

May 15, 1956 **M. AUWÄRTER** **2,745,767**
PROCESS AND APPARATUS FOR TREATING BY VAPOUR DEPOSITION A
PLURALITY OF ARTICLES INTRODUCED AT SEVERAL LEVELS, WHILE
MAINTAINING THE SAME VACUUM
Filed July 11, 1952 **2 Sheets-Sheet 1**

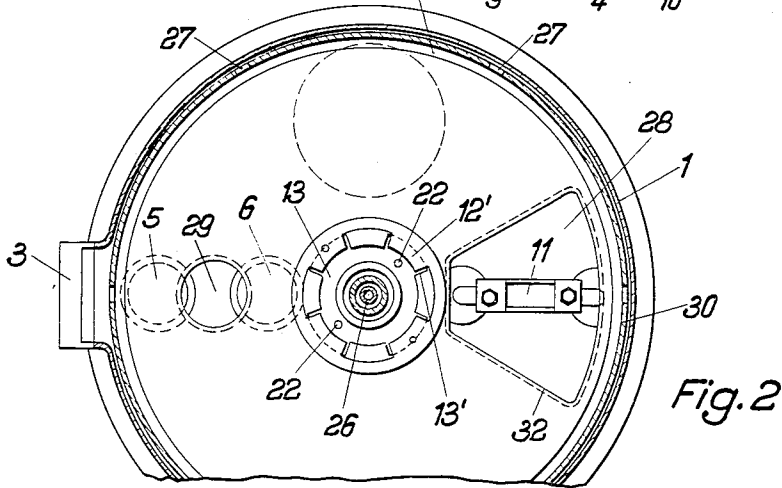
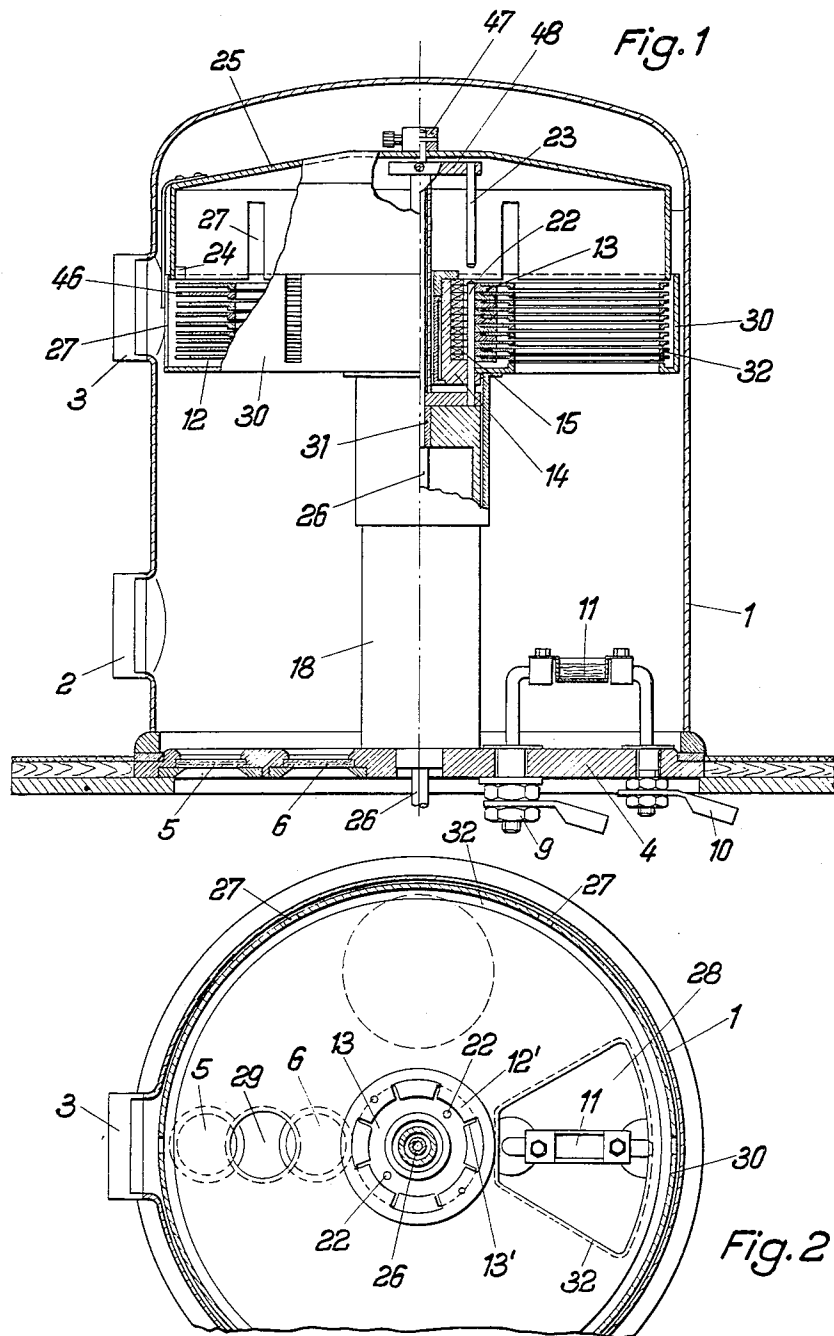
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2 Sheets-Sheet 2

