

[54] **DEVICE FOR TREATING ARTICLES ARRANGED IN CONTAINERS WITH ORGANIC SOLVENTS**

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[58] Field of Search ..... 134/46, 49, 66, 78, 79, 134/82, 83, 105, 133, 134, 157, 160, 161, 165

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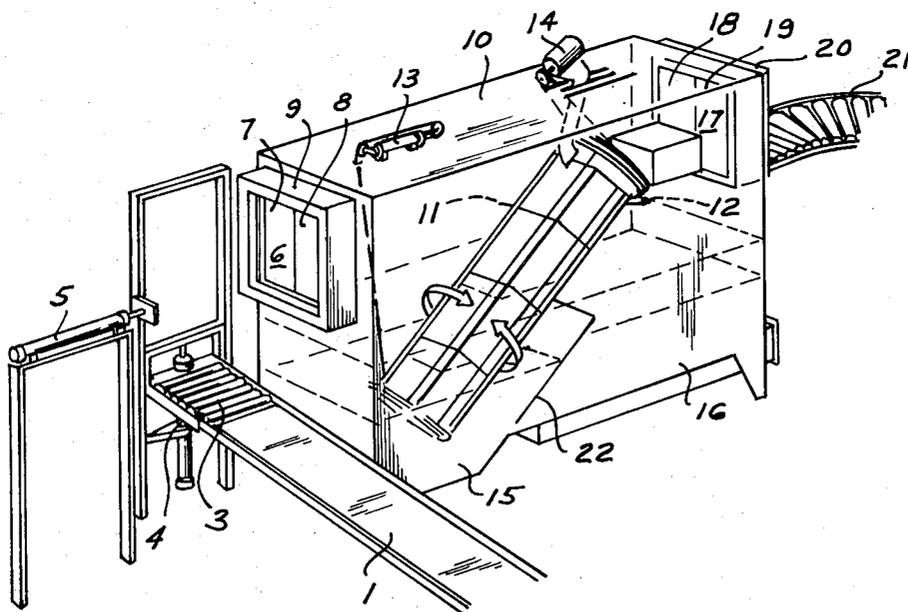
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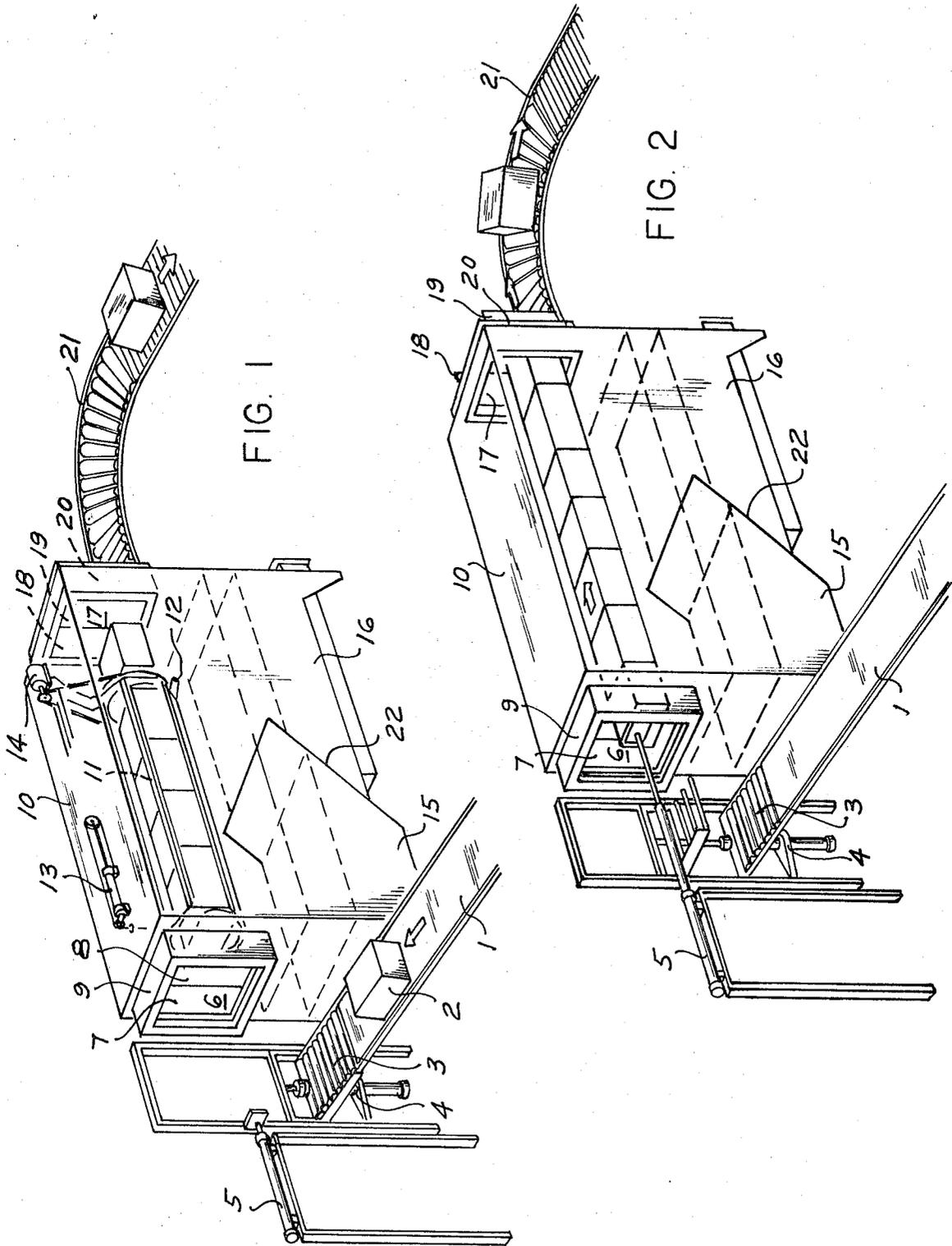
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[57] **ABSTRACT**

