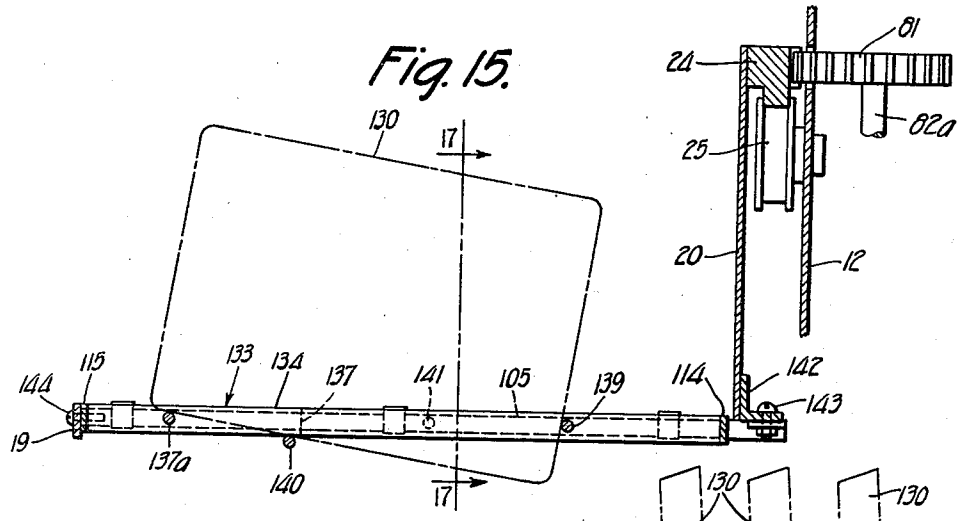


Fig. 17.

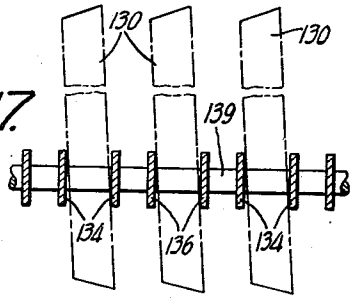
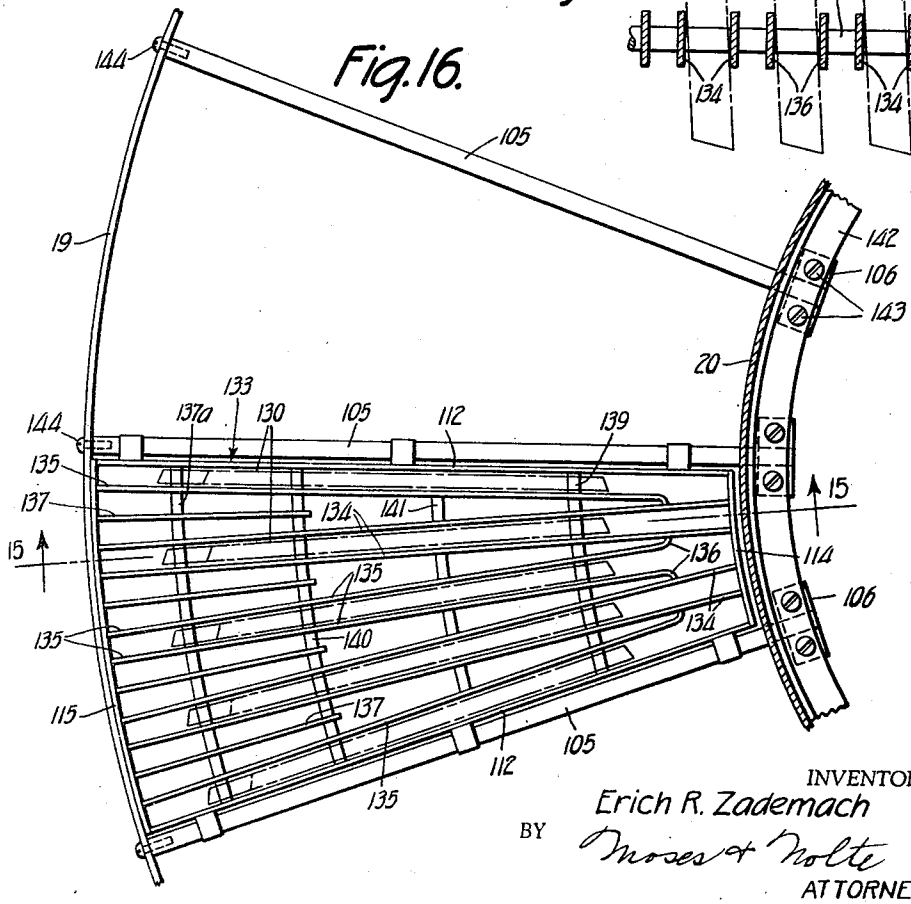


Fig. 16.



