July 12, 1949. J. C. OGLE, JR 2,475,854

APPARATUS FOR COATING BY THERMAL VAPORIZATION

Filed June 20, 1945

2 Sheets-Sheet 1

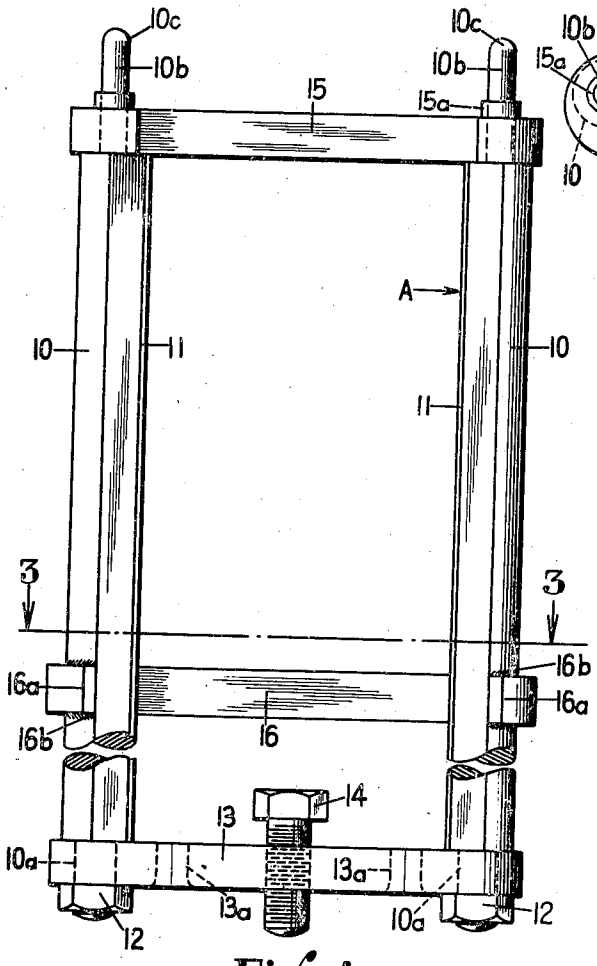


Fig. 1

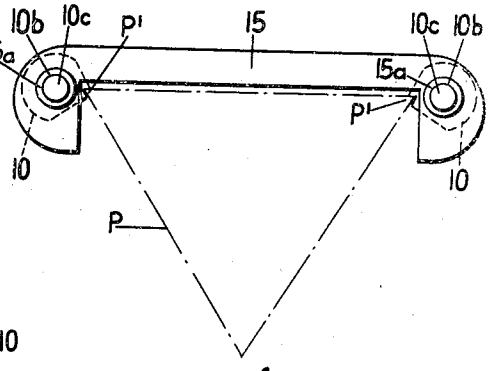


Fig. 2

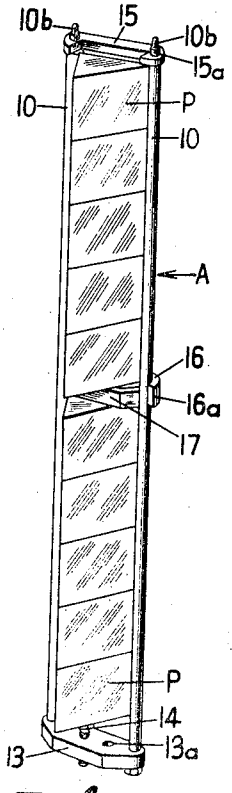


Fig. 4

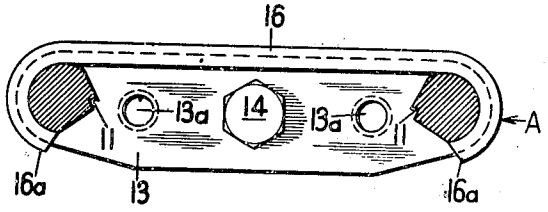


Fig. 3

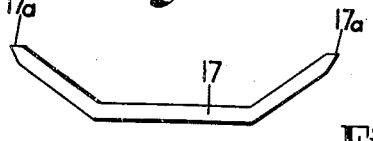


Fig. 5

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Fig. 6.

