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(54) **SYSTEM AND METHOD FOR APPLYING AN IMAGE TO A SUBSTRATE TO FORM A DISPLAY ARTICLE**

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B32B 37/12 (2006.01)
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CPC **G09F 15/02** (2013.01); **A47G 1/17** (2013.01); **B32B 37/12** (2013.01); **B32B 37/182** (2013.01); **B32B 38/10** (2013.01); **B32B 38/145** (2013.01); **B32B 38/1833** (2013.01); **B41M 5/502** (2013.01); **B65C 9/26** (2013.01); **B65C 9/36** (2013.01); **G09F 15/0018** (2013.01); **B32B 2037/109** (2013.01); **B32B 2311/30** (2013.01)

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

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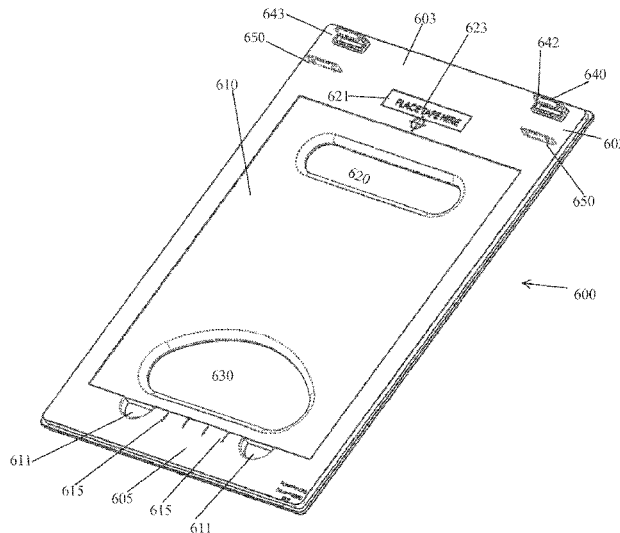
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(57) **ABSTRACT**
A product for displaying an image or object (e.g., printed photo or a print, etc.) according to at least one implementation includes a first sheet having a front face and a rear face. An image or object is formed along the rear face. The product also includes an adhesive coated substrate, such as a ferrous metal substrate, to which the first sheet is adhesively affixed.