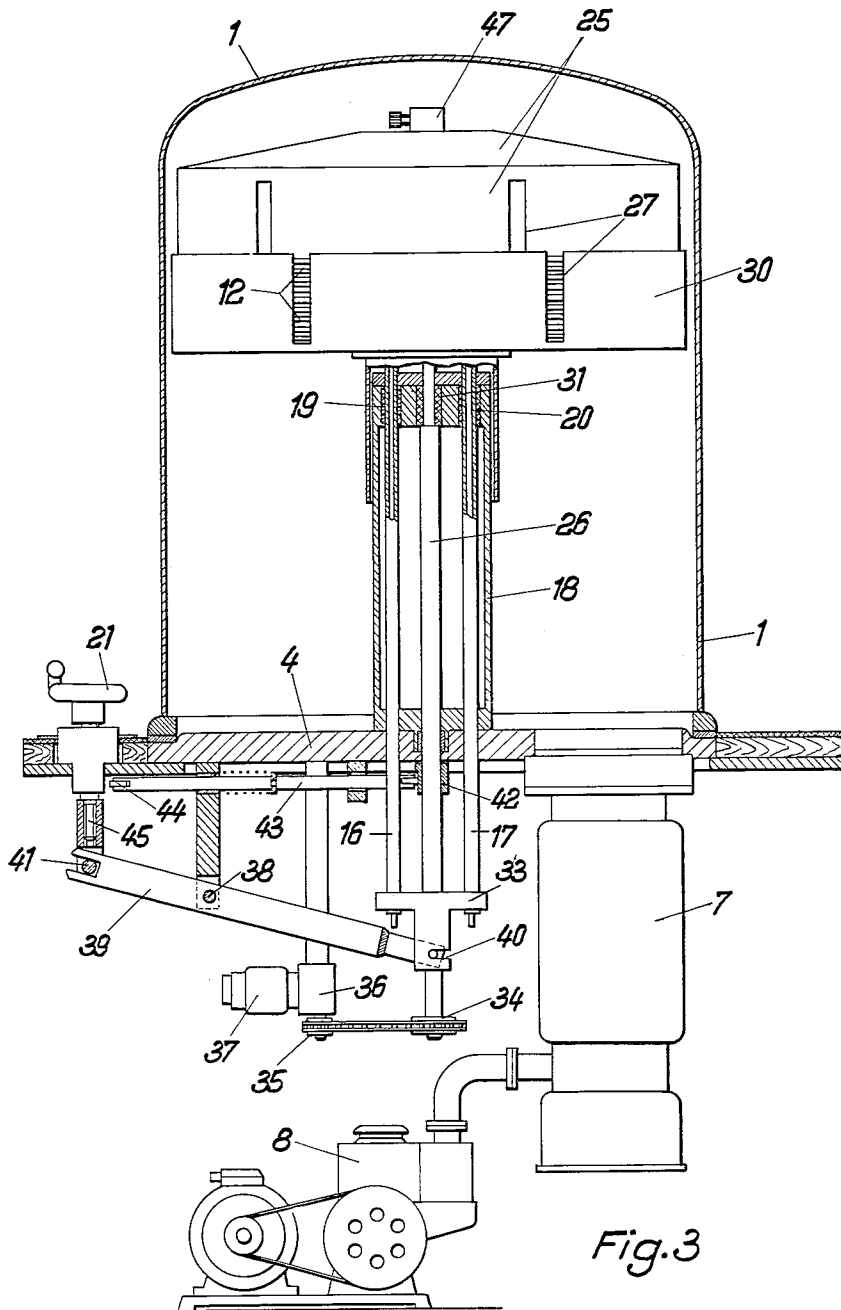


Fig. 3

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2,745,767

PROCESS AND APPARATUS FOR TREATING BY VAPOUR DEPOSITION A PLURALITY OF ARTICLES INTRODUCED AT SEVERAL LEVELS, WHILE MAINTAINING THE SAME VACUUM

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Claims priority, application Austria July 23, 1951

14 Claims. (Cl. 117—38)

The previously known processes for treating by vapour deposition a plurality of articles while maintaining the same vacuum are unsatisfactory for various reasons.