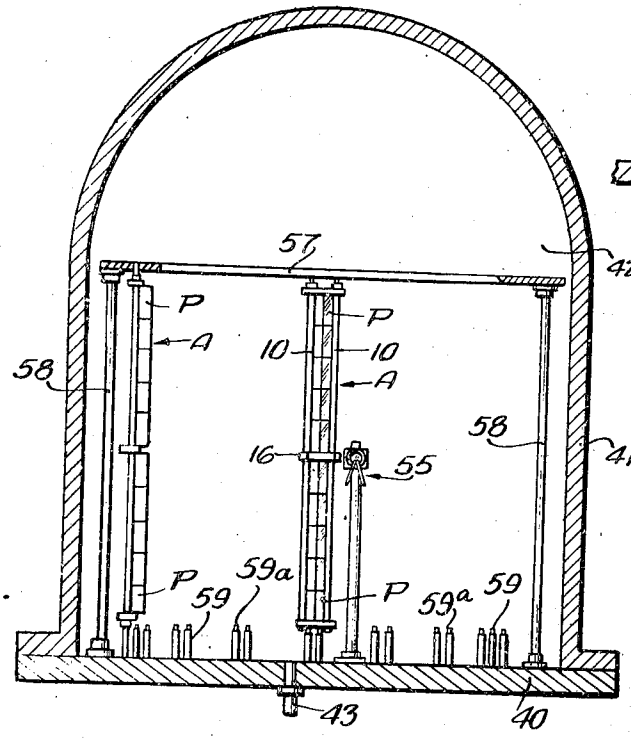
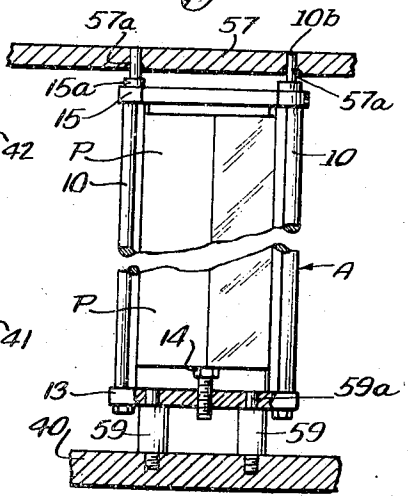


Fig. 7.



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APPARATUS FOR COATING BY THERMAL VAPORIZATION

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2 Claims. (Cl. 91—12.2)

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My invention relates to apparatus for coating by thermal vaporization. It has to do, more particularly, with apparatus for supporting a plurality of article-carrying racks within a vacuum chamber of a thermal evaporating unit where a coating is applied to such articles.

The main object of my invention is to provide apparatus for coating by thermal vaporization wherein racks, which carry a plurality of such articles, are supported within the evaporating chamber in a predetermined manner so as to present the proper surfaces of the articles for coating.

A further object of my invention is to provide an apparatus including a vacuum chamber with improved means for releasably supporting the article-carrying racks in upright positions above the floor or base of the vacuum chamber and in predetermined spaced relationship, so as to present the articles carried in stacked relation by the racks to suitable units or equipment for depositing, preferably by thermal evaporation, metal or other coating materials upon the surfaces of the articles, said supporting means being capable of maintaining the racks and their supported articles in stationary but removable condition.

Another object of the invention is to provide improved means within a vacuum chamber for releasably or removably supporting a plurality of portable article-carrying racks within said chamber.

The foregoing and other objects and advantages of the invention will appear from the following description and appended claims when considered in connection with the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In said drawings:

Fig. 1 is a side elevational view, parts being broken to save space, of a preferred form of article-supporting rack or frame used with the present invention.

Fig. 2 is a top plan view of the structure shown in Fig. 1 and indicating in broken lines one type of article in supported condition in the rack.

Fig. 3 is a horizontal sectional view taken substantially along the line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is a perspective view of the rack shown in the preceding figures supporting a plurality of articles arranged in stacked relationship therein.

Fig. 5 is a top plan view of a spacer member or device forming a part of the rack structure of the preceding views.

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Fig. 6 is a vertical sectional view, partly in elevation, of a thermal depositing apparatus or chamber having therein improved rack-supporting means embodying the present invention.

Fig. 7 is a fragmentary detail elevational view, partly in section, on an enlarged scale and broken away, of the rack supporting means and one of the article carrying racks of Fig. 6.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. It is to be understood also that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention herein claimed beyond the requirements of the prior art.