17 Claims, 14 Drawing Sheets



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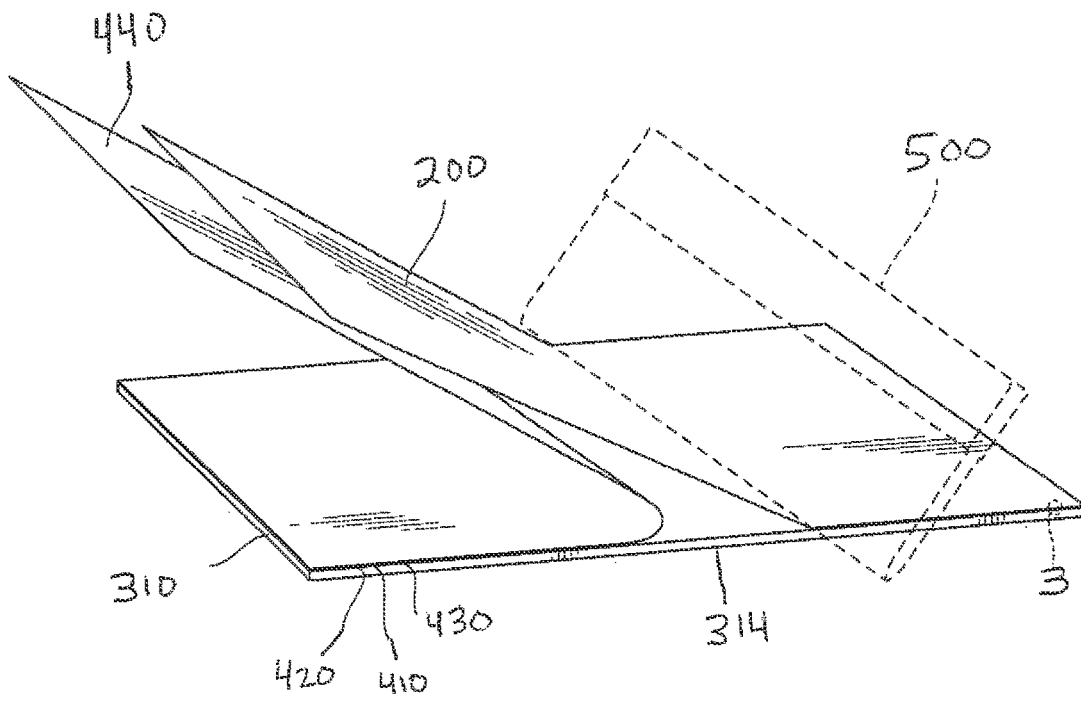
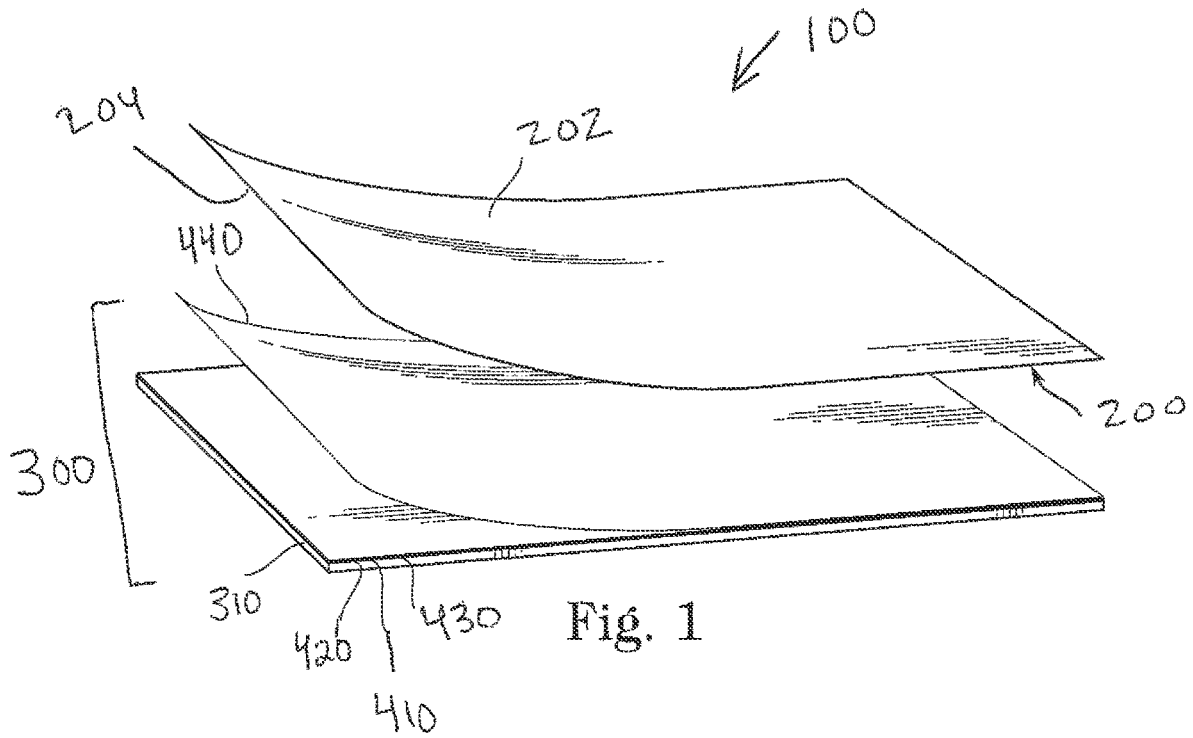
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