In the first place the number of articles which may be treated by vapour deposition simultaneously is relatively small, because it was believed that generally these articles can be arranged only on a single plate or dish to provide equal conditions of vapour deposition, particularly, an equal distance between the source of vapour and the articles to be treated. Whereas such plate has been arranged already so as to be rotatable about a diameter, whereby it becomes possible to arrange articles on both surfaces of the plate and to treat them by vapour deposition successively, while maintaining the same vacuum, this practice has the result that the articles to be treated must be secured against dropping so that special retaining means are required. Moreover, the freedom of rotation of the plate involves the necessity of giving the space to be evacuated a correspondingly large size, with considerably prolonged periods of evacuation. Finally, the disadvantage ensues that the back of the plate, remote from the source of vapour, tends to be soiled by particles, which may consist of residual dust, or may escape or separate from the workpiece or material surfaces exposed to the high vacuum, or, finally, may originate from the source of vapour itself and pass over the plate rim to enter the space delimited by the plate top face.

The present invention has the object of eliminating these disadvantages and difficulties and to increase the surface of the vacuum installation, on which articles to be treated by vapour deposition may be placed, to such a degree that in a vacuum installation of the same size the degree of utilization is increased several times, whereas the conditions of evaporation are always the same and, above all, any changes of already treated articles, which changes may consist primarily in the absorption of impurities and other foreign matter, are precluded completely.

The process suggested for solving this engineering problem, for treating by vapour deposition a plurality of articles introduced at several levels, while maintaining the same vacuum, is characterized according to the invention in that articles arranged at one level are passed through the stream of vapour transversely to the latter, and that subsequently articles introduced at other levels are passed through the stream of vapour transversely thereto, until all articles introduced have been treated. When the articles introduced at other levels are moved, before their vapour deposition treatment, to the level in which the vapour deposition treatment of the articles introduced first into the stream of vapour is effected, then the above-mentioned perfect equality of all conditions of vapour deposition will ensue.

An installation of particularly small size becomes possible when the articles are passed through the stream of vapour along curved paths in planes extending transversely to the direction of the stream of vapour, whereas

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other directions of movement, such as reciprocating rectilinear motion, are not precluded.

Installations of most favorable dimensions result when the articles are passed transversely through the stream of vapour along a circular path in planes, preferably in one plane, extending at right angles to the direction of the vapour.

To facilitate the practical performance of the process and, further, to avoid any change in articles already treated by vapour deposition, the stream of vapour is caused to bypass articles already treated, or the process is reversed kinematically. As a result, the motion of the articles in a direction transversely to the stream of vapour is completed before they can enter the stream of vapour again.

Apparatus for carrying out the process is characterized preferably in that vapour deposition plates having peripherally extending passage apertures for the stream of vapour are arranged vertically one over the other in a vacuum-tight chamber, and that the device serving to produce the stream of vapour is situated below the plates. The set consisting of the plates is suitably arranged to be lifted and lowered, so that the plate with the articles to be treated by vapour deposition at a time can be caused to assume a certain, uniform position. On the other hand, to enable the plates to perform with the articles placed thereon a movement directed transversely, preferably at right angles to the stream of vapour, a driving drum is provided which embraces the set of plates and is connected to drive means. Such drum preferably serves at the same time as a receiving drum for the plates having articles already treated by vapour deposition. The engaging member of the driving drum is to be arranged in juxtaposition to the engaging gap of the respective uppermost plate of that pile of plates which consists of those plates of the set of plates which have been charged with articles but have not yet been treated. Moreover, an interruption gap of guide pins, on which the plates of a pile of plates with articles treated by vapour deposition already, and the plates of a second pile of plates charged with articles but not yet treated, are aligned, is to be arranged also at the level of that engaging member in order that the respective uppermost plate of the pile of plates charged with articles but not yet treated, which uppermost plate is moved by the engaging member, becomes free to rotate and is rotated by the engaging member.

What has been said of the uppermost plate applies analogously to the lowermost plate because obviously a driving and receiving drum embracing the set of plates from above can be replaced by such drum embracing the set of plates from below.

