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(54) **SELF-CENTERING MAGNETIC MASKING SYSTEM**

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B05B 15/04	(2006.01)
B05C 21/00	(2006.01)
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C23C 14/04	(2006.01)
C23C 16/04	(2006.01)
B05C 13/02	(2006.01)
B05D 1/32	(2006.01)
B28B 11/04	(2006.01)
B41F 17/00	(2006.01)

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CPC ***B05B 15/045*** (2013.01); ***B05B 13/0228*** (2013.01); ***B05C 13/02*** (2013.01); ***B05C 21/005*** (2013.01); ***B05D 1/32*** (2013.01); ***B28B 11/001*** (2013.01); ***B28B 11/04*** (2013.01); ***B41F 17/006*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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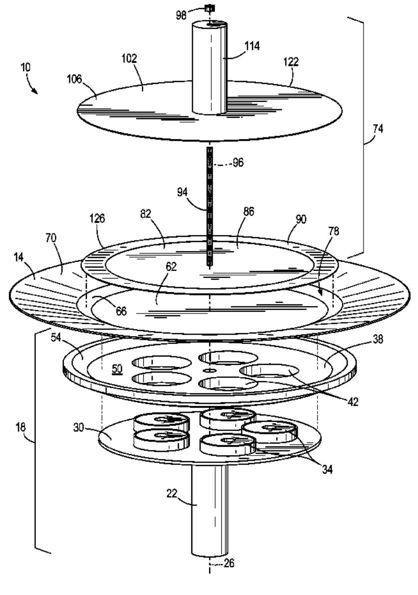
(57) **ABSTRACT**

A masking fixture for coating dishware includes a support base having a first ferromagnetic member and a contoured support surface configured for engagement with a lower contour of the dishware. A mask base includes a second ferromagnetic member. The second ferromagnetic member is magnetically attracted to the first ferromagnetic member. The mask base includes a mask guide. A mask includes a masking surface configured for engagement with the upper contour. The mask is moveably coupled to the mask guide for movement between an engaged position in which the masking surface is engageable with the upper contour and a disengaged position. The mask can be moved to the disengaged position to facilitate removal of the mask base from the dishware after a coating operation.

5 Claims, 4 Drawing Sheets



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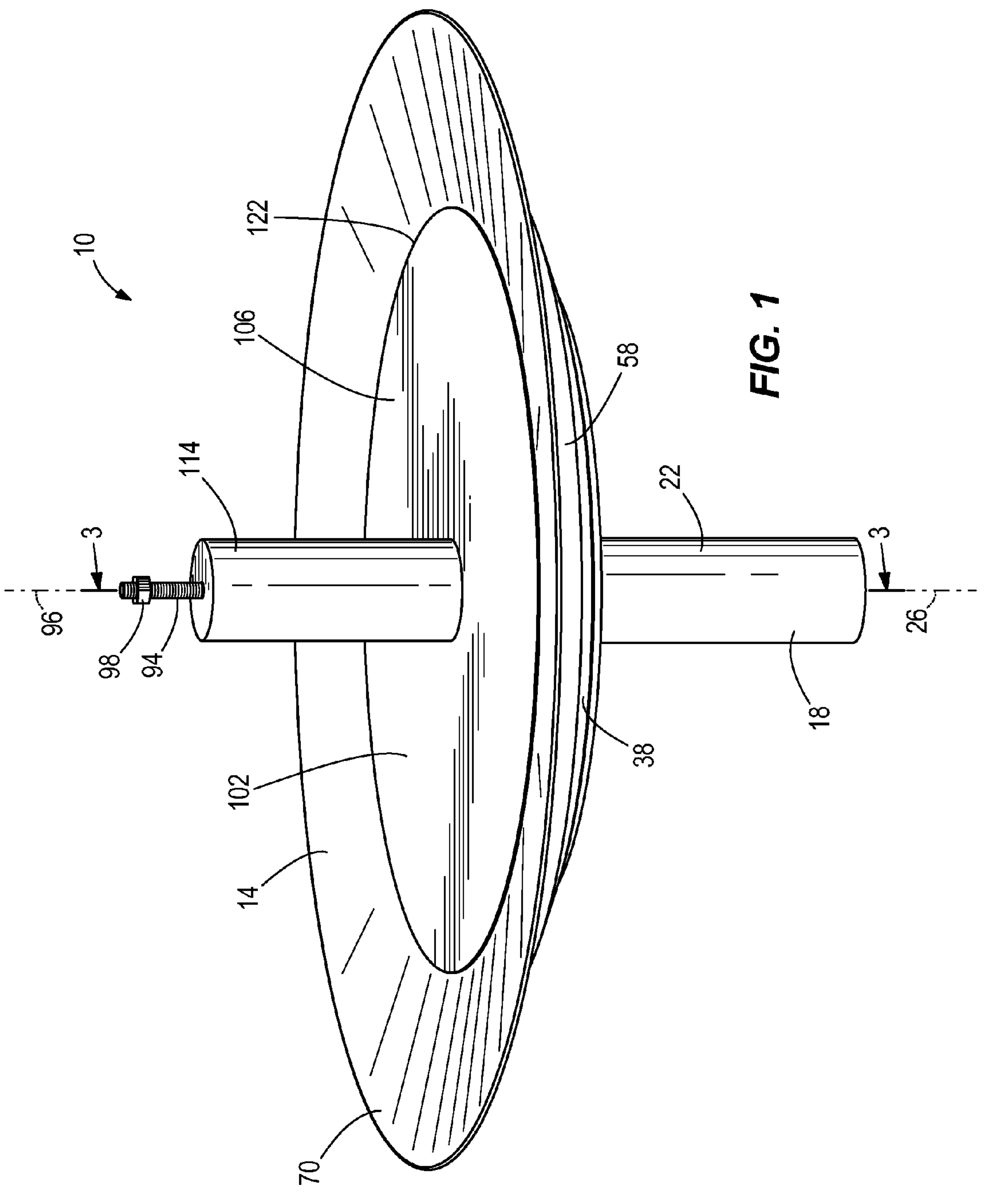