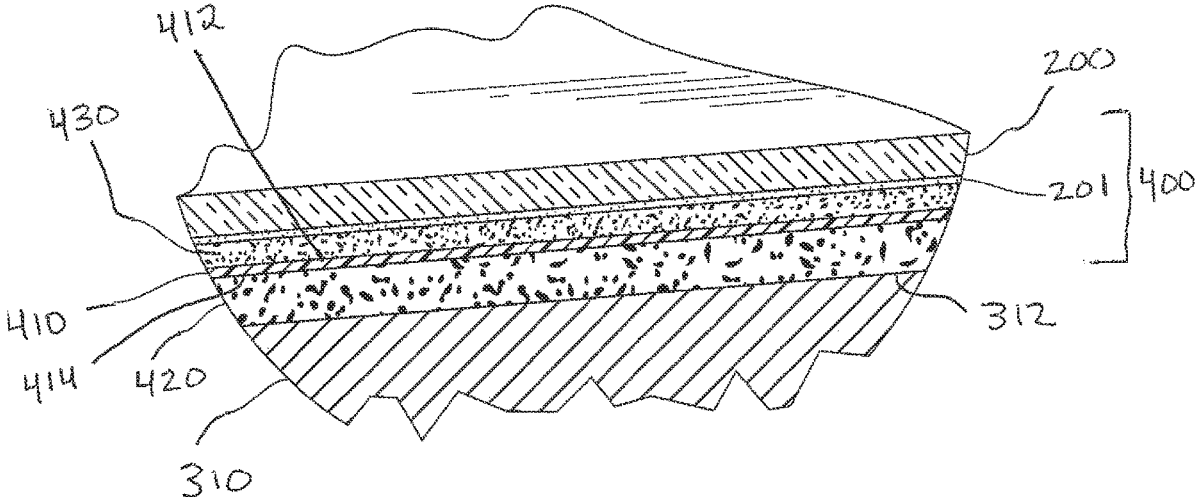
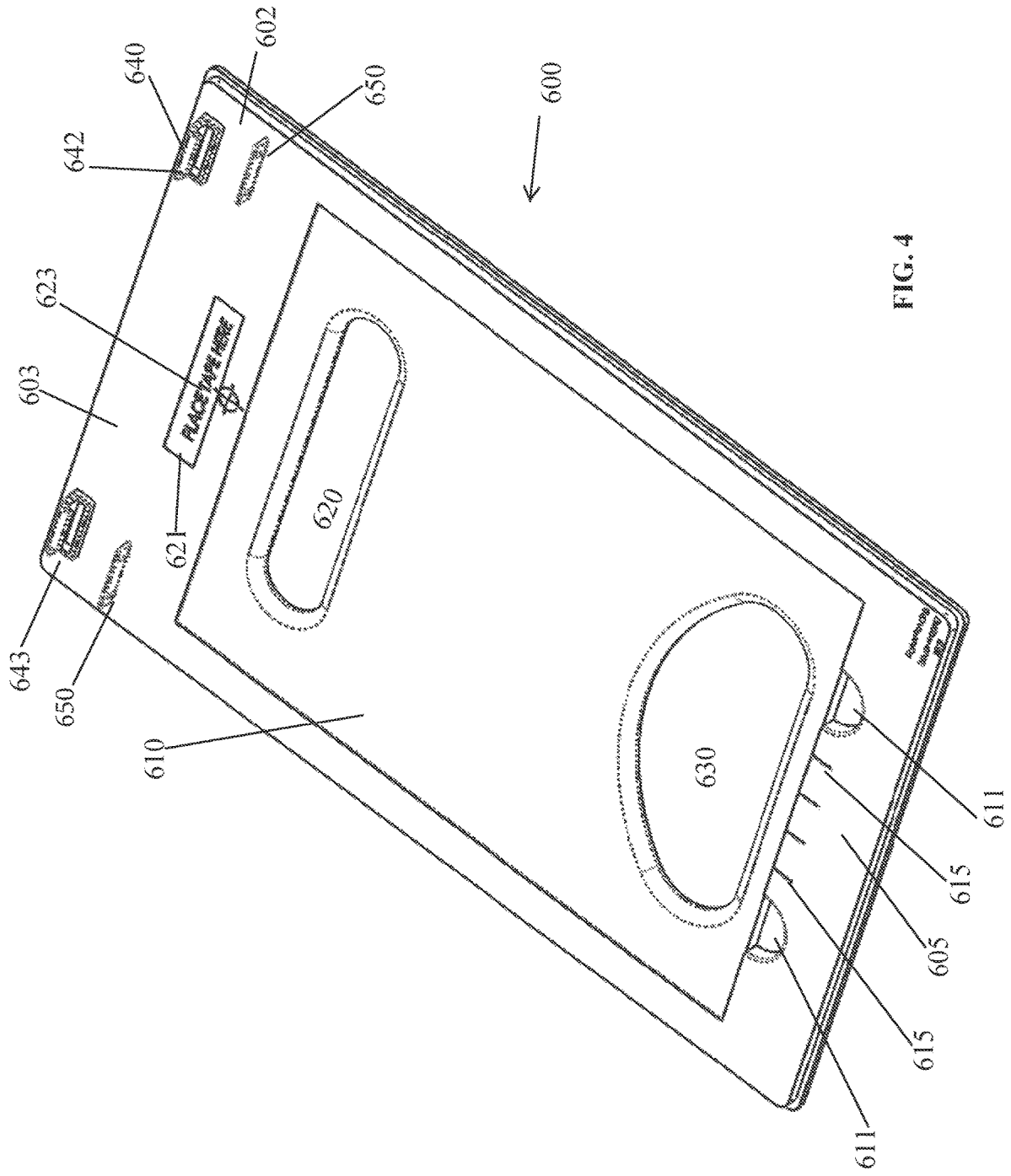