Further details of the apparatus constructed according to the invention are illustrated with reference to an example, which shows a vapour deposition plant operating in a vacuum and serving to produce thin protective layers on glasses to be used, e. g., as sun glasses. These thin layers may consist of dielectrics, metals, or component layers of both. Obviously the base bodies consisting of glass may be replaced by any other body on which thin layers can be and are to be applied.

In detail, the drawing shows in:

Fig. 1 a vertical longitudinal section through the vacuum chamber of the vapour deposition plant, in

Fig. 2 a horizontal transverse section through the lower pile of plates, on line II--II of the vacuum chamber shown in Fig. 1, whereas

Fig. 3 shows the entire plant in a longitudinal section extending at right angles to the plane of section of Fig. 1, partly in elevation.

In the drawings, 1 designates the vacuum chamber, which is provided at 2 and 3 with sight glasses enabling

an observation of the interior of the vacuum chamber. The vacuum chamber 1 rests on a base plate 4, which is also equipped with sight glasses 5 and 6 for the observation of the vapour deposition process. The vacuum chamber 1 communicates through an open aperture of the base plate with the diffusion pump 7, which serves to produce a high vacuum of about 10^{-6} mm. Hg. A fore pump produces the necessary preliminary vacuum. The base plate 4 further accommodates the lead-in tubes for the conductors 9 and 10 for the ingoing and outgoing current. The current thus introduced into the vacuum chamber 1 serves to heat a shuttle of high-melting-point materials, which serves to accommodate the substance 11 to be deposited out of the vapour phase on articles such as glasses, particularly for spectacles, lenses, articles of mica, quartz, synthetic resins, or other materials, for plating the same. Substances such as silicon monoxide or oxide mixtures such as magnetite may be used to produce on glasses for the human eye layers of the small thickness required, as a protection against glare. When component layers consisting of different substances are to be evaporated in the same vacuum, several shuttles, with the corresponding current connections, may be arranged one beside the other and can be operated either in succession or together, i. e., simultaneously.

The articles to be treated by vapour deposition are situated on plates 12, a plurality of which is arranged vertically one over the other in a concentric relationship. At the place where the articles are situated, the plate bottom has apertures of such size and delineation as to ensure the necessary vapour deposition treatment of the articles. The plates rest on retaining rings 13 which themselves are mounted on the central pin 14 by means of anti-friction bearings, preferably ball bearings 15. The entire set of plates is vertically adjustable. To this end the ring pin 14 is subjected to the action of two carrying rods 16 and 17, the adjustability of which will be discussed hereinafter. The carrying rods 16 and 17 are accommodated in an all-encasing central column 18. Vacuum-tight wall ducts are provided in the top end wall of the column at 19 and 20. The column 18 further carries the guide pins 22 and 23. The pins 22 enter apertures of those rings 13 which carry the pile of plates charged with articles not yet treated, i. e., in the vertical position of the set of plates shown in Fig. 1, all plates except the uppermost one, which is just prepared for the vapour deposition treatment of the articles carried by it, or may be considered as just undergoing the vapour deposition treatment. On the other hand, the guide pins 23 enter corresponding apertures of those carrying rings 13, which are associated with the plates of the upper pile of plates (not shown), which carry articles already treated by vapour deposition. Since the stationary guide pins 22 and 23 penetrate certain carrying rings, the plates 12 carried by said rings 13 are secured against rotation. As has been mentioned, the only exception is the respective uppermost plate of the lower pile of plates; that plate is freely rotatable. This rotation is effected through the intermediary of an engaging member 24, provided in a driving and receiving drum 25. The drum 25 is subjected to the action of a drive shaft 26 extending through the column 18. A vacuum seal 31 in the end wall of the column 18 seals the shaft 26 against the high-vacuum chamber 1. The drum 25 has exhaust slots at 27.

Each plate 12 has at 28 a peripheral aperture of sector shape. In the position in which the plate 12 is arrested by the guide pins 22, 23, these apertures 28 are in vertical register so that a vapour deposition treatment of the plate to be treated at any time is possible through these apertures 28. At 29 the plates 12 have another aperture. In conjunction with an illuminating system (not shown), which is arranged below the sight glasses 5, 6, the apertures 29 provide the possibility of an accurate observation of the motions and vapour deposition processes.

Further observation is possible through the sight glasses 2, 3.