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Patented June 8, 1948

2,443,091

UNITED STATES PATENT OFFICE

2,443,091

CLEANING APPARATUS HAVING ROTARY CONVEYER AND RECIRCULATING LIQUID SYSTEMS

Erich R. Zademach, Elizabeth, N. J., assignor, by mesne assignments, to Metalwash Machinery Company, Newark, N. J., a copartnership

Application October 15, 1940, Serial No. 361,211

4 Claims. (Cl. 134—80)

1

This invention relates to apparatus for the continuous fluid treatment of articles traveling on an enclosed conveyor, and is particularly directed to apparatus for continuously subjecting articles to washing and drying operations or other successive steps employing any desired combination of liquid or gas treatments. It has been particularly developed for use in washing and drying pans and other containers generally employed in commercial bakeries. In this field the pans are first subjected to washing with jets of hot water carrying suitable detergents, followed by drying with jets of heated air.

An important feature of the invention is the provision of a rotary arrangement of this type. This construction permits the elimination of one of the operators required on previous straight types of apparatus, since the same operator can be employed for both the insertion and the removal of the articles to be processed. It also has been utilized to provide a very compact and efficient arrangement both of the processing chambers and of the auxiliary fluid-handling apparatus.

This type of arrangement utilizes a rotary support for the articles traveling in an annular enclosed chamber, the treating liquids or gases being introduced at successive points in the chamber. As some or all the treating fluids are preferably hot, it is important that the chamber be enclosed as effectively as possible. This presents serious mechanical problems in the support and drive of the rotary conveyor. The use of a central shaft provided with radial supports for the conveyor is open to serious objections, partly because of the difficulty of sealing the treating chamber, and partly because it renders the central portion of the apparatus inaccessible without stopping the conveyor. A feature of the invention is the provision of an annular conveyor-supporting structure which may be fully sealed while leaving the central part of the apparatus open and accessible during operation.

Where the articles are initially subjected to liquid treatment followed by drying, it is desirable to reduce to a minimum the amount of vapor from the liquid treatment that can pass over to the drying stage. Baffles or curtains are open to objection because they interfere with articles on the conveyor. It is also desirable to prevent steam and the like from interfering with the operator stationed at the feed and discharge opening. A feature of the invention is the provision of a suitable arrangement for this purpose, utilizing ducts venting the vapors at opposite ends of

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the liquid treatment zone and thereby minimizing the extent to which the vapors can enter the drying zone. This is aided by the provision of a forced and regulated circulation of drying air, which likewise tends to exclude such vapors.

The cleaning of baking pans and the like introduces special problems in apparatus of this type, due partly to the shapes and sizes of such pans and utensils, and partly to the type of cleansing and drying action to which they must be subjected. Certain features of the invention are particularly intended to facilitate the treatment of articles of this type. In particular, special supporting means has been provided for holding such articles in proper position in minimum space.

The invention also includes a special arrangement of various parts providing compactness and efficiency. It includes a liquid recirculating arrangement that is compact, efficient and conveniently located, and which in particular is advantageously provided with corner portions projecting beyond the annular treatment chamber to provide convenient access to strainers and other parts which may need periodic attention.

Apparatus of this type, especially when used for cleansing baking utensils, is frequently so large as to present serious problems in transportation and installation, unless a substantial part of the assembly thereof is carried out at the point of use. A feature of the invention is a provision of an apparatus of the indicated rotary type which is arranged for construction in two self-contained units suitably proportioned for standard transportation and formed into a complete machine by joining the two units.

The invention also includes improvements in construction and arrangement of the conveyor, including an improved conveyor support and drive, a shield arrangement which protects working parts while exposing the articles to full cleansing action, and improved sectional construction which facilitates shipping the articles in parts as already indicated, as well as convenience of assembly, repair and replacement of parts. Improved article-supporting sections have been devised to facilitate the cleansing of articles of awkward sizes and shapes, such as cookie sheets, bun pans and the like in minimum space without interfering with the use of the conveyor for other types of articles. The provision of sections that are readily removable through the article feed and discharge opening likewise assists in ready assembly, replacement and the rapid

substitution of one type of article support for another along part or all of the conveyor.

A further feature is the arrangement of the parts to provide a large and convenient opening for inserting and removing articles, particularly those which are large and cumbersome, and to permit convenient access to the back of the conveyor. A feature of this arrangement is the provision of means for trapping steam in the upper part of the treating chamber adjacent the access opening and thereby reducing the operator's exposure to such steam or other hot vapors.

