

Nov. 9, 1948.

W. L. MORGAN
APPARATUS FOR MAKING PATTERN
MIRRORS AND OTHER COATINGS
Filed June 9, 1944

2,453,582

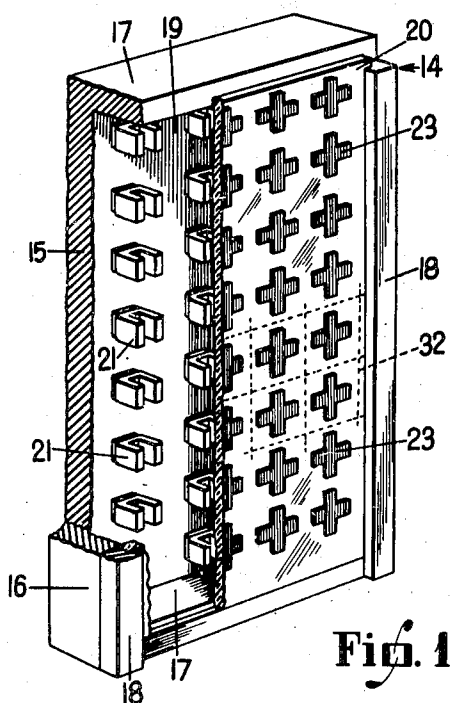


Fig. 1

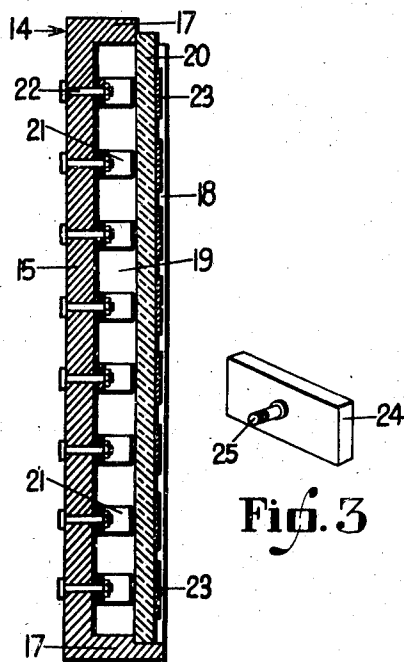


Fig. 3

Fig. 2

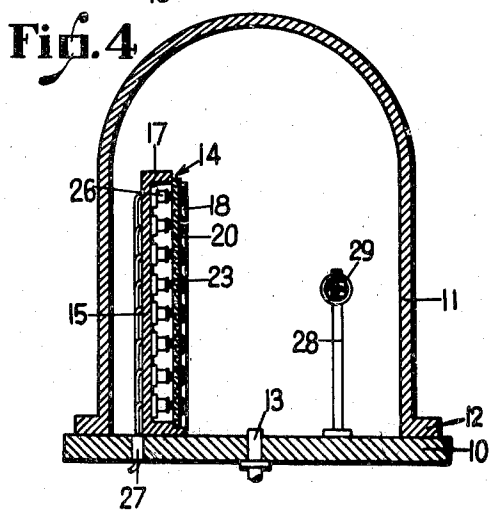


Fig. 4

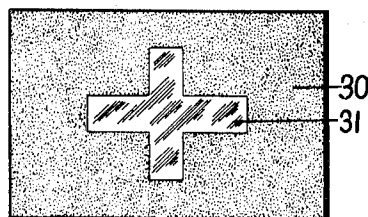


Fig. 5

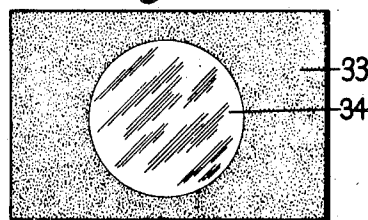


Fig. 6

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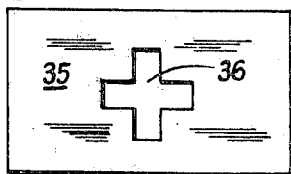


Fig. 7

UNITED STATES PATENT OFFICE

2,453,582

APPARATUS FOR MAKING PATTERN
MIRRORS AND OTHER COATINGS

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Application June 9, 1944, Serial No. 539,530

5 Claims. (Cl. 91—12.2)

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The present invention relates to apparatus for making pattern mirrors and other coatings. It has to do particularly with the production of pattern mirrors and other coated articles in which a portion or portions of a suitable piece of support material, such as glass or other siliceous material, plastic, metal, paper, or the like, are provided with a mirrored surface or other coating which preferably surrounds or frames a clear, transparent, or non-mirrored portion or area which may be of varied design. More particularly, the invention has to do with the production of such pattern mirrors and pattern coatings in a vacuum by producing on the face of the support material, a coating or mirrored surface by deposition resulting from the thermal evaporation or cathodic sputtering of some suitable material, such as metal, magnesium fluoride, etc.

One of the objects of the present invention is to provide an improved apparatus for producing pattern mirrors and other pattern coatings by deposition resulting from thermal evaporation of a suitable material, preferably in the presence of a vacuum.