There is disclosed a device for treating and especially for degreasing solid articles with a liquid organic solvent. The device comprises a housing which has an inlet opening and an outlet opening at opposite sides and the bottom part of which constitutes a receptacle for the treatment liquid. The housing has mounted therein a holder pivotal about a transverse axis adjacent to the outlet opening and also rotatable about its lengthwise axis. Perforated containers for articles to be treated are successively fed into the holder and discharged therefrom after treatment. While within the holder the containers are subjected to the action of the solvent by dipping the holder into the treatment liquid and also exposing it to the solvent in vaporized form.

**9 Claims, 9 Drawing Figures**





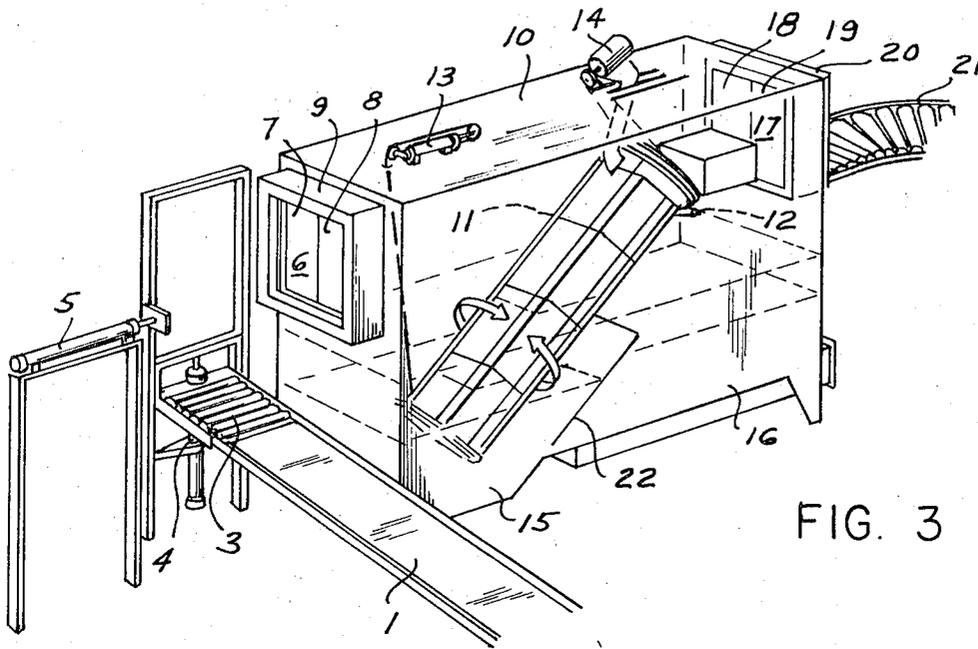