To preclude an irregular vapour deposition treatment of the plates and the articles carried by them while the plates 12 are arrested by the pin 22, a screen 30 is arranged around the lower pile of plates. The screen 30 again has exhaust and observation slots 27. The drum 25 performs the same function in respect of the plates which, being arrested by the pins 23, carry articles already treated by vapour deposition. Moreover, the plates 12 are flanged at least at their outer periphery, at 32, and suitably also at their inner edge, so that a lateral flow of substances evaporated at 11 into the spaces between the several plates is prevented.

To preclude an inadmissible temperature rise of the anti-friction bearings 15, the carrying rods 16 and 17 consist of tubes serving to conduct a coolant, whereby the ring pin 14, carrying rings 13, and anti-friction bearings 15 are indirectly cooled. The rods 16 and 17 are received in the crosspiece 33, which communicates with a coolant supply and discharge means (not shown). The drive shaft carries at 34 a gear so that the drive of the drum 25 can be effected through countergear 35, gear box 36, and motor 37. The crosspiece 33 is subjected to the action of the double lever 39 mounted at the fixed point 38, fork guides 40 and 41 compensating the arcuate motions. The lifting and lowering of the plates 12 is effected by means of the hand wheel 21. This operation can be carried out automatically by the cam 42 keyed to the shaft 26 and operating the push rod 43 after each turn of the shaft 26. Through the roller arrangement 44 and a ratchet drive (not shown) the push rod 43 effects the automatic stepping of the spindle 45 so that after each turn of the drive shaft 26 and drum 25 the lower pile of plates is moved by the overall height of a plate whereby the plate, the articles on which have just been treated by vapour deposition, is arrested by the guide pin 23 whereas the engaging gap 46 of the next plate engages the engaging nose 24 of the drum 25. Thus the respective plate is carried along with the turn of the shaft 26 taking place now, and performs the rotation required for the vapour deposition treatment of the articles carried by it. This is repeated until the lowermost plate has performed its rotation, whereupon a stop (not shown) of the same arrests the motor 37. At that time the vapour deposition treatment of the batch has been completed.

The mode of operation of the apparatus thus described is obvious from what has been said hereinbefore.

When the chamber 1 has been lifted—this may be effected mechanically by means of an automatically controlled lift—the fixing means 47 is released first so that the drum 25 can be drawn off upwardly. Then the holder 48 with the guide pins 23 is released and removed, to enable the single plates 12 to be removed axially from the retaining rings, after each plate has been turned about its vertical axis so that the annular carrying lugs 12' register with corresponding recesses 13' of the carrying rings 13.

Outside the vacuum installation, articles for the vapour deposition treatment for which the plates 12 are intended are placed on the latter. In correspondence with the adaption of the plates to the articles to be treated by vapour deposition, other plates may have been provided with different articles in the meantime so that after the removal of the plates provided with articles treated, the new set of plates, provided with articles not treated, is introduced immediately, without loss of working time. When the set of plates to be charged, which thus becomes the lower pile of plates, has been introduced completely, as is shown in Fig. 1 of the drawing, the parts 23, 48, 25, 47, and 1 are built in again. In this operation the engaging nose 24 will enter automatically the engaging recess 46 of the uppermost retaining ring because another position of the plates is precluded by the alignment of the plates 12 on the pin 22. Then the pumps 8 and 7 are started. After a high vacuum has been produced in

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the chamber 1, the evaporation process in the shuttle 11 is started. As soon as the upward stream of vapour has formed, the motor 37 is started. This means that the uppermost plate 12 performs its rotation and that the articles lying thereon are contacted by the stream of vapour through the vertically registering apertures 28. As soon as the uppermost plate 12 has performed its rotation, the carrying rods 16 and 17 are stepped upwardly by the overall height of a plate by means of the members 42, 43, 44, 45, and 39. Thereby the uppermost plate enters the range of the guide pin 23 and is thus arrested. The next plate assumes its position at exactly the same distance from the source of vapour 11 and through parts 46, 24 comes under the influence of the drum 25. It now also performs a turn so that the articles carried by it are treated by vapour deposition. This is repeated automatically until the vapour deposition treatment of the last plate has been completed. The vapour deposition treatment of all plates thus takes place under exactly the same conditions. The drum 25 receives the articles the vapour deposition treatment of which has been completed, with the plates carrying them, and protects the articles treated by vapour deposition against the access of all kinds of undesired foreign matter.