Other objects and advantages will appear from the detailed description of the preferred embodiment illustrated in the accompanying drawings in which

Fig. 1 is a top plan view of the apparatus;

Fig. 2 is a horizontal sectional view on line 2—2 of Fig. 4 with parts broken away;

Fig. 3 is a front elevation from the lower side of Figs. 1 and 2 facing the feed and discharge opening;

Fig. 4 is a transverse axial section on line 4—4 of Fig. 2;

Fig. 5 is a fragmentary vertical section on line 5—5 of Fig. 4 illustrating the drying system;

Fig. 6 is a fragmentary view of the upper part of a modified form taken on the same line as Fig. 4;

Fig. 7 is a top plan view similar to Fig. 1 showing a modified arrangement having a generally octagonal contour;

Fig. 8 is a fragmentary top plan view of a portion of a modified sectional type of conveyor;

Fig. 9 is a vertical transverse sectional view through one of the conveyor sections shown in Fig. 8;

Fig. 10 is a fragmentary vertical section on line 10—10 of Fig. 8;

Fig. 11 is a plan view of a modified form of an article supporting section;

Fig. 12 is a view similar to Fig. 10 showing a modified arrangement of conveyor support and drive, and a modified type of article support;

Fig. 13 is a fragmentary section on line 13—13 of Fig. 14;

Fig. 14 is a plan view of a conveyor section of the type shown in Figs. 12 and 13;

Fig. 15 is a view similar to Fig. 10 showing another modification, the section being taken on line 15—15 of Fig. 16;

Fig. 16 is a fragmentary top plan view of said modification; and

Fig. 17 is a fragmentary vertical sectional view on line 17—17 of Fig. 15.

The invention is illustrated by an apparatus particularly adapted for use in cleaning various types of pans used in commercial baking. It comprises in general an annular treating chamber 10 which in the form shown in Figs. 1 to 6 is divided into a washing zone W, a rinsing zone R, a drying zone D and a feed and discharge zone F. The treating chamber 10 is formed by suitable sheet metal walls including bottom 11, cylindrical inner wall 12, outer wall 13 and top 14 (Fig. 4) connected at abutting edges to form a complete enclosure except at the feed and discharge opening 44 through the outer wall 13, which is advantageously surrounded by an outwardly flared shield 15 of sheet metal of sufficient extent to prevent objectionable interaction between the external air and the chamber 10. In this embodiment opening 44 likewise may be extended through top 14 to a sufficient distance for the insertion of large articles and to

provide headroom for the operator in reaching across the conveyor. An apron 43 extends downwardly from the chamber top 14 along the entire margin of opening 44 in said top, and abuts outer wall 13, the lower edge of apron 43 being advantageously at least as low as the lower faces of fluid applying apparatus located in the upper part of chamber 10 above the conveyor and preferably slightly lower than such apparatus, providing a convenient guide to the maximum height to which articles on the conveyor may safely extend. It should be noted that removable cover plate 13x may be provided on the exterior wall of the casing for convenience of access and inspection.

A suitable annular conveyor is supported and rotated in chamber 10. In the form shown in Figs. 1–7 the conveyor includes an article supporting grate 17 formed from radial bars 18 fixed at their ends to outer rim 19 and cylindrical grate support 20, which in this form consists of a sheet metal cylinder 21. In the outer portion of grate 17 intermediate bars 22 are provided, attached at their outer ends to rim 19 and supported adjacent their inner ends by the intermediate supporting ring 23.

The grate support cylinder 21 extends upwardly substantially to the top of the available space for the articles to be washed and carries along its inner face, preferably adjacent the upper end, an annular rail 24 resting on a series of rollers 25 rotating in bearings 26 mounted on the inner wall 12 of the treating chamber. Rail 24 advantageously extends between flanges 27 on rollers 25 to maintain the grate 17 in radial alignment.

In this arrangement cylinder 21 is formed from a continuous sheet of suitable metal and serves also as a shield, protecting the supporting and driving elements located on the inner side thereof from the treating liquid applied to the articles on the conveyor grate 17.

Where the apparatus is employed for liquid treatment, as in washing and rinsing pans, means is provided in chamber 10 for discharging liquid against pans on the grate 17, preferably from both upper and lower sides, the illustrated construction including spray units located above and below the grate 17. In the form illustrated in Figs. 1 to 6 two successive liquid treatment sections are employed, the first for washing and the second for rinsing. As the rinsing section R is shown more in detail in Fig. 4, and is substantially the same in construction as the washing section, it will be described first.