FIG. 3

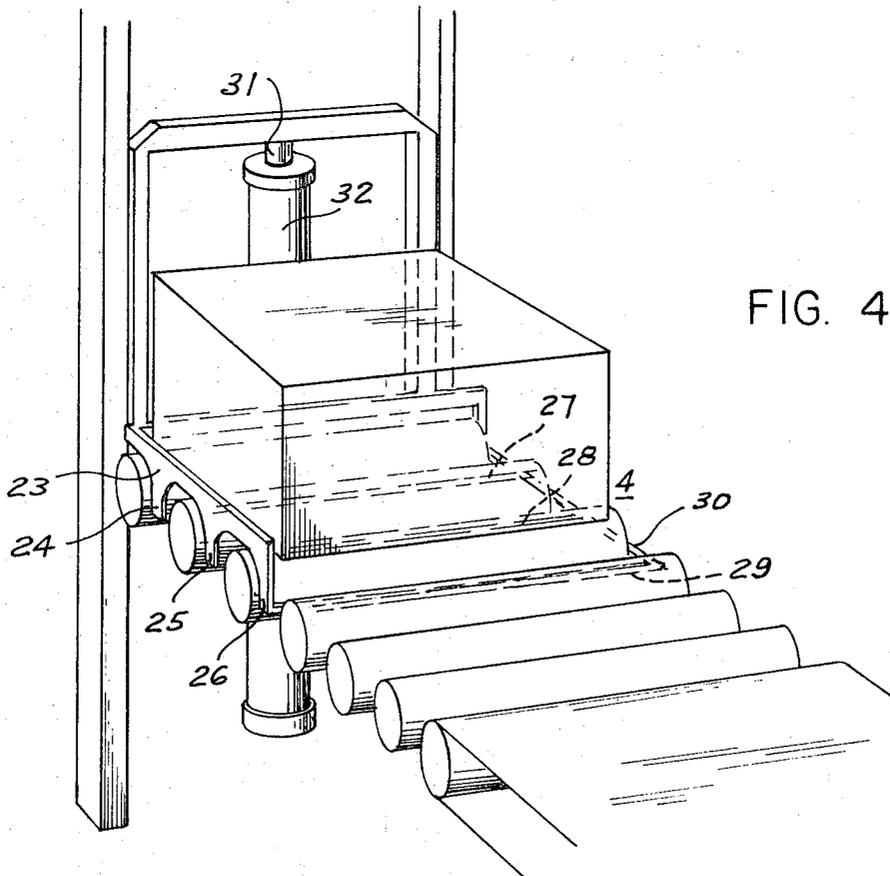


FIG. 4

FIG. 6

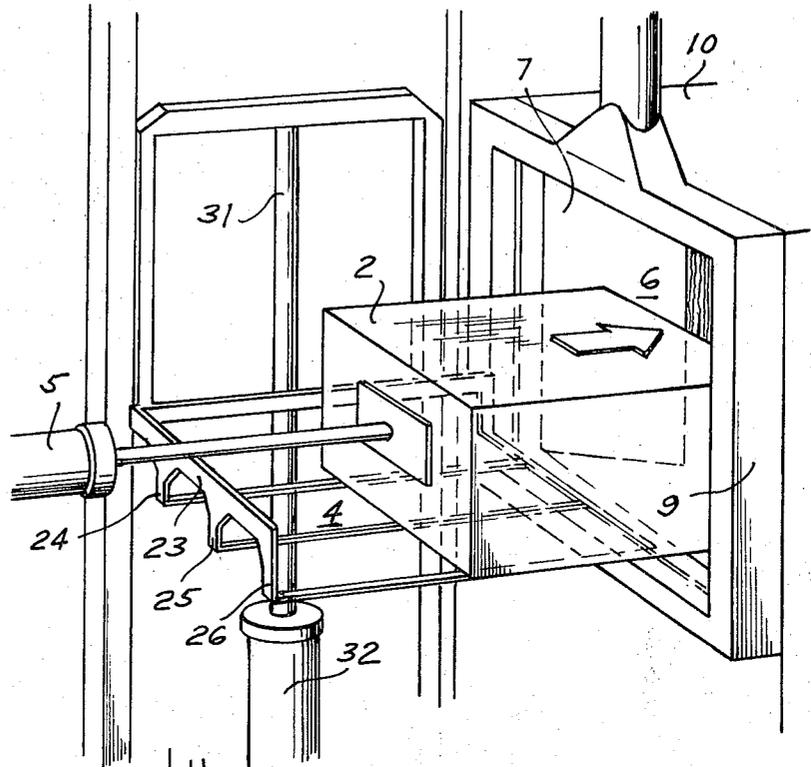
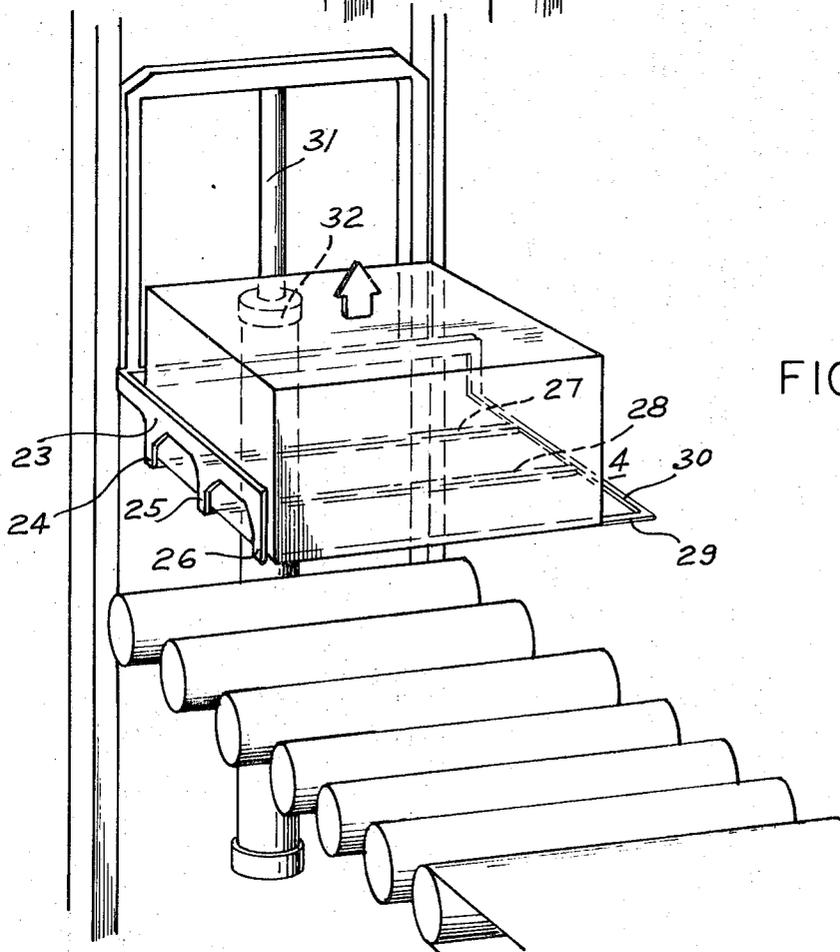
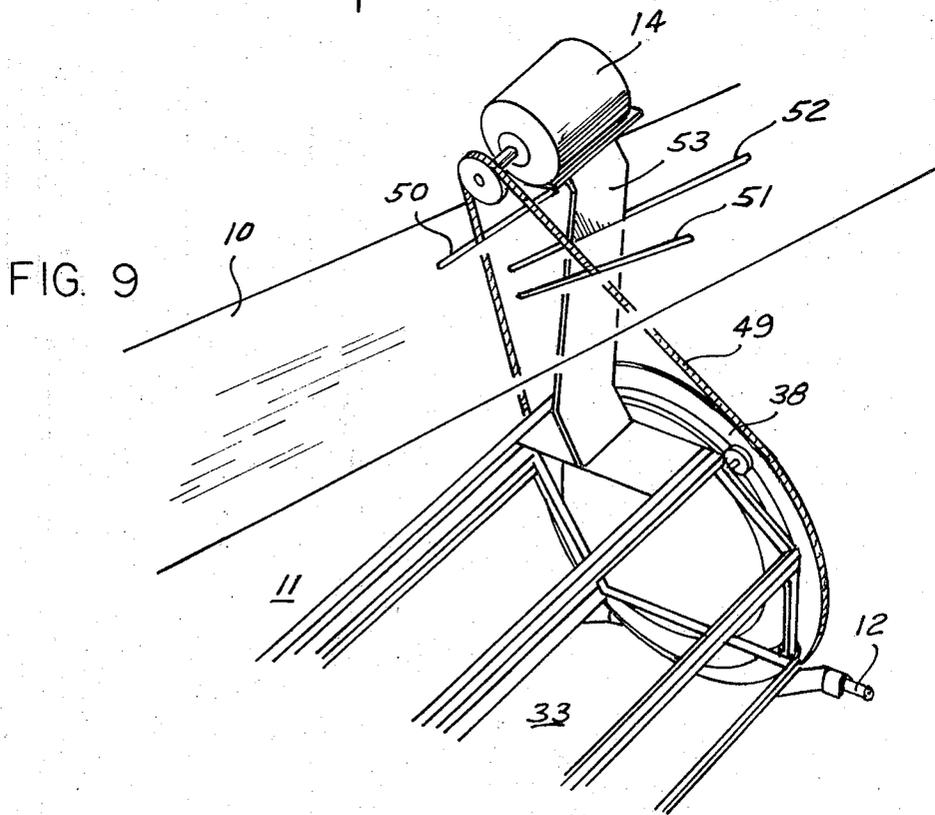
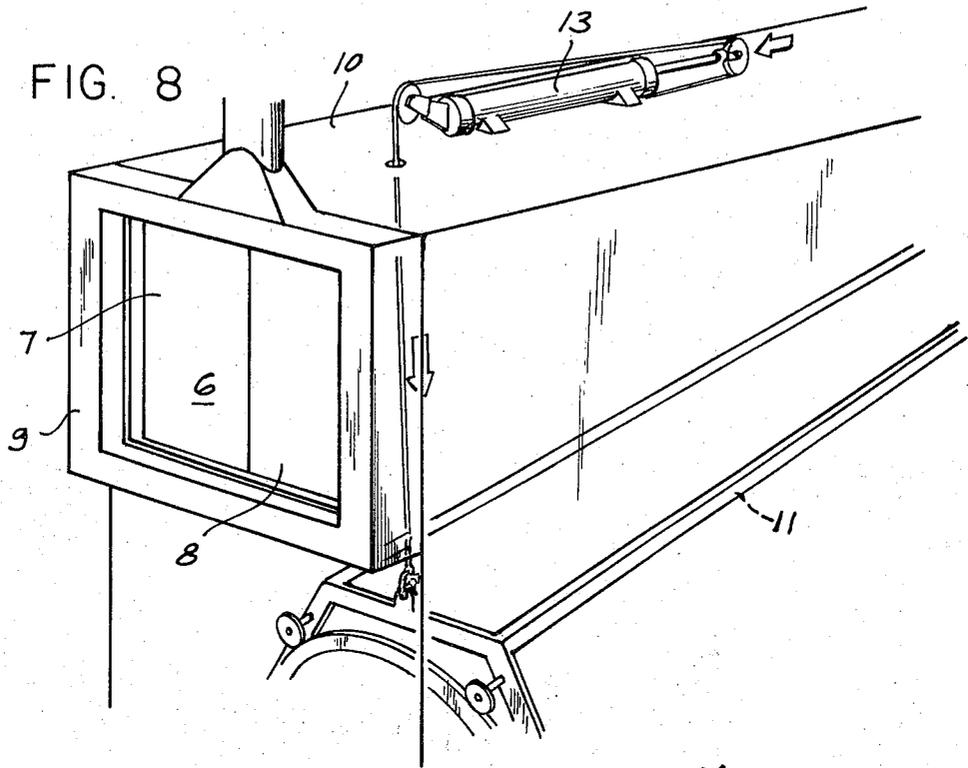