FIG. 1

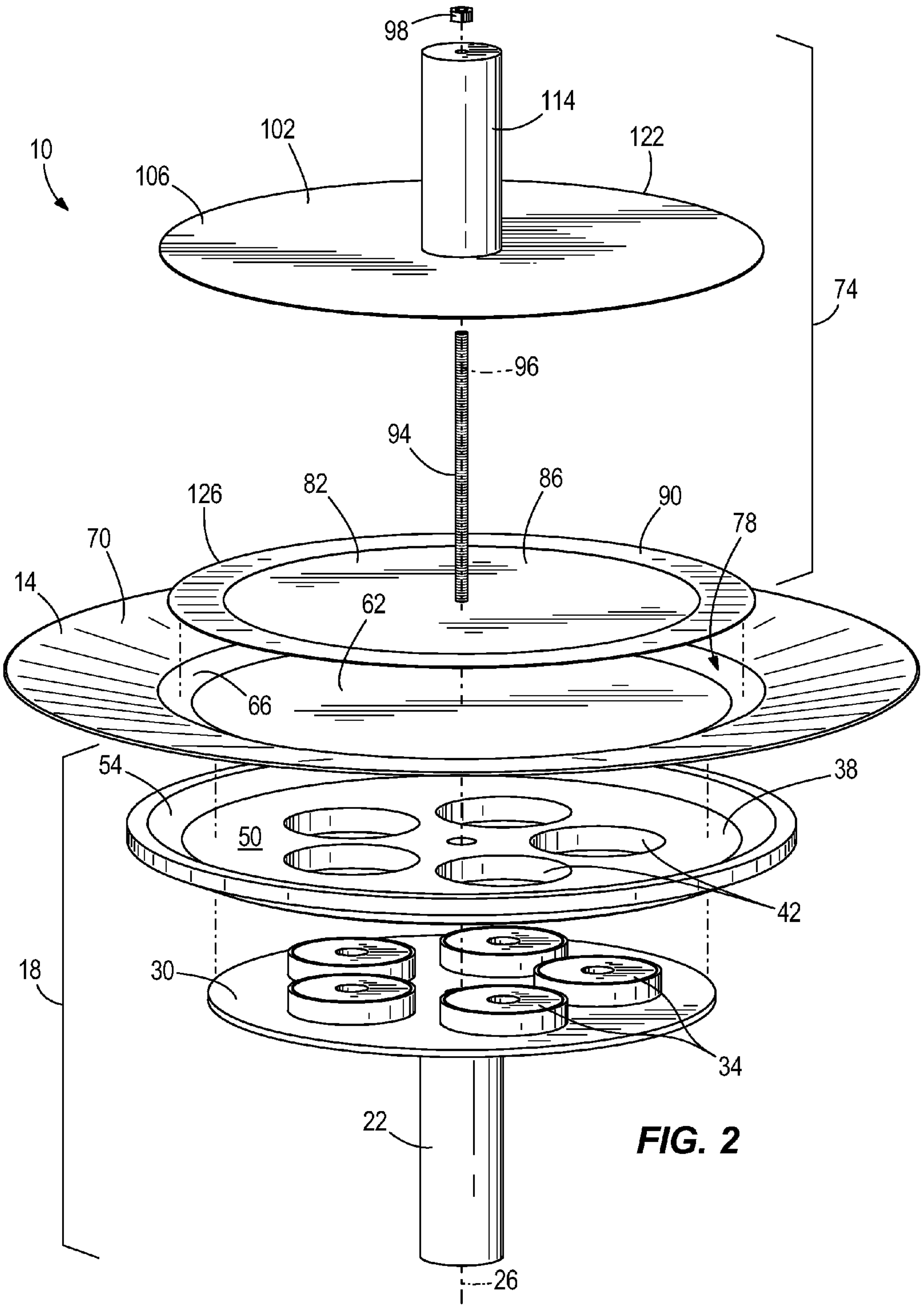
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FIG. 2