In this section R the lower liquid supply includes a lower spray unit 30 comprising a curved header 31 adjacent the grate rim 19, provided with inwardly extending radial spray pipes 32 having suitably spaced nozzles 33 of known type. The liquid is fed to header 31 through pipe 34 extending through the inner wall 12 to feed pipe 35 connected to the discharge of centrifugal pump 36 driven by motor 37.

The upper washing spray unit 38 comprises a curved header 39 adjacent the outer wall 13 connected to radial spray pipes 40 provided with nozzles 41 suitably distributed above the rinsing zone R. Header 39 is connected through radial pipe 42 to the upper end of feed pipe 35.

An arrangement is provided for recirculating the liquid used in rinsing zone R by draining the used liquid into a suitable sump or storage tank, removing foreign matter therefrom, and connecting the tank to the inlet of pump 36. This

is accomplished in the form illustrated by providing a rectangular tank 45 below said zone, advantageously arranged with its inner wall 46 tangent to the downward projection of the inner wall 12 of chamber 10 and its outer wall 47 tangent to the downward projection of the outer wall 13 of said chamber, the bottom wall 11 of the chamber forming the top of tank 45 in the zone across which said bottom extends. The bottom 48 of tank 45 is supported on suitable channels 49, and the rearward end 50 (Fig. 2) of the tank is in a plane substantially tangent to the outer wall 13 of chamber 10.

In this construction the rear corner of the tank projects beyond said outer wall 13 and is provided with a suitable cover plate 51 having a downwardly sloping hinged door 52. The inner edge of plate 51 is joined to wall 13 above the level of the adjacent edge of chamber bottom 11, which slopes downwardly and outwardly throughout the washing and rinsing zones. A draining outlet 53 (Figs. 2 and 4) in the lower margin of wall 13 below plate 51 and opposite the adjacent outward projecting corner of tank 45, discharges the liquid falling on bottom 11 into a rectangular screen basket 54 supported on slanting angle irons 55 and an angle iron bottom support 56 carried by angle irons 55 and fitting the bottom of basket 54. The basket is arranged for ready removal and insertion through door 52.

The rinse water compartment 57 of tank 45 is advantageously provided with a decanting trough 58 extending along the upper edge of the compartment and arranged to receive the overflow with floating waste material which is carried off by drain pipe 59 connected to trough 58 through discharge passage 64 in the corner of compartment 57. The bottom of the compartment 57 is connected to drain pipe 59a through a suitable valve (not shown) for draining the compartment and removing settled material therefrom when desired. The inlet of pump 36 is connected through pipe 60 with the liquid in compartment 57, the end of pipe 60 advantageously letting into a vertical triangular screen 61 located above the bottom of the compartment and extending above the liquid level in said compartment.

A similar liquid supply system is provided in the washing zone, but is not described in detail, similar parts being indicated by similar numbers having a prime. The rinse water compartment 57 and the wash water compartment 57' are separated by a suitable vertical partition 62 in tank 45; and suitable vertical radial walls or flanges 63 (Figs. 2 and 4) extend upwardly from the bottom wall 11 of compartment 10 at the limits of the washing and rinsing zones to retain the liquid and assure its discharge through the proper outlet 53 or 53', the end of the lower air manifold 67 hereafter described being advantageously arranged so that it extends upwardly from bottom wall 11 at the discharge end of the rinsing compartment in position to confine liquid accumulating on said bottom, Fig. 4. It is understood that the arrangement is adapted for the addition of suitable detergents, liquid components, or the like to the circulating system and for the heating or other treatment or manipulation of the liquid in tank 45.

The drying zone occupies substantially the remaining half of chamber 10, and is provided with means for directing suitable blasts of drying air on the articles, as well as means for supplying the heated air, advantageously by recirculating and reheating such air. In the illustrated constructions air is directed against articles on the grate 17 through nozzles 65 (which may be of the type disclosed in Zademach Patent No. 1,756,965) mounted in the lower face of an annular segmental upper manifold 66 and in the upper face of lower registering manifold 67 of similar shape, the two manifolds extending from a point at the end of the rinsing zone R substantially to the feed and discharge zone F. The manifolds are connected by a vertical supply duct 68 projecting into the open well 70 (Fig. 2), supply duct 68 being suitably contoured, as by providing deflector plate 71 and outwardly deflected connecting wall sections 72, to assure an even flow of air into the manifolds 66 and 67. The upper wall of the lower manifold 67 advantageously is inclined downwardly toward the rear sufficiently to provide drainage onto the portion of bottom plate 11 extending beneath the rinsing zone R.