It is in the nature of the invention that the possibilities of carrying it out are not exhausted at all by the embodiment shown. Instead of carrying plates, other structures such as baskets, screens, networks, or the like may be used as holders or carriers for the articles to be treated by vapour deposition. The bell- or hood-shaped drum 25 may be replaced by radial arms or other gripping means, and the protection against the access of foreign matter may be provided by separate hoods or the like, which are not moved. The engaging nose and engaging gap may be replaced by any other coupling means. The decisive feature of the invention resides essentially in that a plurality of articles introduced at several levels can be subjected to vapour deposition in the same vacuum and under uniform conditions.

What I claim is:

1. The process of treating by vapour deposition a plurality of articles introduced at several levels into a vacuum chamber while maintaining the same vacuum, comprising creating a vacuum in said chamber, producing within this vacuum a stream of vapour, and conducting groups of superposed rings through the vapour stream at the same level in succession by passing articles situated at the same level through the stream of vapour, after all articles situated at the same level have been passed through the stream of vapour, moving the articles situated at at least one level to the level where the articles treated by vapour deposition already has been situated, at the same time shielding the articles already treated by vapour deposition against the stream of vapour, and passing the articles through the stream of vapour at that level at which the articles already treated by vapour deposition had been situated while being thus treated.

2. The process of treating by vapour deposition a plurality of articles introduced at several levels into a vacuum chamber while maintaining the same vacuum, comprising creating a vacuum in said chamber, producing within this vacuum a stream of vapour, and conducting groups of superposed rings through the vapour stream at the same level in succession by passing articles situated at the same level through the stream of vapour transversely thereto along a curved path, after all articles situated at the same level have been passed through the stream of vapour, moving the articles situated at at least one adjacent level to the level where the articles already treated by vapour deposition had been situated, at the same time shielding the articles already treated by vapour deposition against the stream of vapour, and passing the moved articles through the stream of vapour transversely thereto along a curved path at that level at which the next previously treated articles had been situated while being thus treated.

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3. The process of treating by vapour deposition a plurality of articles introduced at several levels into a vacuum chamber while maintaining the same vacuum, comprising creating a vacuum in said chamber; producing within this vacuum a stream of vapour, and conducting groups of superposed rings through the vapour stream at the same level in succession by passing articles situated at the same level through the stream of vapour transversely thereto along a closed circular path, after all articles situated at the same level have been passed through the stream of vapour, moving the articles situated at at least one adjacent level to the level where the articles already treated by vapour deposition had been situated, at the same time shielding the articles already treated by vapour deposition against the stream of vapour, and passing the articles through the stream of vapour transversely thereto along a closed circular path at that level at which the next previously treated articles had been situated while being thus treated.

4. The process of treating by vapour deposition a plurality of articles introduced at several levels into a vacuum chamber while maintaining the same vacuum, comprising creating a vacuum in said chamber; producing within this vacuum a stream of vapour, and conducting groups of superposed rings through the vapour stream at the same level in succession by passing articles situated at the same level through the stream of vapour transversely thereto along a closed circular path, completing the passage of the articles already through the stream of vapour before articles treated by vapour deposition are again introduced into the stream of vapour, after all articles situated at the same level have been passed through the stream of vapour, moving the articles situated at at least one adjacent level to the level where the articles already treated by vapour deposition had been situated, at the same time shielding the articles already treated by vapour deposition against the stream of vapour, passing the articles through the stream of vapour transversely thereto along a closed circular path at that level at which the next previously treated articles by vapour deposition had been situated while being thus treated, and completing the passage of the articles through the stream of vapour before articles already treated by vapour deposition are again introduced into the stream of vapour.

5. The process of treating by vapour deposition a plurality of articles introduced at several levels into a vacuum chamber while maintaining the same vacuum, comprising creating a vacuum in said chamber; producing within this vacuum a stream of vapour, and conducting groups of superposed rings through the vapour stream at the same level in succession by passing articles situated at the same level through the stream of vapour, after all articles situated at the same level have been passed through the stream of vapour, moving the articles situated at at least one adjacent level to the level where the articles already treated by vapour deposition had been situated, at the same time shielding the articles already treated by vapour deposition against the stream of vapour, passing the articles through the stream of vapour at that level at which the articles next previously treated by vapour deposition had been situated while being thus treated, and repeating said steps until all articles have been treated by vapour deposition.

6. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing a stream of vapour, at least two vapour deposition plates arranged in said container one behind the other in the direction of the stream of vapour, in said vapour deposition plates, excepting at most one, an aperture of the minimum size of the cross section of the stream of vapour, means for moving the vapour deposition plates in the direction trans-

verse to the stream of vapour, means for moving the vapour deposition plates in the direction of the stream of vapour, said means adapted to move each vapour deposition plate to the same position relative to the means producing the stream of vapour.

7. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing a stream of vapour, at least two vapour deposition plates lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, an aperture of the minimum size of the cross section of the stream of vapour, means for producing a rotation of the vapour deposition plates about their vertical axis of rotation, a device for lifting and lowering the vapour deposition plates, said device adapted to move a vapour deposition plate with articles not yet treated by vapour deposition to the level at which a plate is situated during the vapour deposition treatment.

8. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, said vapour deposition plates consisting of annular plates, each of said annular plates having a stop at its rim, a bearing pin penetrating the central apertures of the vapour deposition plates and contacting the lower plate with an engaging surface, said bearing pin being constructed to be lifted and lowered, in the container a bellshaped drum the cavity of which faces the vapour deposition plates, the size of said cavity being such that all plates are receivable in the drum cavity, said drum arranged above the bearing pin, drive means for the drum, which is arranged for rotation about a vertical axis, at said drum a counterstop for the stop of the vapour deposition plate which at any time is at the level of the drum counterstop, means to enable the bearing pin to be lifted and lowered, in said vapour deposition plates apertures for the stream of vapour, and stops at the rim of said plates, situated in the same relative angular position in all vapour deposition plates, said relative angular position being determined so that in the position assumed by a vapour deposition plate stop under the influence of a drum counterstop, the apertures of all vapour deposition plates for the stream of vapour lie vertically one over the other, and above the means for producing the stream of vapour.

9. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, an aperture of the minimum size of the cross section of the stream of vapour, said vapour deposition plates consisting of annular plates, each of said annular plates having a stop at its rim, a bearing pin penetrating central apertures of the vapour deposition plates and contacting the lower plate with an engaging surface, said bearing pin being constructed to be lifted and lowered, in the receiver a bell shaped drum the cavity of which faces the vapour deposition plates, the size of said cavity being such that all plates are

receivable in the drum cavity, said drum arranged above the bearing pin, drive means for the drum, which is arranged for rotation about a vertical axis, at said drum a counterstop for the stop of that deposition plate which at any time is at the level of the drum counterstop, means to enable the bearing pin to be lifted and lowered, in said vapour deposition plates apertures for the stream of vapour, and stops at the rim of said plates, situated in the same relative angular position in all vapour deposition plates, said relative angular position being determined so that in the position assumed by a vapour deposition plate stop under the influence of a drum counterstop, the apertures of all vapour deposition plates for the stream of vapour lie vertically one over the other, and above the means for producing the stream of vapour, at least one pair of arresting pins for the vapour deposition plates, the arresting pins of each pair lying opposite each other and having between them a gap of the vertical dimension of a vapour deposition plate, the length and vertical position of the lower arresting pin of a pair of arresting pins being equal to the length and vertical position of the bearing pin, the upper arresting pin being arranged in the drum cavity.

10. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates arranged in said container one behind the other in the direction of the stream of vapour, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, means for moving the vapour deposition plates in the direction transverse to the stream of vapour, means for moving the vapour deposition plates in the direction of the stream of vapour, said means adapted to move each vapour deposition plate to the same position relative to the means producing the stream of vapour, mechanism adapted to maintain the means to move the vapour deposition plates in the direction of the stream of vapour in automatic dependence on the means to move the vapour deposition plates in the direction transverse to the stream of vapour, in such a manner that after all articles arranged on a vapour deposition plate have been passed through the stream of vapour the adjacent plate with articles not yet treated by vapour deposition is moved into the position relative to the means producing the stream of vapour previously assumed by the vapour deposition plate with articles already treated by vapour deposition.

11. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, said vapour deposition plates consisting of annular plates, each of said annular plates having a stop at its rim, a bearing pin penetrating central apertures of the vapour deposition plates and contacting the lower plate with an engaging surface, said bearing pin being constructed to be lifted and lowered, in the receiver a bell-shaped drum the cavity of which faces the vapour deposition plates, the size of said cavity being such that all plates are receivable in the drum cavity, said drum arranged above the bearing pin, drive means for the drum, which is arranged for rotation about a vertical axis, at said drum a counterstop for the stop of that annular plate type vapour deposition plate which at any time is at the level of the drum counterstop, a drumshaped screening jacketing the vapour deposition

plates aligned on the bearing pin, exhaust slots in said drums and said screening, and means to enable the bearing pin to be lifted and lowered, said means consisting of cooled carrying rods.

12. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, said vapour deposition plates consisting of annular plates, each of said annular plates having a stop at its rim, a bearing pin penetrating central apertures of the vapour deposition plates and contacting the lower plate with an engaging surface, said bearing pin being constructed to be lifted and lowered, in the receiver a bellshaped drum the cavity of which faces the vapour deposition plates, the size of said cavity being such that all plates are receivable in the drum cavity, said drum arranged above the bearing pin, drive means for the drum, which is arranged for rotation about a vertical axis, said drive means consisting of a central drive shaft for the bellshaped drum, at said drum a counterstop for the stop of that annular plate type vapour deposition plate which at any time is at the level of the drum counterstop, means to enable the bearing pin to be lifted and lowered, said means consisting of cooled carrying rods, a column arrangement jacketing in the container the central drive shaft for the bellshaped drum and the carrying rods for the bearing pin, a drive cam outside said container on said drive shaft of the bellshaped drum, means operated by the drive cam to automatically move vertically the carrying rods of the bearing pin by a distance corresponding to the vertical dimension of a vapour deposition plate after each rotation thereof, whereby the vapour deposition treatment of the articles of a vapour deposition plate is effected.

13. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, observation and illuminating windows in the container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates arranged in said container one behind the other in the direction of the stream of vapour, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, illuminating windows in said vapour deposition plates, an illuminating system arranged outside the container and adapted to illuminate the articles carried by the vapour deposition plates through the illuminating windows of the container and of the vapour deposition plate, and to enable their observation through the observation windows of the container, means for moving the vapour deposition plates in the direction transverse to the stream of vapour, means for moving the vapour deposition plates in the direction of the stream of vapour, said means adapted to move each vapour deposition plate to the same position relative to the means producing the stream of vapour.

14. Apparatus for treating by vapour deposition a plurality of articles situated at several levels, while maintaining the same vacuum, comprising, in combination, a container, observation and illuminating windows in the container, a vacuum producing device for the container, means inside the container for producing at least one stream of vapour, at least two vapour deposition plates

lying in said container vertically over the means for producing the stream of vapour and arranged vertically one behind the other, in said vapour deposition plates, excepting at most one, at least one aperture of the minimum size of the cross section of the stream of vapour, illuminating windows in said vapour deposition plates, an illuminating system arranged outside the container and adapted to illuminate the articles carried by the vapour deposition plates through the illuminating windows of the container and of the vapour deposition plate, and to enable their observation through the observation windows of the container, said vapour deposition plates consisting of annular plates, each of said annular plates having a stop at its rim, a bearing pin penetrating central apertures of the vapour deposition plates and contacting the lower plate with an engaging surface, said bearing pin being constructed to be lifted and lowered, said bearing pin being constructed for being cooled, annular members constituting carriers for the vapour deposition plates, said annular members aligned on the bearing pin, revolvable members between the annular members, in the receiver a bellshaped drum the cavity of which faces the vapour deposition plates, the size of said cavity being such that all plates are receivable in the drum cavity, said drum arranged above the bearing pin, drive means for the drum, which is arranged for rotation about a vertical axis, said drive means consisting of a central drive shaft for the bellshaped drum, at said drum a counterstop for the stop of the deposition plate which at any time is at the level of the drum counterstop, means to enable the bearing pin to be lifted and lowered, said means consisting of cooled carrying rods, in said vapour deposition plates apertures for the stream of vapour, and stops at the rim of said plates, situated in the same relative angular position in all vapour deposition plates, said relative angular position being determined so that in the position assumed by a vapour deposition plate stop under the influence of a drum counterstop, the apertures of all vapour deposition plates for the stream of vapour lie vertically one over the other, and above the means for producing the stream of vapour, at least one pair of arresting pins for the vapour deposition plates, the arresting pins of each pair lying opposite each other and having between them a gap of the vertical dimension of a vapour deposition plate, the length and vertical position of the lower arresting pin of a pair of arresting pins being equal to the length and vertical position of the bearing pin, the upper arresting pin arranged in the drum cavity, a column arrangement jacketing in the container the central drive shaft for the bellshaped drum and the carrying rods for the bearing pin, a drive cam outside said container on said drive shaft of the bellshaped drum, means operated by the drive cam to automatically move vertically the carrying rods of the bearing pin by a distance corresponding to the vertical dimension of a vapour deposition plate after each revolution thereof, whereby the vapour deposition treatment of the articles of a vapour deposition plate is effected.

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