FIG. 5







## DEVICE FOR TREATING ARTICLES ARRANGED IN CONTAINERS WITH ORGANIC SOLVENTS

The present invention relates to a device for treatment of articles with a liquid. The articles are placed in perforated baskets, which are immersed in a liquid bath, the liquid then coming into contact with the articles due to the perforations. The invention particularly relates to a device for cleaning metal objects, for example degreasing. The liquid with which the metal object comes into contact consists of trichloroethylene. After the liquid treatment, the metal object is usually subjected to treatment with trichloroethylene vapour. After the liquid and vapour treatment, the metal object is dried.

The purpose of the present invention is to provide a device which is as automatic as possible and which receives a container with articles at the same time as it delivers a container with treated articles. This can be achieved through the use in the device of a holder for a number of containers for articles arranged one after the other, which holder is rotatable around the end which is located nearest the outlet opening of the device. The free end of the holder can be immersed in a liquid bath each time a new container is fed to it. The holder is also rotatable around its longitudinal axis, so that the liquid will come into good contact with the objects enclosed in the container.

The device according to the present invention also contains a liquid bath which is subjected to heating, so that vapour is formed. This vapour comes into contact with the container or containers which are located above the container which is in the liquid bath.

The device according to the invention also contains devices which limit the height to which the vapour rises. One method of achieving this is to use cooling coils.

According to the invention, the device comprises a closed housing with an inlet opening and an outlet opening, which contain closing devices which are actuated by the by-passing containers.

According to the invention, the inlet as well as the outlet are provided with exhaust devices, by means of which any fumes emanating from the housing are evacuated.

Further characteristic properties of the present invention will be noted from the following claims.

The present invention will be described in more detail with reference to the accompanying drawing, in which

FIGS. 1-3 show the device according to the invention in three different working phases,

FIGS. 4, 5, and 6 show a hoisting device comprised in the device in three different working phases,

FIG. 7 shows the holder for containers,

FIG. 8 shows a device for raising and lowering the holder member, and

FIG. 9 shows a device for turning the holder member about its own longitudinal axis.

In FIGS. 1-3, the reference designation 1 indicates a band conveyor for a perforated parallelepipedal container 2 with a cover. At its front end, the conveyor 1 is continued by a roller conveyor 3. At the roller conveyor 3, a hoisting device 4 is arranged, to move vertically. At the side of the hoisting device 4 there is a pusher 5, which is appropriately operated by hydraulic means. Opposite the pusher there is an inlet opening 6

with two doors 7 and 8. The inlet opening 6 is enclosed by a gate 9 with a rectangular cross section. The gate is connected with a suction device (not shown) and has suction nozzles in its inner envelope surface, for evacuation of fumes. The inlet opening 6 is located at the left end of a closed housing 10, which contains a holder 11 in the form of a drum, which is pivotal on an axle 12 at its right end. At its left end, the holder 11 is connected with a device 13 for raising and lowering the left end of the holder 11, i.e., the holder 11 executes a pivoting movement around the axle 12. The holder 11 is rotated around its longitudinal axis by means of a motor 14. The design of the holder 11 will be described in detail in the following. Under the left end of the holder there is a liquid containing tank 15, and under the right end of the holder there is a liquid containing tank 16. The tank 16 coacts with a heating device not shown, so that the liquid in the tank 16 is vapourized. The separating wall 22 between the two tanks 15 and 16 is arranged obliquely, in such a way that it will be more or less parallel to the holder 11 when the same is in the lowered position, as shown in FIG. 3. The two tanks 15 and 16 are intended to contain trichloroethylene. The housing 10 has a cooling coil (not shown) on its inside, which is placed in such a way that the trichloroethylene vapour will rise only to the height desired. This height is regulated by the distance of the cooling coil from the bottom of the liquid tanks. In the right end of the housing 10 there is an outlet opening 17 with two doors 18 and 19. The outlet opening has a gate 20 of the same kind and which has the same function as the gate 9. All of the doors have such properties that they assume a closed position, but open when actuated mechanically by a container. When the containers leave the opening, the doors close automatically. The opening and closing of the doors can, of course, be controlled in any known way whatsoever, for example with the aid of photocells.