The lower end of duct 68 is in line with and connected to the discharge from a centrifugal blower 69 (Figs. 2 and 5) located in an air conditioning chamber 73 positioned beneath the bottom wall 11 of the drying zone and connected, through return passage 74 located in the outer margin of the lower manifold 67, with an intermediate or central portion of such drying zone. Blower 69 includes fan 69a (Fig. 4) driven by suitable means (not shown) and has an inlet flange 69b extending around the fan inlet, which advantageously is directly in line with a portion of return passage 74 which may be laterally extended for the purpose (Fig. 2), this arrangement providing a relatively direct flow of air from passage 74 through the heater to the fan inlet.

Suitable means is provided in chamber 73 for conditioning the air before it enters the blower inlet, which opens into said chamber. In the construction illustrated said means consists of a somewhat diagrammatically indicated heater 75 which may be of a known gas fired type provided with burner tubes at the bottom of the heater from which the flames and exhaust gases pass through a suitable vertical header 76a (Fig. 5) into a battery of spaced heating tubes 77 discharging into vertical header 76b connected to exhaust pipe 78 which passes laterally through chamber 73 and thence upwardly through an extension of compartment bottom 10 and a lateral portion of supply duct 68 to discharge, this arrangement providing substantial heat exchange between pipe 78 and the air in duct 68. Heater 75 extends entirely across chamber 73 so that all of the air introduced through passage 74 must pass between heating tubes 77 before reaching the inlet to blower 69.

It is, of course, apparent that this arrangement permits any type of air conditioning, including dehydration, to be employed in chamber 73; but for the purpose indicated a simple heater has been found to be sufficient. The construction illustrated is compact and is adapted for insulation by the provision of suitable lagging 79 surrounding both the drying zone of chamber 10 and the air conditioning chamber 73.

A suitable arrangement is provided for revolving the grate 17 at the desired speed; and such drive is located appropriately to avoid interference with the accessibility and operation of the various fluid treatment constructions that have been described. For this purpose, in the form shown in Figs. 1–6, the rail 24 is provided with an inwardly extending annular rack 80 engaged by pinion 81 (Fig. 2) extending through

a restricted opening in the inner wall 12 and driven through vertical shaft 82, reducing gear 83 (Fig. 1), pulley 84 and belt 85 from motor 86 mounted on the top plate 14. The transmission elements in well 70 are adapted to be housed, and are arranged to prevent any material leakage or discharge from the chamber 10. While the reducing gear 83 is shown as mounted on a shelf 87 formed from an extension of plate 14, the latter plate may in practice extend across the adjacent half of the well 70, as the latter arrangement still leaves sufficient room for an operator to enter the well for purposes of repair and the like.

An arrangement is provided for reducing to a minimum the tendency for moist air from washing and rinsing operations to travel into the drying zone, thereby wasting a corresponding amount of the drying capacity of the air therein. For this purpose means is installed for exhausting the air from points at the ends of the liquid treating space which are adjacent the drying zone D and the feed and discharge zone F; and the apparatus has been constructed and arranged to facilitate this operation. In the illustrated embodiment the top plate 14 is provided with an exhaust duct 90 located at or just beyond the end of the rinsing stage R, and an exhaust duct 91 located between the end of the feed zone F and the beginning of the washing zone W. These ducts may be provided with suitable exhaust means (not shown), and frequently are connected to a common discharge duct passing to the outer air. Duct 91 also serves to keep excessive steam or heated air from discommoding the operator stationed at the opening 44, and its operation is assisted by apron 43, which restricts ingress of outside air into duct 91.

The parts have been carefully designed and arranged to facilitate the convenient separation of the apparatus into two portions which may be readily attached to each other at the point of use. It will be noted that the supporting framework 92 (Fig. 4) of channel irons is in two halves connected at their ends to two pairs of vertical angle irons 93 located at opposite points and fixed at their upper ends to an abutting pair of top channels 94. The top plate 14 is formed into halves with the division in line with the adjoining faces of channels 94. The outer wall 13 is similarly divided with its ends fixed to angles 53, and inner wall 12 is likewise divided with its ends fixed to abutting pairs of vertical angle irons 95 (Figs. 2 and 4) attached to the respective channels 94. The grate 17 is also suitably sectionalized as by providing suitable breaks 28 in the outer rim 19, cylindrical support 20 and rail 24, and appropriate means for fastening these parts together at the breaks when the machine is assembled, the arrangement illustrated in Fig. 2 being provided with suitable bridge or connecting plates 29 extending across the breaks 28 and suitably attached to the adjacent portions of the above mentioned parts.

It will be noted that the grate drive and blower are located entirely in the right-hand half as viewed in Figs. 1 and 2, while the liquid circulation system and the exhaust ducts are positioned entirely in the left-hand section. These sections are readily assembled at the factory, may be economically shipped by standard transportation means, and can be readily and rapidly assembled.