Fig. 3



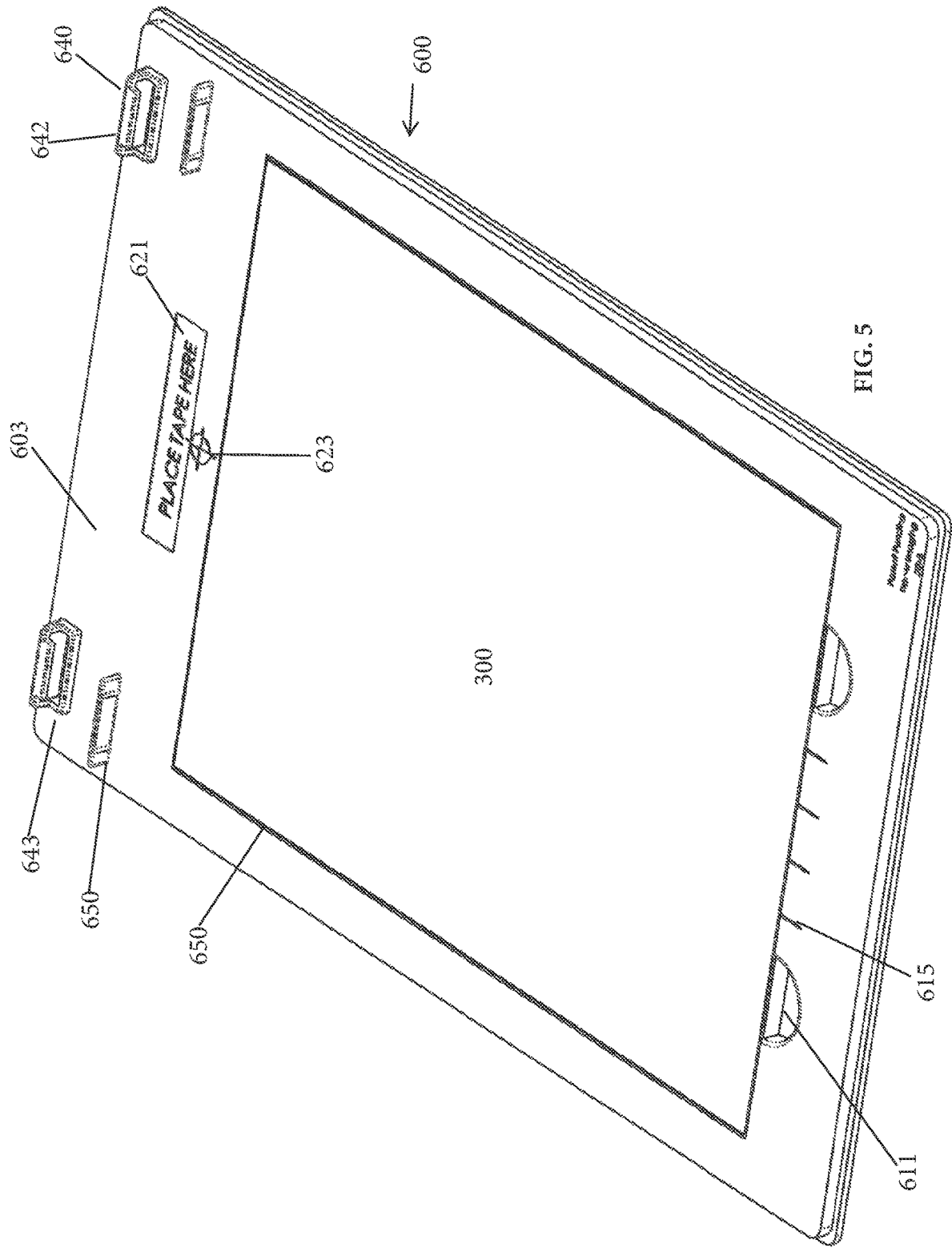


FIG. 5

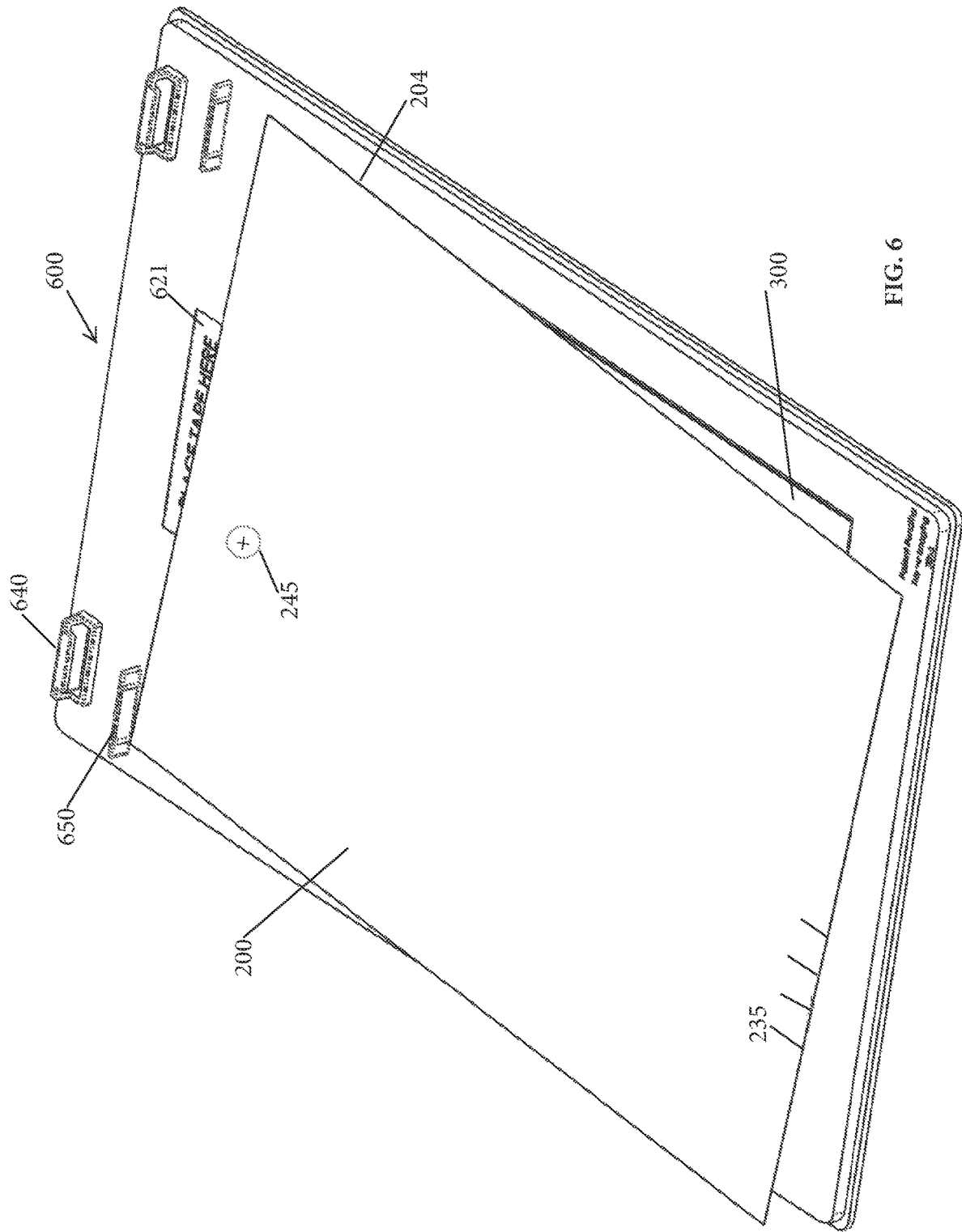


