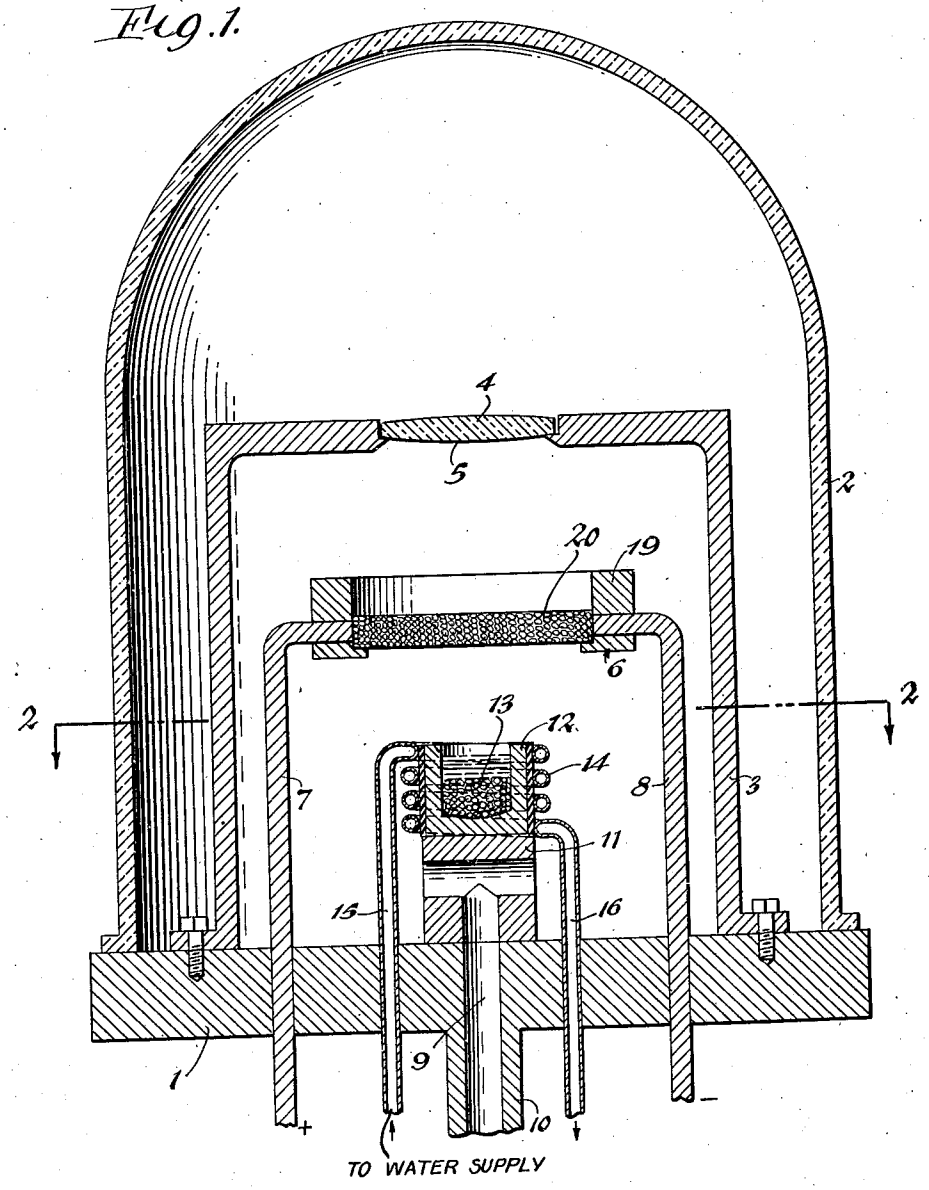
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COATING APPARATUS

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Fig. 1.



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Fig. 2.