Referring now particularly to Figs. 1 to 5, inclusive, of the drawings, there is shown in these figures one preferred form of article-supporting rack or frame structure which is preferably used with the present invention. As shown, the rack structure A comprises a pair of spaced longitudinally extending substantially parallel rods or members 10 each of which has a longitudinally extending substantially V-shaped slot, groove, or notches 11 formed therein. The lower ends, with reference to Fig. 1, of the rods 10 are reduced at 10a and the outer end portions thereof are threaded to receive nuts 12. The upper ends of the rods 10 are likewise of reduced diameter and terminate in pins or projecting portions 10b having rounded or dome-like outer ends or tips 10c.

The lower ends of the rods are maintained in their spaced and substantially parallel relationship by means of a transverse frame member 13 having holes or openings through which the reduced end portions 10a of the rods extend, the transverse member being fixed to the rods by the nuts 12, above mentioned. The member 13, as shown, is provided with preferably round holes or sockets 13a whose lower or outer ends are enlarged or flared outwardly, as clearly seen in Fig. 1. The transverse frame member or brace 13 carries an adjustable cap screw or bolt 14 which is threadedly engaged in a threaded opening formed intermediate the ends of the member. The screw or bolt 14 provides an adjustable stop for the column or stack of articles P to be supported by the rack or frame, see Fig. 4.

The opposite or upper ends of the rods 10, with reference to Fig. 1, are similarly maintained in

predetermined spaced substantially parallel condition by means of a removable transverse frame member 15 whose outer end portions are provided with openings and carry upstanding hollow bosses 15a so that the member 15 may be slipped over the reduced end portions 10b of the rods. It will be seen that the main or thickened body portions of the rods 10 provide shoulders which serve as stops for the member 15 at one end of the rods and similar stops adjacent their opposite ends for the transverse member 13.

Intermediate the transverse members 13 and 15, the rods 10 are provided with a fixed or permanently attached brace member, shown as a whole at 16, which member has hook-like or reversely curved inwardly directed end portions 16a which are secured, as by welding at 16b, to the rods 10. Normally, the member 13 remains in its position as shown in the drawings and provides, with the brace 16, means for maintaining the parts of the portable rack or frame structure in fixed positions, with or without the upper transverse member 15 which is removable.

When it is desired to support a plurality of stacked articles, such as the prisms P of Figs. 2 and 4, in the rack, the angular edges or corners P^1 of the prism, see Fig. 2, are brought into registry with the upper end portions of the grooves or slots 11 and the prism moved downwardly in the rack or frame until it contacts the head of the adjustable stop member 14. Any number of additional articles may be assembled in stacked relationship in the rack by repeating this operation. If, the overall height or thickness of the articles, when in stacked relationship does not correspond to the distance or space between the transverse members 13 and 15, the stop member 14 may be adjusted to fill in or take up the surplus or excess space. Moreover, if the stop member 14 alone will not accomplish the purpose of causing the stacked articles to remain in position against undesirable shifting movement lengthwise of the rack, a removable spacer, such as that shown as a whole at 17, may be employed. This spacer 17, as shown, is of generally V-shape in longitudinal cross section and has, as shown, pointed or wedge-shaped free end portions 17a which are preferably shaped so as to interfit with the longitudinal grooves or notches 11 formed in the rods 11 with sufficient freedom to permit the spacer to be moved in the grooves longitudinally of the rack or frame structure. As seen in Fig. 4, merely by way of example, the stack of articles P is separated into two groups of five articles each, the removable spacer member 17 being interposed between and filling the space between the two groups. The lower article of the lower group rests upon the head of the stop member 14 and the upper member of the top group of articles terminates substantially at the outer or upper end of the slots 11. As shown in the drawings, the removable upper transverse frame member 15 is so shaped and proportioned as to permit the articles P and/or the spacer 17 to be engaged with the slots 11 and moved to the desired positions in the rack, without necessitating the removal of the member 15 from the remaining rack structure.

Referring now to Figs. 6 and 7, of the drawings, there is shown in these figures improved means for removably or releasably supporting the article-carrying and supporting racks or frames in position within a vacuum chamber in which thermal evaporation and deposition operations may be performed.

The apparatus of Figs. 6 and 7 comprises, as shown, base 40 upon which a dome-like casing, housing, or bell 41 is supported, thus providing a chamber 42 within which thermal evaporation operations may be carried out. A pipe or conduit 43 is in communication with the interior of the chamber and with high speed suction pumps (not shown) for withdrawing air from the chamber to create a vacuum therein.

The article supporting racks A carrying stacked articles P, such racks being shown in detail in the preceding views of the drawings, are arranged in spaced relationship adjacent the upright walls of the chamber, two such racks being shown in Fig. 6.