In some installations it is desirable to provide a fluid blast or spray from one or both of the sides of chamber 10 as well as from the top and bottom; and a modified construction of this type is illustrated in Fig. 6. The general circulation systems for the liquid and the air are the same as those described. In each liquid treatment step, however, the lower radial spray pipes 30 are extended upwardly within the cylindrical grate support 20 and are provided with suitable nozzles 33', while a series of vertical spray pipes 96 provided with nozzles 41' extends downwardly from header 39 along the treatment zone. The same construction is, of course, employed if desired in both the washing and rinsing zones.

In the drying zone the vertical supply duct 68 is laterally extended along the inner face of the inner wall 12 to the limits of the drying zone and is provided with inwardly directed nozzles 65. The upper manifold 66 is extended downwardly inside the outer wall 13 throughout the drying zone and is similarly provided with nozzle 65.

In this construction it is necessary that the cylindrical grate support 20 shall be of open construction adapted to permit ready flow of the fluids into contact with the articles on grate 17. For this purpose the support 20 in the form illustrated in Fig. 6 consists of a series of suitably spaced vertical hanger bars 97 connecting rail 24 with an inner grate rim 98 to which the grate bars 18 are attached.

If desired the grate 17 may be radially inclined, as illustrated in Fig. 6, thereby providing a similar inclination to pans set flatwise on the grate and assisting in the drainage of water from the upper flat surfaces of such pans over the lower pan edge, this arrangement likewise serving to assure inward radial movement of any utensils which may be shifted on the conveyor by vibration, thereby avoiding outward movement of utensils and consequent interference with the stationary structures along the outer wall.

The general method of operation will be apparent from the description of the apparatus. Only a single operator is required to place the dirty pans on the conveyor grate 17 and remove the clean pans from the grate through the opening 44, being protected against steam and other vapors from the washing zone W by the removal of such vapors through exhaust duct 91. The dirty pans traveling from the feed zone F through the washing zone W are subjected to the action of jets of hot water carrying suitable detergents, which remove the foreign matter and carry it down into compartment 57' where the larger particles are caught by the basket 54', floating material is decanted to waste through trough 58', and the heavier and finer solids drop to the bottom of the compartment and are periodically withdrawn through pipe 59a'. The water thus purified is then returned for reuse.

The cleansed pans pass into the rinsing zone R where they are similarly subjected to jets of clear rinsing water, any foreign matter remaining on the pans being carried off and removed from the water in similar manner before its return for use.

The pans then travel with the drying zone D, and vapors from rinsing zone R are prevented from entering the drying zone D to any substantial extent by withdrawing said vapors through exhaust duct 99. In the drying zone D the pans are subjected to jets of hot air which serve to remove the water both mechanically and by evaporation, leaving the pans ready for removal by the operator when they reach the discharge opening 44.

The modification illustrated in Fig. 7 is general-

ly similar to the form shown in Figs. 1–5, except for certain specific features. In this construction the outside to the tank is octagonal in shape, avoiding the expense incident to the provision of curved parts. In this embodiment only one liquid treatment section is shown, arranged and constructed in the same general manner as the rinsing section previously described. The tank 45' has only a single compartment and has a corner projecting from a flat section 13a of the outer wall 13, the walls 47' and 50' of said tank being flush with wall sections 13b and 13h contiguous to section 13a.

The feed and discharge opening 44' spans a corner of the chamber 10, having one margin 100 extending along the forward edge of wall section 13h and across the top 14' at right angles to the division between the two halves of the top, the margin 101 of the right-hand half of top 14' and the contiguous angles 93, which extend along wall section 13f forming the other margin of opening 44'. This arrangement provides an opening extending substantially across the conveyor as well as a convenient place for the operator to stand adjacent side 13g.

In this arrangement the angles between wall sections 13e to 13f are utilized to provide risers 102 connecting the upper and lower air manifolds 66, 67 outside of the path of the conveyor 17, risers 102 being provided with inwardly directed nozzles 65. The return passage 74' is also located in an angle between wall sections 13d and 13e, and the air conditioning chamber 73' is arranged with its outer walls flush with sections 13c, 13d and 13e, the inner walls 103 extending radially inward and normal to the centers of sections 13c and 13e to provide a chamber 73' having a corner projecting into the central well 70. The chamber construction and connections in well 70 between chamber 73' and the manifolds 66 and 67 are substantially the same as those already described, except for necessary and obvious modifications in contour. The heater 75 extends across chamber 73' from one wall 103 into contact with an opposite wall flush with wall section 13d, providing the requisite direct flow of air from return passage 74' through the heater to the blower 69.