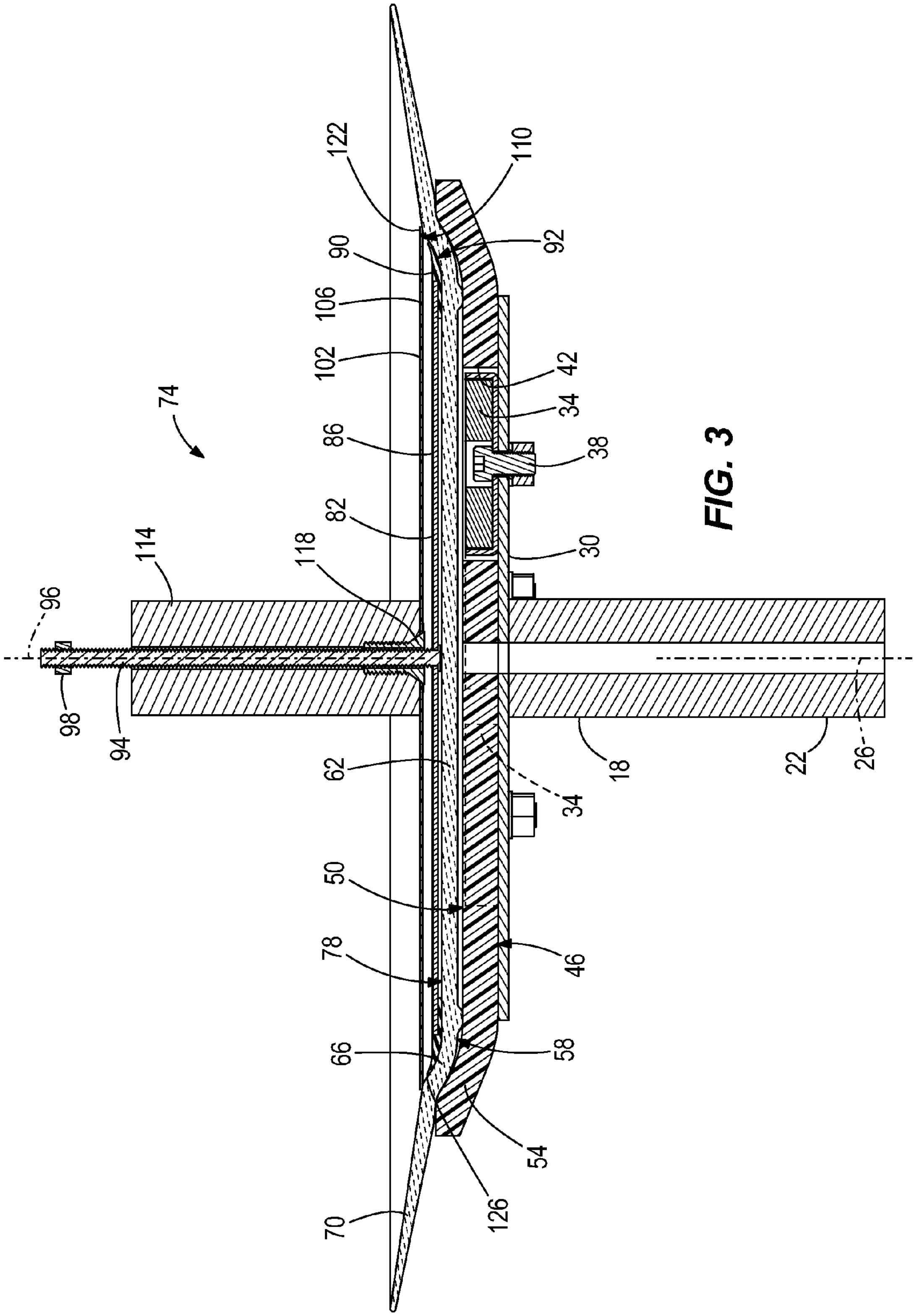

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FIG. 3

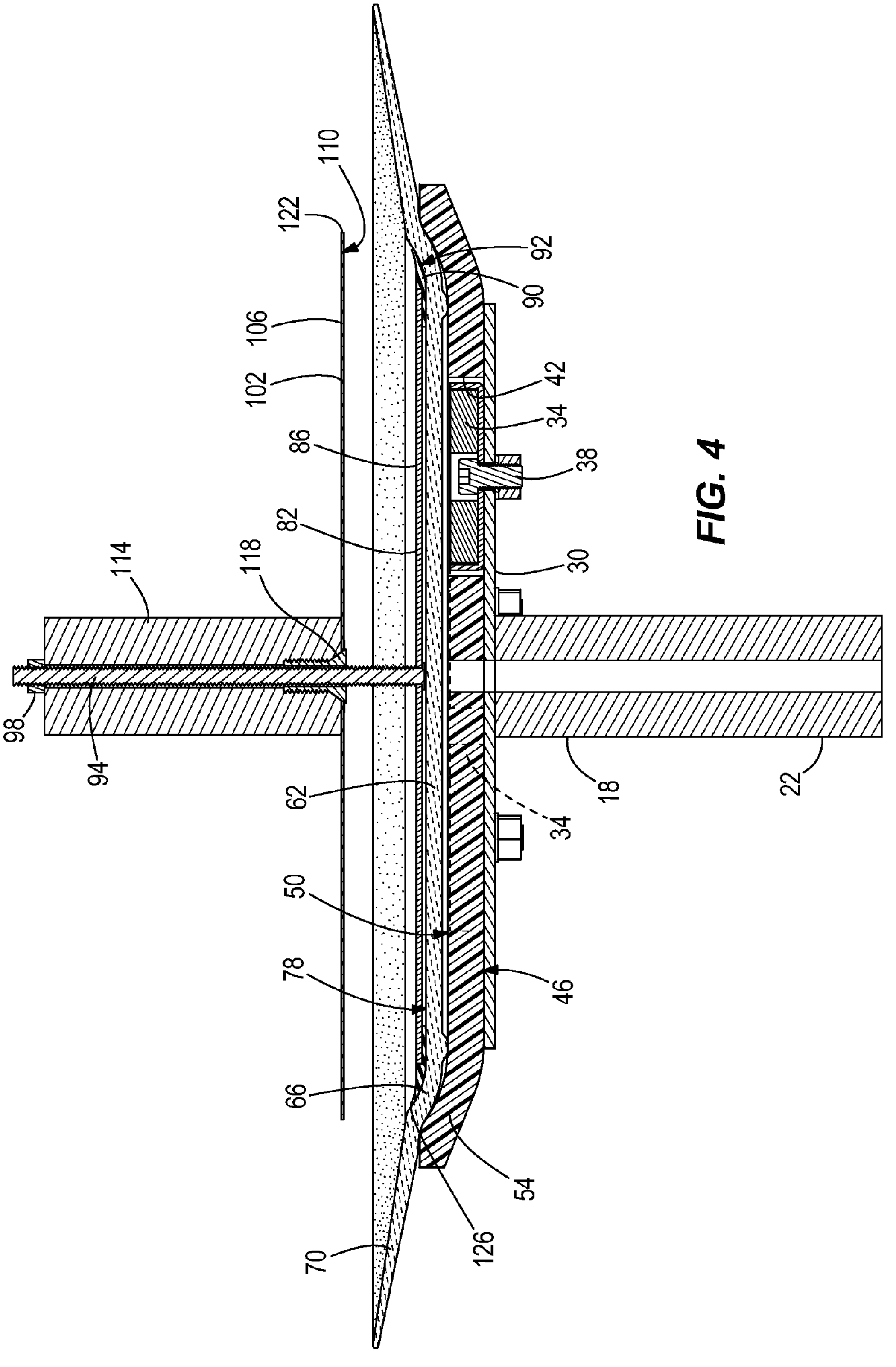
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FIG. 4

SELF-CENTERING MAGNETIC MASKING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional of U.S. application Ser. No. 13/755,878, filed Jan. 31, 2013, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure generally relates to a system for masking contoured objects for the application of coatings, and more particularly to a system for masking disk-like objects, such as kitchen ware, for the application of paints or glazes.