The upper end portions of the racks, as shown in Figure 6, are supported by means of an annular or ring-like member 57 which is supported above the base 40 in spaced relation thereto, by upright supporting members or rods 58 attached to the base and ring. The ring-like member 57 is provided at predetermined spaced points with pairs of holes or sockets 57a to receive the pins or projecting portions 10b of the article-carrying rack or frame A. The base 40 of the apparatus is provided with spaced pairs of upright supporting posts or members 59, each of which has a reduced pin-like upwardly projecting end portion 59a. The pins 59a are adapted to be received in the openings or sockets 13a formed in the bottom member 13 of the rack A, as clearly seen in Fig. 7. The pairs of members 59 are positioned in vertical alignment and registry with and below the pairs of openings or sockets 57a formed in the upper supporting ring 57, so as to support the racks A in predetermined spaced and preferably vertical positions within the vacuum chamber 42, as seen in Fig. 6 whereby the face of the article to be coated is presented towards the evaporation filaments 55.

The racks A are so positioned that the pair of pins 10b of each rack are moved into engagement with the sockets 57a of the upper ring member. The pins 10b are of sufficient length to permit the rack to be moved upwardly toward the supporting ring 57 so that the sockets 13a in the base of the article-carrying rack or frame may be brought into engagement with the pins or studs 59a and the rack lowered into position, as clearly seen in Fig. 7. After the desired number of racks A has been placed upon the base 40 and held thereupon in the manner above described, the bell-like casing or housing 41 is lowered into position upon the base 40 and the chamber 42 is then exhausted of its air content to create a vacuum therein, whereupon the thermal evaporating unit or equipment 55 is operated to effect the deposition, by thermal evaporation, of the desired material upon the surface or surfaces of the rack-supported articles P. The rack supporting means is adapted particularly for use in connection with applying coatings to only certain faces or surfaces of articles located within the vacuum chamber, the articles in their supporting racks being presented, as desired, to the thermal evaporating equipment, and wherein it is not necessary to revolve or rotate the racks and their supported articles.

Having thus described the invention, what is claimed as new is:

1. In combination with a vacuum chamber comprising a base and a housing mounted upon said base, said chamber including thermal evaporating means, of support means located within the vacuum chamber and mounted upon the base

of said chamber for releasably supporting a plurality of article-carrying racks within the chamber, said supporting means comprising a supporting member disposed above the base, attached thereto and in spaced parallel relationship thereto and being provided with sockets therein, article-carrying portable racks having base members and having upwardly projecting upper end portions slidably engaging within the supporting member sockets, and other supporting members mounted upon the base in relatively close proximity thereto provided with upwardly projecting locating portions releasably engaging and supporting the base members of the racks and cooperating with the said first-mentioned support means for removably supporting the racks in fixed upright positions.

2. In combination with a vacuum chamber comprising a base and a housing mounted upon said base, said chamber including thermal evaporating means, of support means located within the vacuum chamber and mounted upon the base of said chamber for releasably supporting a plurality of article-carrying racks within the chamber, said supporting means comprising a ring-like supporting member disposed above the base, attached thereto and in spaced parallel relationship thereto and being provided with circumferentially spaced groups of sockets therein, article-carrying portable racks each having a flat base member and having upwardly projecting upper end portions in groups slidably engaging within the supporting member sockets of the corresponding group, and other supporting members mounted upon the base in relatively close proximity thereto and arranged in a circle of substantially the same diameter as said ring-like member and in groups similarly spaced circumferentially, said supporting members being provided with upwardly projecting locating plugs slidably fitting into sockets formed in the base members of the racks and cooperating with the said first-mentioned support means for removably supporting the racks in fixed upright positions.

JAMES C. OGLE, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
504,476	Kelley	Sept. 5, 1893
683,356	Todd	Sept. 24, 1901
722,514	Johnson	Mar. 10, 1903
1,046,354	Weeks	Dec. 3, 1912
1,134,651	Trammel	Apr. 6, 1915
2,260,471	McLeod	Oct. 28, 1941
2,271,239	Vokes	Jan. 27, 1942
2,339,613	Becker et al.	Jan. 18, 1944
2,369,764	Ullrich	Feb. 20, 1945
2,398,382	Lyon	Apr. 16, 1946
2,403,199	Swope et al.	July 2, 1946
2,414,406	Colbert et al.	June 14, 1947