In the modification shown in Figs. 8–11 the conveyor 17' is provided with removable grate sections mounted on a suitable frame. The frame consists of a plurality of equally spaced radial rods 105, each carrying at its inner end a mounting plate 106 attached as by means of screws 107 to lower frame ring 108, and supporting strips 109 connected at one end to rod 105 as by welding and detachably connected to the cylindrical grate support 20 as by screws 110.

Suitable grate sections are removably mounted on rods 105, the section 111 illustrated in Figs. 8 and 9 being of the same general construction as the grate shown in Figs. 1–7, being provided with side bars 112 carrying hook-shaped hangers 113 of sheet metal fitting over rods 105 and advantageously extending around the rods to a sufficient distance to prevent substantial radial movement of sections 111. A modified form of grate section 111a is shown in Fig. 11, in which the section is covered with woven wire welded to the side bars 112 as well as to the inner frame bar 114 and outer frame bar 115 connecting side bars 112. Bars 114 and 115 are concentric with the axis of rotation to the conveyor.

In Figs. 8 and 10 an alternative or supplemental arrangement for supporting and driving the conveyor is also illustrated. For this purpose frame ring 108 is provided with an inner rack or ring gear 118 engaged by pinion 81' corresponding to pinion 81. This arrangement also may include means for supporting the conveyor from beneath, the illustrated embodiment comprising a rail 119 extending downwardly from frame ring 108 and resting upon rollers 120 rotating on studs 121 mounted on the inner wall 12. Flanges 122 on rollers 120 engage the inner face of rail 109 and hold said rail, ring 108 and the structures carried thereby in proper radial as well as vertical position. This constitutes, therefore, a support in addition to the support furnished by the rollers 25 and rail 24.

Apparatus of this type is frequently used for cleaning large flat utensils such as cookie sheets, bun pans or the like, and it is desirable to place such utensils on edge during treatment in the apparatus. For this purpose removable racks may be provided, one form being illustrated in Figs. 12 to 14. In this construction the racks are carried by support rods 125 having downturned ends 126 engaging radial grate bars 18, the diverging relationship of the grate bars preventing substantial radial movement of the rack 124 due to engagement of the ends 126 with said bars.

A suitable rack structure is mounted on rods 125, the illustrated arrangement being particularly inexpensive since it may be constructed of ordinary rods. It consists of a plurality of sections 127, each of which may be made from a single rod and comprises a pair of vertical rectangular frames 128. Each frame 128 consists of a top bar 129, vertical end bars 130, and inturned bottom bars 131 attached to support rods 125 as by welding, and is provided with horizontal bars 132 connecting the inner ends of bars 131 at points spaced from rods 125. The frames 128 may be spaced and arranged so as to be substantially radial when the rack 124 is in operative position, or they may be suitably spaced and proportioned to accommodate any particular type of pan or sheet.

The pans 130a or other flat utensils may be inserted between adjacent frames 128 either of a section 127 or of contiguous sections, as shown in Fig. 13, and will be supported thereby in suitable slightly sloping position for exposure to the streams of liquid and air and for draining. This type of construction likewise permits ready insertion and removal of large flat utensils as well as ready removal or replacement of racks 124 throughout part or all of the conveyor according to varying conditions of use. With reference to the construction of Fig. 12, it should be noted that the table 17' is provided with an outer ring 19', having on it rack teeth, which rack teeth engage with a driving element 81a which element it should be noted is mounted on the outer wall of the casing of the machine. The table is supported by rollers 25a running in a groove 24c in a circular rail 24b.

A modified arrangement for the same general purpose is illustrated in Figs. 15–17. In this construction the grate sections 133 are provided with utensil supports appropriately spaced to carry ordinary utensils in the usual manner, but are provided in addition with generally radial openings into which the lower margin of a flat utensil may be inserted appropriately to support it in upright position during treatment. In the form illustrated each section 133 is provided with a plurality of pairs of parallel grate bars 134 mounted at their ends on inner frame bar 114

and outer frame bar 115. Between contiguous pairs of bars 134 an intermediate pair of parallel grate bars 135 is located, attached at their outer ends to outer frame bar 115 and having their inner ends 135 deflected laterally and attached to adjacent bars 134. An intermediate bar 135 is also located parallel to and adjacent each side bar 112 and is similarly mounted at its ends to bar 115 and adjacent bar 134. Filler bars 137, connected at their outer ends to frame bar 115, are located in the outer parts of the tapered spaces between each bar 135 and the bar 134 to which it is connected.