BACKGROUND

Kitchen ware, such as bake ware, tableware, dinner ware, service ware, and the like are provided in a wide variety of colors and patterns. Although various materials can be used, much kitchen ware is formed of ceramic materials. As a result, it can be difficult from a manufacturing perspective to precisely control the dimensions of the various curves, radii, and the like that define the overall contour of the plate. This relative lack of dimensional stability of the kitchen ware poses challenges for the high-volume manufacturer kitchen ware, particularly with respect to the application of colors and patterns to the kitchen ware during the manufacturing process. For example, it can be difficult to precisely and repeatably fixture multiple samples of a given piece of kitchen ware for the application of paint or other coatings because there may relatively large dimensional variations from sample to sample.

SUMMARY

According to some aspects, a masking fixture is provided for coating dishware. The dishware has an upper contour and a lower contour. The fixture includes a support base having a first ferromagnetic member. The support base also includes a contoured support surface configured for engagement with the lower contour. A mask base includes a second ferromagnetic member. The second ferromagnetic member is magnetically attracted to the first ferromagnetic member. The mask base includes a mask guide. A mask includes a masking surface configured for engagement with the upper contour. The mask is moveably coupled to the mask guide for movement between an engaged position in which the masking surface is engageable with the upper contour and a disengaged position.

According to other aspects a masking fixture is provided for coating dishware. The dishware has a lower contour. The fixture includes a support base having a contoured support surface substantially corresponding to the lower contour. The support base also includes a ferromagnetic member positioned adjacent the support surface. A mask base is magnetically attracted to the ferromagnetic member. The mask base includes an elongated guide member that defines a guide axis. A mask includes a masking profile defined by a masking surface. The mask is slidably coupled to the elongated guide member for movement along the guide axis between a lowered position for performing a coating operation and a raised position for facilitating removal of the mask and the mask base from the support base by overcoming the magnetic attraction between the ferromagnetic member and the mask base.

According to still other aspects, a method is provided for applying a coating to dishware. The method includes positioning a first side of the dishware on a support surface of a support base. The support base includes at least one ferromagnetic member positioned adjacent the support surface. A mask base that is magnetically attracted to the ferromagnetic member is positioned against a second side of the dishware. The magnetic attraction between the ferromagnetic member and the mask base substantially clamps the dishware between the support surface and the mask base. A mask is engaged with the second side of the dishware. The mask is moveably mounted to the mask base and includes a masking surface that defines a masking profile. With the mask engaged with the second side of the dishware, a coating is applied to the second side of the dishware. After applying the coating, the mask is moved with respect to the mask base to disengage the mask from the second surface. With the mask disengaged from the second surface, a force is applied to at least one of the mask and the mask base to overcome the magnetic attraction between the ferromagnetic member and the mask base, and to thereby disengage the mask base from the second side of the dishware.

The present disclosures generally relate to a masking fixture for use in applying coatings to disk-like contoured objects. In particular, a magnetic masking system is provided for the application of coatings to kitchen ware or dishware. Features, advantages and embodiments of the magnetic masking system may be set forth, or are apparent, from consideration of the following description. Moreover, it is to be understood that the following description is exemplary and intended to provide further explanation without limiting the scope of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

To understand the present disclosure, it will now be described by way of example, with reference to the accompanying drawings in which embodiments of the disclosures are illustrated and, together with the descriptions below, serve to explain the principles of the disclosure.

FIG. **1** is a perspective view of a masking system according to one embodiment.

FIG. **2** is a partially exploded perspective view of the masking system of FIG. **1**.

FIG. **3** is section view taken along line **3-3** of FIG. **1**.

FIG. **4** is a section view similar to FIG. **3** with a masking member in a raised position.

The components in the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the present disclosure.

DETAILED DESCRIPTION

While the masking system discussed herein is susceptible of embodiments in many different forms, there is shown in the drawings, and will herein be described in detail, exemplary embodiments with the understanding that the present description is to be considered as an exemplification of the principles of the masking system and is not intended to limit the subject matter of the masking system to the embodiments illustrated.

FIGS. **1-4** illustrate a masking fixture **10** for the application of a coating to an object **14**. In the illustrated configuration, the object **14** is a piece of ware, such as a dinner plate, however the structure, function, and operation of the masking fixture **10** can be applied to a wide variety of objects. As discussed further below, the masking fixture **10** may be "self-centering" and in that regard may be well suited for holding and securing generally circular objects having features, such as surface contours, that are arranged in a generally concentric manner, like the exemplary dinner plate **14** shown in the Figures.