The holder 11 in the present figures has such a length that when the holder is in the horizontal position, its left end is aligned with the opening 6. Thus, no conveyor is required between the opening 6 and the holder 11. The distance from the right end of the holder to the opening 17 corresponds to the length of a container. A conveyor is required here. However, this conveyor can be eliminated, but it can also be replaced by a conveyor having a length corresponding to the length of a certain number of containers. In the same way, a conveyor can be arranged in front of the left end of the holder 11, having a length corresponding to the length of a number of containers. Outside of the outlet opening 17 a conveyor track 21 is arranged, which consists of first a number of rollers, followed by a conveyor belt.

As shown in FIG. 4, the previously mentioned hoist 4 comprises a vertical supporting wall 23, which has three legs 24, 25 and 26, each of which, when the hoist is in the position for receiving a container, is in between two rollers in the roller track 3. Each leg 24-26 is connected with a cross bar 27, 28 and 29 extending between said rollers. The cross bars are held together at the right end by means of a connecting bar 30. The hoist is raised and lowered by means of a vertically movable rod 31, which is arranged to be actuated by a hydraulic cylinder 32.

In FIG. 7, the holder 11 is shown in more detail. It consists of a number of longitudinally arranged bars 34 which are connected to the corners of two hexagonal

frames 25 and 26. Thus, the longitudinal bars and the hexagonal frames form a framework 33. The framework 33 is rotatable on axle 12. Inside the framework 33, a second framework 33A is rotatably arranged. The framework 33A consists of two rings 37 and 38, to which the ends of four angle steel bars 39, 40, 41 and 42 are connected. The profiles of the angle steel bars form the corners of a rectangle, which rectangle corresponds to the cross section of a container. The angle bars constitute holders for inserted containers. The rings 37 and 38 are rotatably supported against a number of rolls 43 to 48 which are fastened to the hexagonal frames 35 and 36. The rolls run against the outer envelope surfaces of the rings 37 and 38. It can also be appropriate to arrange rolls which run against the flat, vertical surfaces of the rings 37 and 38, to prevent axial displacement of the framework 33A. As it is now apparent, framework 33 constitutes an outer cage and framework 33A an inner cage.

At its right end, the framework 33A is provided with a blocking device which has such properties that it allows a container to pass from left to right, but not in the opposite direction.

The ring 38 is connected with a peripheral gear ring, which coacts with a driving chain 49, which is in connection with the motor 14. This, in turn, is connected to a control member, not shown, which can set the framework 33A in motion around its own longitudinal axis in any arbitrary way whatsoever. Thus, the framework can be given unidirectional rotation, but can also be caused to rotate a certain number of turns in one direction and thereafter a number of turns in the other direction etc. Furthermore, the framework can also be caused to turn only a certain number of angular degrees in one direction and thereafter a number of angular degrees in the other direction.

FIG. 8 shows more clearly the hoisting device 13, which contains a wire cable 54. The hoisting device is of the hydraulic type, with a hydraulic piston connected to a rod.

FIG. 9 shows how the motor 14 is fastened to a stand 53, which is connected to the framework 33. In the housing 10 there is a slot 52 for passage of said stand. In the housing 10 there are also two slots 50 and 51 for the driving chain 49.