Another object of the invention is to provide an improved apparatus for producing a plurality of pattern mirrors or pattern articles simultaneously.

Another object of the invention is to provide improved means for supporting a workpiece in upright position within a vacuumized chamber and for supporting block-out pieces, plates or stencils on the outer face of the workpiece during the deposition of the reflective or other coating on the workpiece to provide clear or uncoated areas in the workpiece.

A further object of the invention is to provide magnetic means for supporting a block-out piece, plate or stencil, or a plurality of such pieces, in improved manner upon the outer surface or face of the workpiece during the coating operation.

Another object of the invention is to provide an improved workpiece-supporting frame for use in connection with an apparatus for producing pattern mirrors and pattern coated articles.

A further object of the invention is to provide a workpiece-supporting frame of improved nature which is relatively inexpensive to manufacture, simple in construction, and one to which the workpiece may be applied and removed therefrom with ease and facility; another object of the invention being to provide improved means whereby the block-out pieces, plates or stencils may be quickly and accurately applied to the

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face of the workpiece in predetermined positions and remain in such positions during the coating operation, said pieces being easily and quickly removable from the face of the workpiece when desired.

The above and other objects and advantages of the invention will be apparent 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 perspective view, partly broken away, showing a workpiece-supporting frame embodying the present invention.

Fig. 2 is a vertical sectional view of the frame shown in Fig. 1.

Fig. 3 is a perspective view of one type or form of permanent magnet adapted to be used with the frame of Figs. 1 and 2.

Fig. 4 is a vertical sectional view of an apparatus embodying the present invention.

Fig. 5 is a front elevational view of a pattern mirror produced in accordance with the present invention.

Fig. 6 is a view similar to Fig. 5 showing a somewhat different type of pattern mirror produced in accordance with the invention.

Fig. 7 is a front elevational view of a stencil, plate, or mask embodying the present invention.

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. Also, it is to be understood 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.

Generally speaking, the present invention has to do with the production of pattern mirrors and pattern coated articles. It has to do with apparatus for producing such mirrors and coated articles in which a workpiece is adapted to be supported in upright position within a vacuum chamber and to have supported upon its outer face or surface in predetermined positions or arrangement a block-out piece, plate or stencil, or a plurality of such pieces, which are positively held in their proper positions during the depo-

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sition of a suitable material upon the face or surface of the workpiece or workpieces, such deposition resulting from the thermal evaporation or cathodic sputtering of the material, to produce pattern mirrors and pattern coated articles each of which has a clear, transparent or non-coated area which is preferably surrounded or framed by a coated area or areas, such as a mirrored or reflective area or areas. The coatings employed, depending upon the use to be made of the pattern coated article, may be of other materials than metals, such as magnesium fluoride in low reflective articles, or copper oxide in photo-electric articles.

Referring now to the drawings and particularly to Fig. 4 thereof, there is shown in this figure a suitable apparatus embodying the present invention. The apparatus, as shown, comprises a supporting base 10 to which is applied a housing or bell-like casing 11 which, together with the base, provides a chamber from which the air may be evacuated to create a vacuum therein. The side walls of the housing 11 at the lower ends thereof are provided with a surrounding flange or projection 12 which is adapted to rest flatwise upon the base 10. A suitable exhaust pipe or conduit 13 is provided and is in communication with suitable pumps (not shown) for evacuating air from within the chamber to create a vacuum in said chamber.

Located within the chamber and preferably adjacent to one of the side walls of the housing 11, is a workpiece-supporting frame or case shown as a whole at 14. This frame or member 14 is shown in greater detail in Figs. 1 and 2 of the drawings. As shown, it comprises a substantially rectangular upright frame which includes a back wall 15, upright side walls 16 and top and bottom walls 17. Suitable guide strips 18 are preferably secured to the forward edges of the side walls 16 to provide a space for receiving and supporting a removable workpiece 20 which, when in position, overlies and closes the forward open portion 19 of the frame.

As shown in Figs. 1 and 2, the back wall 15 supports a plurality of horseshoe type permanent magnets 21 which are held in position upon the inner face of the wall by bolts or screws 22. As shown, the magnets 21 are arranged in vertical and horizontal rows. It will be understood, however, that any desired number of magnets 21 may be employed and that they may be arranged in any suitable manner, as desired.

It is to be noted that the outer face or surface of the workpiece 20 has applied thereto a plurality or series of block-out pieces, plates or stencils 23, one being provided for each of the magnets 21 so that the magnet will attract the corresponding piece 23 and maintain it in proper position upon the face of the workpiece 20. The workpiece may be formed from glass or other suitable material and the block-out pieces or stencils 23 may be formed from any suitable material which will be attracted by the magnets 24, these block-out pieces being preferably formed from relatively thin iron sheet metal.

While I have shown a workpiece 20 in the form of a single sheet or plate, it is to be understood that any number of workpieces may be supported by the frame 14.

If desired, relatively flat plate-like permanent magnets may be employed in lieu of the horseshoe magnets 21. In Fig. 3 there is shown one such permanent magnet 24 having a securing screw or bolt 25.