Referring initially to FIGS. **1-3**, the fixture **10** includes a support base **18** including a generally cylindrical support post **22** defining a central axis **26**. The support post **22** may be configured for mounting to other structure, such as a rotary drive mechanism, for rotating the masking fixture **10**. A support plate **30** is mounted to one end of the support post **22** and is substantially axially aligned therewith. The support base **18** also includes a plurality of first ferromagnetic members **34** coupled to the support plate **30**. In the illustrated embodiment, the support base **18** includes five substantially cylindrical, puck-shaped first ferromagnetic members **34** circumferentially spaced around the central axis **26**. Other embodiments of the fixture **10** may include more or fewer first ferromagnetic members **34** in different arrangements, depending on the particular application. The first ferromagnetic members **34** may be coupled to the support plate **30** by fasteners **38**, as shown in FIG. **3**, or may be coupled to the support plate **30** in another suitable manner, such as by adhesives or the like.

The support base **18** also includes a support portion that in the illustrated embodiment is in the form of a support disk **38**. The support disk **38** is supported by the support plate **30** and is configured to fit over and around the first ferromagnetic members **34**. Thus, in the illustrated configuration, the support disk **38** is provided with five substantially circular through openings **42** positioned to receive the first ferromagnetic members **34**. In other configurations having a different arrangement of first ferromagnetic members **34**, the support disk **38** will have a different configuration and arrangement of openings to accommodate the different arrangement of first ferromagnetic members **34**.

The support disk **38** includes a substantially flat bottom surface **46** that rests upon or that may be coupled to the support plate **30**. The support disk **38** also includes a contoured support surface **50** opposite the bottom surface **46**. In the illustrated configuration, the support surface **50** includes a generally concave and upwardly extending outer rim portion **54**. The support disk **38** and, more specifically, the contoured support surface **50**, is configured to support the object **14**. More specifically, the contoured support surface **50**, including the outer rim portion **54**, is configured to correspond to a lower contour **58** of the object **14**. For example, the exemplary object **14** includes a relatively flat central portion **62**, an upwardly curved transition portion **66**, and an outwardly and slightly upwardly extending outer portion **70**. The support surface **50** therefore includes a relatively flat central portion, and the concave outer rim portion **54** extends upwardly and outwardly to engage and support the object in the vicinity of the transition portion **66** and the outer portion **70**. As shown, while the support surface **50** is contoured to correspond to the general configuration of the lower contour **58** of the object **14**, the support surface **50** does not necessarily correspond to each and every feature of the lower contour **58** of the object **14**. The configuration of the support surface **50** is such that when the object **14** is placed on the support disk **38**, the object **14** "self-centers" with respect to the central axis **26**. Stated another way, gravity acting on the object **14** tends to pull the object **14** into a substantially centered, substantially coaxial relationship with respect to the support disk **38**.

The support disk **38** preferably is formed of a rigid yet non-marring material, such as a suitable plastic. As shown in FIG. **3**, the support disk **38** also has a thickness that is slightly greater than a height of the first ferromagnetic members **34**, thereby preventing direct contact between the first ferromagnetic members **34** and the object **14**. In some implementations, the support disk **38**, and more particularly the outer rim portion **54** of the support disk **38**, may be formed by taking an imprint of the lower contour **58** of the object **14** and forming the support surface **50** based on the imprint.

The masking fixture **10** also includes a masking assembly **74** that is releasably engageable with an upper contour **78** of the object **14**. The masking assembly **74** includes a mask base **82** that is magnetically attracted to the first ferromagnetic members **34**. In the illustrated configuration, the mask base **82** includes a central plate portion **86** formed of a ferromagnetic material, and an outer engagement member **90** formed of a non-ferromagnetic material, such as urethane. The engagement member **90** may be formed of a non-marring material that holds its shape but is able to accommodate slight variations in the upper contours **78** of the objects **14**.

The engagement member **90** includes a lower engagement surface **92** configured to conform to the upper contour **78** of the object **14**. In this regard, the engagement member **90** may be formed by taking a mold or imprint of the upper contour **78** of the object **14** and forming the lower engagement surface **92** based on the mold or imprint. The engagement member **90** prevents substantial direct contact between the central plate portion **86** and the object **14**. In the illustrated construction this is achieved by molding the engagement member **90** around the outer circumference of the central plate portion **86**. In other embodiments, the engagement member **90** may comprise several engagement members spaced or otherwise distributed around or along the central plate portion **86** in a manner that prevents substantial direct contact between the central plate portion **86** and the object **14**. The engagement member **90** is also configured such that when the masking assembly **74** is placed on the object **14**, the masking assembly **74** "self-centers" with respect to the object **14**. Stated another way, the magnetic force acting between the mask base **82** and the first ferromagnetic members **34** tends to pull the masking assembly **74** into a substantially centered, substantially coaxial relationship with respect to the object **14**. Because the object **14** also "self-centers" with respect to the support disk **38**, when the support base **18**, the object **14**, and the masking assembly **74** are assembled with one another the components are substantially coaxially aligned along the central axis **26**.