The device according to the present invention functions in the following way. As shown in FIG. 1 there is on the conveyor 1 a perforated container 2 on its way to the roller conveyor 3. When the container is on the roller conveyor 3, as shown in FIG. 4, the hoist 4 starts, and lifts the container up to the position shown in FIGS. 2 and 6. In this position the pusher 5 starts, and moves the container into the holder 11, so that the container enters into the left, outer position in the holder 11. At the same time, a container 2 is ejected onto the conveyor 21. In the present case the doors 7 and 8 open inwards when the container passes through. After it has passed, the doors are closed again. The exhaust devices at the gates 9 and 20 are functioning, and evacuate any emanating fumes or vapour. When the two openings are closed, the left end of the holder 11 is lowered, by means of the member 13. The left container in the holder 11 will then be immersed in the liquid in the tank 15, which consists of trichloroethylene. The temperature of the bath is approx. 40°C. From the tank 16, which is heated to approx. 87°C, trichloroethylene vapour is obtained, which rises to a height limited by said

cooling coil. The height is appropriately chosen so that when the holder is lowered, the second container from the left is subjected to treatment with trichloroethylene vapour. The other three containers are subjected to drying, which can be intensified through the use of suitable fan and heating units. When the holder 11 is in the lowered position, it is subjected to turning or rotation with the aid of the motor 14. When the left container has been subjected to the treatment desired, the holder 11 is raised up again, so that it is ready to receive a new container, in the way previously described, at the same time as one container is ejected. Through the present invention, the advantage is thus obtained that an automatically functioning degreasing device for metal articles is achieved, which functions in such a way that a container with objects to be treated is inserted in one end of the device, at the same time as a container with objects that have been treated leave the device. The device naturally works intermittently. The length of the intervals is determined by the time a container with articles needs to be kept in the trichloroethylene bath.

I claim:

1. A device for treating solid articles with a fluid organic solvent in continuous operation, said device comprising in combination:

a housing having an inlet opening and an outlet opening at opposite ends, the bottom part of said housing constituting a receptacle for treatment fluid; closure means for selectively closing and opening the inlet and outlet openings;

a container for articles to be treated, said container including wall openings for ingress and egress of treatment fluid;

an elongate holder for accommodating the container therein, said holder having openings for passage of treatment fluid and container inlet and outlet openings at its ends, said holder being disposed within the housing;

first mounting means supporting the end of the holder adjacent to the outlet opening of the housing pivotal about an axis transverse of the length of the holder, and second mounting means supporting the holder rotatable about its lengthwise axis; and drive means for selectively pivoting the holder between a horizontal position and a downwardly slanted position, the holder in its horizontal position being in alignment with the inlet and outlet openings of the housing for feeding containers into the holder and discharging the same therefrom and in its lowered position dipping part of its length into the bath in the housing.

2. A device for treating solid articles according to claim 1 and comprising loading means coacting with the housing at the inlet end thereof for pushing successive containers through the inlet opening of the housing into the holder for treatment of the articles therein and for simultaneously pushing a container with treated articles therein out of the holder and through the outlet opening of the housing.

3. A device for treating solid articles according to claim 2 and further comprising conveying means contiguous with the inlet and the outlet opening of the housing for feeding successive containers to the inlet end of the housing and removing containers discharged at the outlet end of the housing.

4. A device for treating solid articles according to claim 1 wherein said holder comprises at its inlet end

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one-way retaining means permitting movement of successive containers into the holder through said inlet end but blocking leaving of containers through said holder end thereby preventing sliding of containers out of the holder when it is in its downwardly slanted position.

5. A device for treating solid articles according to claim 1 wherein said closure means comprise actuating means responsive to activation for opening the closure means upon being engaged by a container and for closing the closure means upon passage of said container through the respective housing opening.

6. A device for treating solid articles according to claim 1 wherein a partition wall divides said receptacle, said wall being slanted so as to accommodate said holder in its downwardly slanted position, and heating means for heating treatment fluid in the compartment adjacent to the pivotally mounted end of the holder for effecting vaporization of fluid in said compartment.

7. A device for treating solid articles according to claim 6 and comprising cooling means disposed above the bottom of said heatable compartment, said cooling means limiting the rise of vapors to a selected level above the receptacle bottom by condensation of the vapors.

8. A device for treating solid articles according to claim 1 and comprising exhaust means communicating with said housing for exhausting fumes released within the housing by the treatment fluid.

9. A device for treating solid articles according to claim 1 wherein said drive means for rotating said holder about its lengthwise axis comprises an outer cage pivotal about said transverse axis but secured against rotation, an inner cage lengthwise disposed within said outer cage, and bearing rollers journaling the inner cage within the outer cage.

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