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Moreover, if desired, the back wall or board 15 of the workpiece-supporting frame may be provided with a series or plurality of electromagnets 26, such as those shown in Fig. 4 of the drawings. Each of these magnets will be electrically connected to a source of electric current supplied thereto by a wire or cable 27.

As explained above, the workpiece-supporting frame or case is located within the chamber of the apparatus shown in Fig. 4. This supporting frame may be formed from any suitable non-conducting material, such as wood. A workpiece 20 or a plurality of such workpieces is slid into position between the guide strips 18 of the frame after which any desired number of the block-out pieces or stencils 23 may be applied to the face thereof in any desired arrangement. The housing 11 is then applied to the base 10 and the chamber evacuated of air through the outlet or exhaust pipe 13 and a vacuum created within the chamber. Thereafter, an evaporating source or unit, such as the unit shown as a whole at 28 in Fig. 4, is electrically energized to heat the coil or filament 29 thereof to which has been previously applied some suitable material, such as aluminum or other metal, to be thermally evaporated. As the metal on the coil or filament 29 is evaporated, molecules or particles thereof are thrown onto the face of the workpiece 20 to provide a reflective coating or surface, such as the coating or surface 30 of Fig. 5. By reason of the fact that the workpiece has portions thereof blocked out by the members 23, areas of the workpiece will remain uncoated by the reflective material to produce, in the case of the cross-like block-out pieces 23, a similarly shaped clear, transparent and non-reflective area or portion, such as the portion 31 of Fig. 5. It is to be understood that after the coating operation has been performed in the apparatus of Fig. 4 and the vacuum chamber opened, the workpiece is removed from the frame, whereupon the stencil members 23 are removed from the workpiece to leave the clear, transparent and uncoated portions or areas 31 each of which is surrounded or framed by the reflective area or coating 30. To produce individual mirrors such as that shown in Fig. 5, the coated workpiece 20, which may be a glass plate, is cut along the broken lines 32 shown in Fig. 1 to produce the rectangular individual pattern mirror or mirrors of Fig. 5.

It is desirable to produce a pattern mirror such as that shown in Fig. 6, the stencils such as the stencils 23, may be in the form of annular disks in which case a pattern mirror having a reflective surface coating 33 and a round or circular clear or transparent area 34, will be produced. As in the form of Fig. 5, the pattern mirror of Fig. 6, as shown, has a central clear area 34 which is surrounded or framed by the reflective coating or area 33.

It will be understood, of course, that block-out pieces, plates or stencils of any desired shape may be employed dependent upon the type or design of pattern mirror which is to be produced, the stencil corresponding in shape to the desired shape of the clear and transparent portion or area of the mirror. See, for example, the block-out piece, plate, or stencil illustrated in Fig. 7 of the drawings, wherein the body portion 35, shown merely by way of illustration as of rectangular shape, is provided with a perforate portion 36.

Obviously, within the vacuum chamber the pattern mirrors may equally readily be produced

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employing my stencil holding and support material holding equipment by cathodic sputtering of metal with a high voltage between electrodes (not shown) in the well known manner.

Further if coatings having other characteristics are desired, such as low reflection coatings, there may be thermally evaporated from the energized and heated filament 29 within the high vacuum any suitable material, such as magnesium fluoride desirable when producing patterned low reflection coatings, employing the stencils and holding magnets as just described.

From the foregoing it will be seen that I have provided improved apparatus for producing simultaneously a plurality of pattern mirrors or pattern coated articles of any desired size or design in which the pattern mirror or article consists of a clear or transparent area and a coated or reflective area or areas, said coated areas being preferably produced by a process of coating by deposition resulting from the thermal evaporation or sputtering of some suitable material within a vacuumized chamber.

Having thus described my invention, what I claim is:

1. In an apparatus for producing pattern coatings having clear uncoated areas and a coated area, the combination of a vacuum chamber, an evaporating source located within the chamber, means for supporting a workpiece to be coated also located within said chamber, a plurality of unsupported metallic magnetic plates engaging the front face of said workpiece, and means for maintaining said plurality of plates in predetermined positions on said front face, said last-named means comprising a plurality of permanent magnets.

2. An apparatus according to claim 1 wherein said last-named means comprises a plurality of electro-magnets.

3. A workpiece-supporting frame for use in an apparatus for producing pattern mirrors, comprising a back, side and end walls and an open

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front, guide means associated with the open front for guiding the edges of a workpiece into position and for removably supporting the same in upright position, a plurality of separate thin metallic plates engaging the outer face of said workpiece, and means adjacent the inner face of the workpiece for maintaining said plates in predetermined positions on said outer face.

4. A workpiece-supporting frame for use in an apparatus for producing pattern mirrors, comprising a back, side and end walls and an open front, guide means associated with the open front for guiding the edges of a workpiece into position and for removably supporting the same in upright position, a plurality of separate thin metallic magnetic plates engaging the outer face of said workpiece, and a plurality of magnets adjacent the inner face of the workpiece for maintaining said metallic plates in predetermined positions on said outer face.

5. A workpiece-supporting frame according to claim 4 wherein the magnets are supported by the back of said frame.

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