As mentioned, the central plate portion **86** of the exemplary mask base **82** may be formed of a ferromagnetic material that is attracted to the first ferromagnetic members **34**. In the illustrated embodiment, the first ferromagnetic members **34** are permanent magnets and the mask base **82** is a ferromagnetic metal. In other embodiments, the mask base **82** may be or include one or more permanent magnets and the first ferromagnetic members **34** may be or include a ferromagnetic metal. In still other embodiments, both the mask base **82** and the first ferromagnetic members **34** may be or include permanent magnets. In still other embodiments, one or both of the mask base **82** and the first ferromagnetic members **34** may be or include electromagnets that can be turned on or off to activate or deactivate a magnetic field.

The masking assembly **74** also includes a mask guide **94** in the form of an elongated post that extends from the mask base **82**. In the illustrated configuration the mask guide **94** is a single post that extends substantially linearly away from a central portion of the central plate portion **86** and defines a guide axis **96**. In other configurations, a plurality of posts or other forms of guides may also or alternatively be provided. The illustrated mask guide **94** is a threaded rod that extends through the central plate portion **86**. A stop member **98** the form of a stop nut is coupled to a distal end of the mask guide **94**.

Referring also to FIG. **4**, a mask **102** is moveably coupled to the mask guide **94** for substantially linear movement between a lowered or engaged position, as shown in FIG. **3**, and a raised or disengaged position as shown in FIG. **4**. The mask **102** includes a masking portion **106** that defines a masking surface **110** configured for engagement with the upper contour **78** of the object **14**, and a guide sleeve **114** coupled to the masking portion **106** and slidingly engaged with the mask guide **94**. As shown in FIGS. **3** and **4**, the masking portion **106** is coupled to the guide sleeve **114** by a hollow fastener **118**, and the mask guide **94** extends through the hollow fastener **118** and through the guide sleeve **114**. When the mask **102** is in the engaged position (FIG. **3**), the masking surface **110** engages the upper contour **78** of the object **14** and covers the radially inner portions of the object. When the mask **102** is in the disengaged position (FIG. **4**), the masking surface **110** is disengaged from the upper contour **78** of the object **14** and the guide sleeve **114** is engaged with the stop member **98** provided on the mask guide **94**. The guide sleeve **114** also acts as a handle for positioning and removing the masking assembly **74** with respect to the object **14** and the support base **18**.

The masking fixture **10** is thus configured to cover or mask a desired area of the object **14** during a coating operation. The mask **102** defines a masking profile **122**, which in the illustrated embodiment is generally circular. When the mask **102** is in the lowered or engaged position, portions of the object **14** that are covered by the mask **102**, e.g., that are obscured by the masking profile **122** will not be coated during a coating operation, such as a painting or powder coating operation. Thus, in the illustrated embodiment, central portion **62** and the transition portion **66** of the object **14** are covered by the mask and therefore remain uncoated, while the outer portion **70** remains exposed and receives the coating. It should be appreciated that the masking profile **122** may be any desired shape or configuration, and may be configured to include decorative patterns, stencils, and the like. The illustrated circular masking profile **122** has a greater diameter than a base perimeter **126** of the mask base **82**, such that when the mask **102** is in the lowered or engaged position, the base perimeter **126** is inwardly offset from the masking profile **122**, thereby preventing coating from collecting on the mask base **82**.

In use, the object **14** may be positioned on the support surface **50** of the support disk **38**. The lower contour **58** of the object **14** cooperates with the contour of the support surface **50** to self-center the object **14** with respect to the central axis **26**. The masking assembly **74** is then moved into position above the object **14**, for example by holding the guide sleeve **114**. When the masking assembly **74** gets close enough to the central portion **62** of the object **14**, the ferromagnetic central plate portion **86** comes under the influence of the magnetic force provided by the ferromagnetic members **34** and is drawn downwardly toward the object **14**. The outer engagement member **90** of the mask base **82** engages the upper contour **78** of the object **14** and the magnetic force provided by the ferromagnetic members **34** pulls the mask base **82** downwardly against the object **14**, thereby effectively clamping the object between the mask base **82** and the support disk **38**. The contour of the lower engagement surface **92** cooperates with the upper contour **78** of the object to self-center the mask base **82** with respect to the object **14**, which also substantially aligns the guide axis **96** with the central axis **26**.