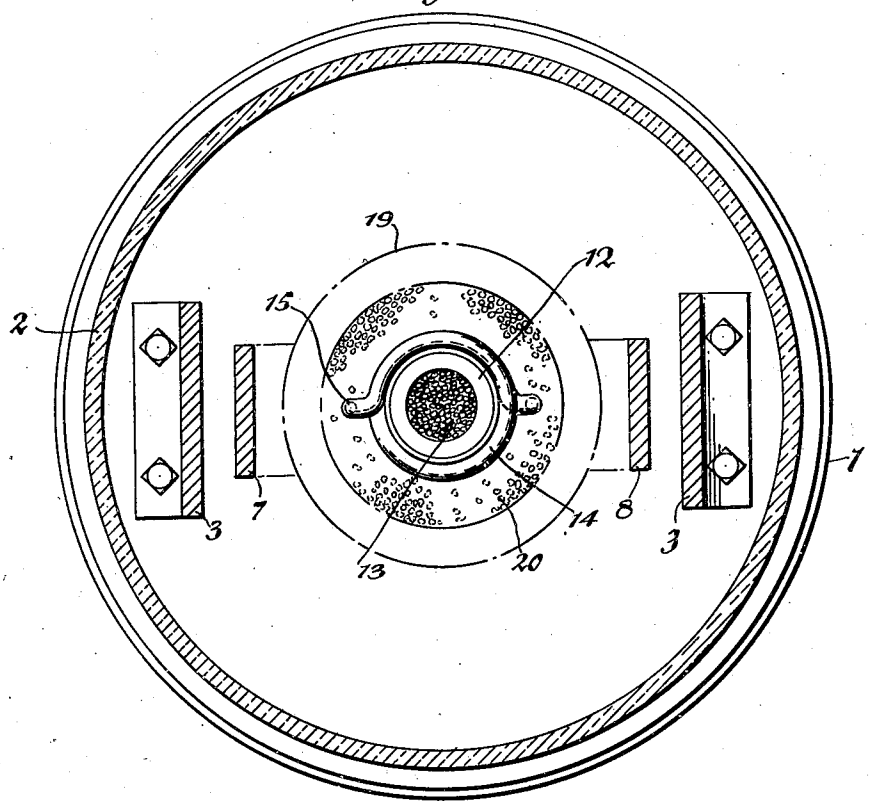
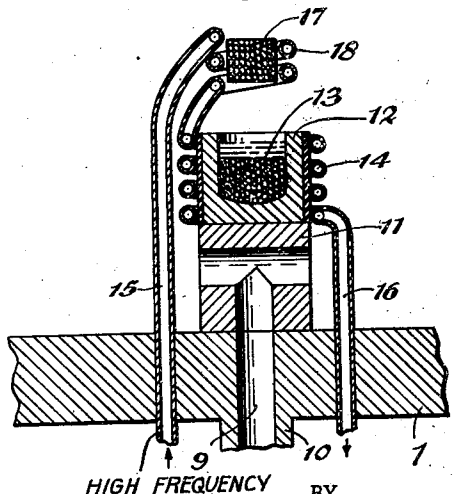


Fig. 3.



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UNITED STATES PATENT OFFICE

2,378,476

COATING APPARATUS

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Application February 11, 1943, Serial No. 475,555

7 Claims. (Cl. 91—12.2)

This invention relates to apparatus for applying coatings to the surfaces of articles and more particularly to apparatus for applying reflection reduction coatings to the surfaces of light reflecting or transmitting articles although it may be employed for coating other forms of articles.

An object of the invention is to provide new and improved apparatus for applying coatings, which coatings will be wear resistant and durable.

Another object of the invention is to provide a new and improved apparatus for coating articles which will prevent the depositing of larger particles or unvaporized particles from being deposited on the surface to be coated.

Another object of the invention is to provide a new and improved apparatus for applying coatings of vaporized coating materials with which the size of the deposited particles of the coating material may be kept within controlled limits and which will produce durable, wear resistant coatings.

In the application of Osterberg filed December 29, 1942, Serial Number 470,489 there is disclosed a method and apparatus for coating surfaces wherein the surface to be coated is preheated and the velocity of the vaporized particles of the coating material is considerably increased thereby producing coatings of greater durability and wear resistance.

The present invention relates to a new and improved apparatus for obtaining these advantages as well as filtering out the unvaporized particles which might affect the quality of the coating and also provides a uniform and constant source of radiation for heating the surface to be coated.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings and it will be understood that many changes may be made in the details of construction and arrangement of parts without departing from the spirit of the invention as set forth in the accompanying claims. I, therefore, do not wish to be limited to the exact details of construction and arrangement of parts shown and described as the preferred form has been shown by way of illustration only.

Referring to the drawings:

Fig. 1 is a sectional view of an apparatus embodying the invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1 looking in the direction of the arrows; and

Fig. 3 is a fragmentary sectional view similar to Fig. 1 but showing a modified form of the invention.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the device embodying the invention comprises the base 1 on which is supported the bell jar or the like 2 forming a vacuum chamber.

Within this vacuum chamber is positioned the support 3 for the lens or the like 4, the surface 5 of which is to be coated. While the support 3 is shown adapted to support a single lens or the like 4, it is to be understood that this support 3 may be so formed as to support a plurality of members to be coated simultaneously.

Beneath the support 3 is positioned the member 6 having the leads 7 and 8 extending through the base 1 to supply current for the purposes hereinafter described.

Interchangeably supported by the member 6 is the member 19 which contains the filtering and accelerating medium 20.

This accelerating and filtering disc 20 may be formed of a porous heat conducting and preferably electric current conducting material such as carbon, graphite or silicon carbide.

This disc 20 may be formed of compressed and sintered metal powders with a sufficient porosity to permit the passage of the vaporized coating material.

It is pointed out that with the present arrangement it is possible to provide such discs 20 of desired porosity for use with particular coating materials.

It is also pointed out that the disc 20 may be formed from a porous electrically nonconducting refractory material such as fire clay, aluminum oxide, zirconium oxide and the like with electrically conducting elements embedded therein.

In the base 1 of the vacuum chamber is the opening 9 which is connected by the pipe 10 to the diffusion pumps to thereby evacuate the vacuum chamber.