Suitable means is provided for supporting a flat utensil inserted between parallel bars of a grate section 133 far enough to support such utensil in generally upright position by engagement with such parallel bars. For this purpose supporting members connected to the grate bars, and which may serve likewise to hold such bars in position, are utilized. In the illustrated construction outer cross rod 137a extends parallel to outer frame bar 115, passing through and engaging bars 134, 135 and 137, and is fixed at its ends to side bars 112. Inner cross rod 139 is located a short distance from and generally parallel to inner frame bar 114, and likewise extends through and engages bars 134, 135 and 137, with its ends mounted on bars 112. With this arrangement a corner of a flat utensil may be inserted between adjacent bars 134 or 135 with its bottom edge resting on rod 137a and its inner edge bearing against rod 139. Bars 134 will be spaced appropriately to permit utensil 130 to tilt slightly, holding it in place by engagement of its opposite faces with bars 134 or 135. By suitably positioning rods 137a and 139, utensils may be effectively supported in this manner.

It is frequently desirable to provide additional support to limit downward projection of the utensils, to serve as a guide in rapidly locating the utensils in proper position, or for both purposes. This is accomplished in the form shown by providing a support rod 140 located below the grate section 133 between rods 137a and 139, and appriately attached to the section, arranged to engage the lower margin of a utensil 130 and to retain it in proper position. In the arrangement illustrated rod 140 extends along the lower margins of bars 112, 134, 135 and 137 and is suitably attached thereto as by welding. Filler bars 137 project to or slightly beyond rod 140, which provides appropriate support for the inner ends of such bars, and is suitably attached thereto as by welding. Suitable short brace rods 141 may be fixed at their ends to adjacent bars 134 and 135 intermediate rods 140 and 139 to provide additional rigidity.

A modified arrangement for mounting and supporting the frame rods 105 is also disclosed in Figs. 15 and 16. In this construction an annular mounting angle 142 is fixed to the lower margin of the cylindrical grate support 20 as by welding, and the conveyor frame rod mounting plates 106 are detachably connected to angle 142 as by bolts 143. The outer ends of frame rods 105 are detachably connected to the outer frame rim 19 as by screws 144 extending through the rim and threaded into the ends of rods 105. This construction is relatively simple and inexpensive, and permits ready assembly and disassembly, repair and replacement of damaged parts without requiring any general dismantling of the machine.

It should be noted that in the form of construction of Fig. 15, the driving gear 81 is rotated by a shaft 82a extending from below. In this form of construction, therefore, the motor or other driving means is not required to be located on the top of the machine, but may be at a point below.

It will be noted that the mechanical parts of the recirculation system and conveyor drive which may need attention are located in or adjacent to the central well, which is arranged for ready access to such parts and may be readily reached by passing beneath the chamber 10 between tank 45 and chamber 73. The various parts are arranged so that the two halves of the tank form complete units of suitable size for handling, the halves of one standard type of commercial unit for cleaning baking utensils being each 6½ feet wide by 13 feet long, tank 45 being designed and located so that it does not increase these rectangular shipping dimensions.

I have described what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. Treating apparatus comprising an annular treatment chamber, a conveyor in the chamber, and a system for treatment of articles on the conveyor with a recirculated stream of liquid comprising a tank located beneath the chamber, having a substantially right-angular corner projecting beyond the chamber with its two adjoining intersecting sides substantially flush with the respective portions of the outer wall of said chamber adjacent to said corner, said tank being provided with a top opening in said corner for access to the tank.

2. Treating apparatus as set forth in claim 1 in which the tank is provided with a screen removable through the access opening, the chamber is provided with means for draining used treatment liquid into the screen, said opening has its sides substantially coextensive with the intersecting sides of said corner, and a door is provided for said opening.

3. Treating apparatus comprising an annular chamber, a conveyor in the chamber, and means for subjecting articles on the conveyor to two separate treatments with recirculating streams of liquid comprising a rectangular tank located beneath the chamber and having two substantially right angular corner portions projecting beyond the chamber, each corner portion being provided with an access opening, and having intersecting sides substantially flush with the respective portions of the outer wall of said chamber adjacent to said corner, a partition dividing the tank in two compartments, and means in the chamber for draining into each compartment the liquid from one of the treatment operations.

4. Cleansing apparatus comprising an annular fluid treatment chamber having an inner peripheral wall, an annular rotary conveyor in the chamber, means for supporting and driving the conveyor including an annular driven support located adjacent to and on the chamber side of said inner peripheral wall and depending supporting means connecting the support with the inner portion of the conveyor, and means for applying fluid to articles on the conveyor including means extending vertically between said supporting means and said inner peripheral wall and discharging fluid outwardly through the supporting means.

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