The mask **102** may then be moved to the lowered or engaged position such that the masking surface **110** engages the upper contour **78** of the object. A coating such as paint, powder coat, or the like may then be applied to the object **14**, for example by spraying, brushing, or substantially any other method. The mask **102** functions to provide a well defined edge to the portions of the object **14** that are coated and those that are not. After the coating has been applied, the mask **102** is moved to the raised or disengaged position by moving the guide sleeve **114** axially along the mask guide **94**. By limiting movement of the mask **102** in a direction that is substantially perpendicular to the upper contour **78** of the object, the mask **102** can be removed without disturbing the well defined border between the coated and the uncoated portions of the object **14**, even though the coating may not be completely dried or cured. With the mask **102** in the raised position, upward and/or sideways forces may be applied to the guide sleeve **114** to overcome the magnetic attraction between the central plate portion **86** and the ferromagnetic members **34** and to thereby disengage the masking assembly **74** from the object **14**. Because the base perimeter **126** is inwardly offset from the masking profile **122**, small movement of the mask base **82** during removal will generally not disturb the previously applied coating. When removing the masking assembly **74**, forces may be transferred from the guide sleeve **114** to the mask base **82** by way of the stop member **98** and/or the mask guide **94**.

Thus, the masking fixture **10** is configured for use in connection with a method for applying a coating to the object **14**, and can include positioning a first side of the object **14** on the support surface **50** on the support disk **38** of the support base **18**. The support base **18** includes at least one ferromagnetic member **34** positioned adjacent the support surface **50**. The mask base **82**, which is magnetically attracted to the ferromagnetic member **34**, is positioned against a second side of the object **14**. The magnetic attraction between the ferromagnetic member **34** and the mask base **82** substantially clamps the object **14** between the support surface **50** and the mask base **82**. The mask **102** is engaged with the second side of the object **14**. The mask **102** is moveably mounted to the mask base **82** and includes the masking surface **110** that defines the masking profile **122**. With the mask **102** engaged with the second side of the object **14**, a coating is applied to the second side of the object **14**. After applying the coating, the mask **102** is moved with respect to the mask base **82** to disengage the mask **102** from the second surface of the object **14**. With the mask **102** disengaged from the second surface, a force is applied to at least one of the mask **102** and the mask base **82** to overcome the magnetic attraction between the ferromagnetic member **34** and the mask base **82** and to thereby disengage the mask base **82** from the second side of the object **14**.

While the specific embodiments have been illustrated and described, numerous modifications come to mind without significantly departing from the spirit of the disclosure, and the scope of protection is only limited by the scope of the accompanying claims.

What is claimed is:

1. A method for applying a coating to dishware, the method comprising:

positioning a first side of the dishware on a support surface of a support base, wherein the support surface has a concave and upwardly extending outer rim portion and the support base includes at least one ferromagnetic member positioned adjacent the support surface;

positioning a mask base that is magnetically attracted to the ferromagnetic member against a second side of the dishware, the magnetic attraction between the ferromagnetic member and the mask base substantially clamping the dishware between the support surface and the mask base;

engaging a mask with the second side of the dishware, the mask being moveably mounted to the mask base and including a masking surface that defines a masking profile;

with the mask engaged with the second side of the dishware, applying the coating to the second side of the dishware;

after applying the coating, moving the mask with respect to the mask base to disengage the mask from the second surface; and

with the mask disengaged from the second surface, applying a force to at least one of the mask and the mask base to overcome the magnetic attraction between the ferromagnetic member and the mask base and to thereby disengage the mask base from the second side of the dishware.

2. The method of claim **1**, wherein engaging the mask with the second side of the dishware includes moving the mask in a substantially linear direction.

3. The method of claim **1**, wherein engaging the mask with the second side of the dishware includes positioning the mask to substantially overlie the mask base.

4. The method of claim **1**, wherein positioning the mask base against the second side of the dishware includes engaging a non-ferromagnetic portion of the mask base against the second side of the dishware and thereby preventing contact between a ferromagnetic portion of the mask base and the second side of the dishware.

5. The method of claim **1**, wherein applying the coating to the second side of the dishware includes rotating the support base, the dishware, the mask base, and the mask about a common rotational axis.

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