In said vacuum chamber is provided the support 11 adapted to support the crucible or the like 12 which is adapted to contain the coating material 13 which may consist of magnesium fluoride or other metallic fluorides, cryolite, albeit, quartz or other material for forming reflection reduction coatings and if it is desired to form coatings on reflectors such as mirrors or the like such coating material 13 may consist of aluminum, silver or other suitable material.

Surrounding said crucible member 12 is positioned the water cooled high frequency induction heating coil or unit 14 which is adapted to allow water to enter through the tubular connection 15 and to pass therefrom through the tubular connection 16.

The leads 7 and 8 extend through the base 1 and if desired insulating sleeves may be provided surrounding the portions of said leads in said base or if the base is formed of insulating material such sleeves are not necessary. The leads 7 and 8 are secured to the usual type electrodes for supplying current to said leads.

The high frequency leads 15 and 16 also extend through the base 1 and insulating sleeves may be provided surrounding the portions of said leads in said base or if the base is formed of insulating material, as stated above, such sleeves are not necessary. The leads 15 and 16 are connected to the usual type electrodes for supplying current to said leads and are also secured to a water source for providing cooling water for said leads.

Where the leads extend through the base, such connections are sealed to preserve the vacuum.

The crucible 12 is of electrical conducting material and is separated from the coil 14 by an air space or by suitable insulating material as shown.

The high frequency current in the coil 14 causes the crucible 12 to become heated and thereby heat and vaporize the coating material.

The form of the invention shown in Fig. 3 is generally similar to the forms shown in Figs. 1 and 2 except the filtering and accelerating member 17 which may be of similar type to the filtering and accelerating member 20, previously described, is positioned directly above the crucible 12 and is heated by a high frequency induction unit 18 which is connected to the high frequency induction unit 14 which supplies heat for vaporizing the coating material in the crucible 12.

From the foregoing it will be seen that I have provided simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described my invention, I claim:

1. In a device of the character described, a vacuum chamber, means in said chamber for supporting a source of coating material to be vaporized, means for supporting an object in said chamber and a porous heated filter and accelerating member, said member being of porous heat conducting material for filtering and accelerating the vaporized particles passing therethrough, means for heating said member, said member being positioned between said object to be coated and said means for supporting the coating material and aligned therewith whereby the vaporized particles will pass through the pores of said filtering and accelerating member.

2. In a device of the character described, a vacuum chamber, means in said chamber for supporting a source of coating material to be vaporized, means for supporting an object in said chamber and a carbonaceous heated filter and accelerating member, said member being of porous heat conducting material for filtering and acelerating the vaporized particles passing therethrough, means for heating said member, said member being positioned between said object to be coated and said means for supporting the coating material whereby the vaporized particles will pass through said filtering and accelerating member.

3. In a device of the character described, a vacuum chamber, means in said chamber for supporting a source of coating material to be vaporized, means for supporting an object in said chamber and a porous heat conducting member, said member being of porous heat conducting material for filtering and accelerating the vaporized particles passing therethrough, means for heating said member, said member being positioned between said object to be coated and said means for supporting the coating material and aligned therewith whereby the vaporized particles will pass through the pores of said filtering and accelerating member.

4. In a device of the character described, a vacuum chamber, means for suporting an article in said vacuum chamber, means for supporting a source of coating material in said vacuum chamber and high frequency induction heating means surrounding said means for supporting said supply of coating material for heating the same to vaporize the coating material and a porous heat conducting filter and accelerating member, said member being of porous heat conducting material for filtering and accelerating the vaporized particles passing therethrough, means for heating said member, said member being positioned between said article and said means for supporting a supply of coating material and aligned therewith whereby the vaporized particles will pass through the pores of said filtering and accelerating member.

5. In a device of the character described, a vacuum chamber, means for supporting an article in said vacuum chamber, means for supporting a source of coating material in said vacuum chamber and high frequency induction heating means surrounding said means for supporting said supply of coating material for heating the same to vaporize the coating material and a substantially flat carbonaceous heat conducting member, said member being of porous heat conducting material for filtering and accelerating the vaporized particles passing therethrough, and means for heating said member, said member being positioned between said article and said means for supporting a supply of coating material whereby the vaporized particles will pass through the pores of said carbonaceous member.

6. In a device of the character described, a vacuum chamber, means for supporting an article in said vacuum chamber, means for supporting a source of coating material in said vacuum chamber and high frequency induction heating means surrounding said means for supporting said supply of coating material and for heating the same to vaporize the coating material and a porous carbonaceous heat conducting member between said article and said means for supporting a supply of coating material whereby the vaporized particles will pass through the pores of said heat conducting member, and means for heating said heat conducting member.

7. In a device of the character described, a vacuum chamber, means for supporting an article in said vacuum chamber, means for supporting a source of coating material in said vacuum chamber and high frequency induction heating means surrounding said means for supporting said supply of coating material for heating the same to vaporize the coating material, and a substantially flat member of porous heat conducting material for filtering and accelerating the vaporized particles passing therethrough, means for heating said member, said member being positioned between said article and said means for suporting a supply of coating material, whereby the vaporized particles will pass through the pores of said heat conducting member.

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