FIG. 6

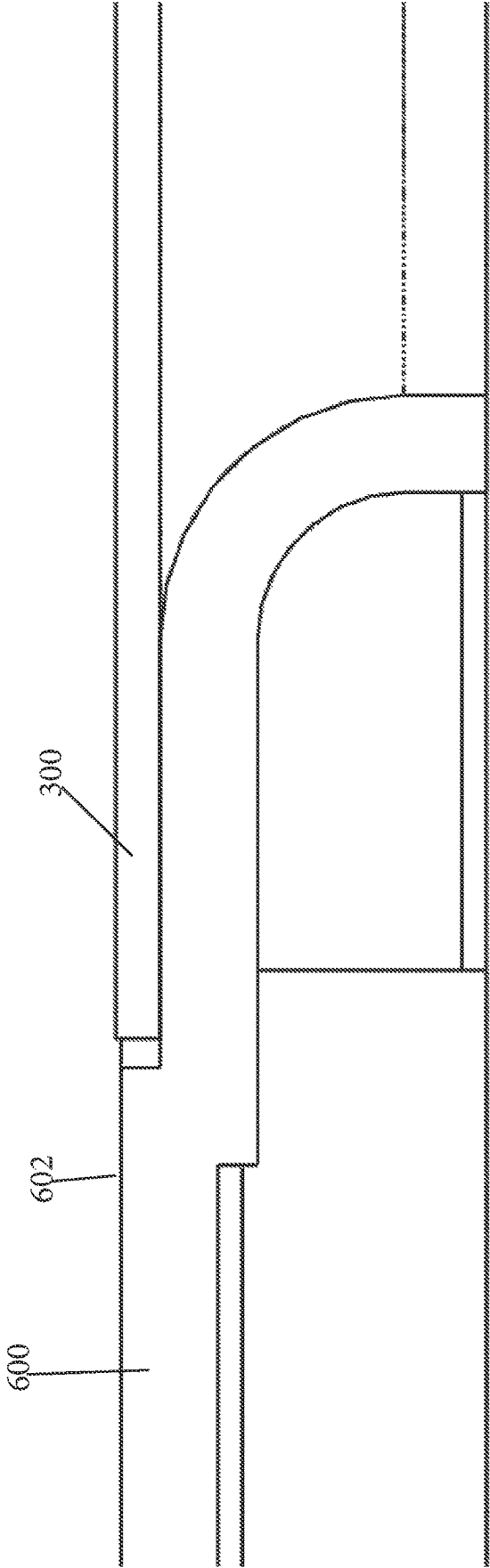


FIG. 7

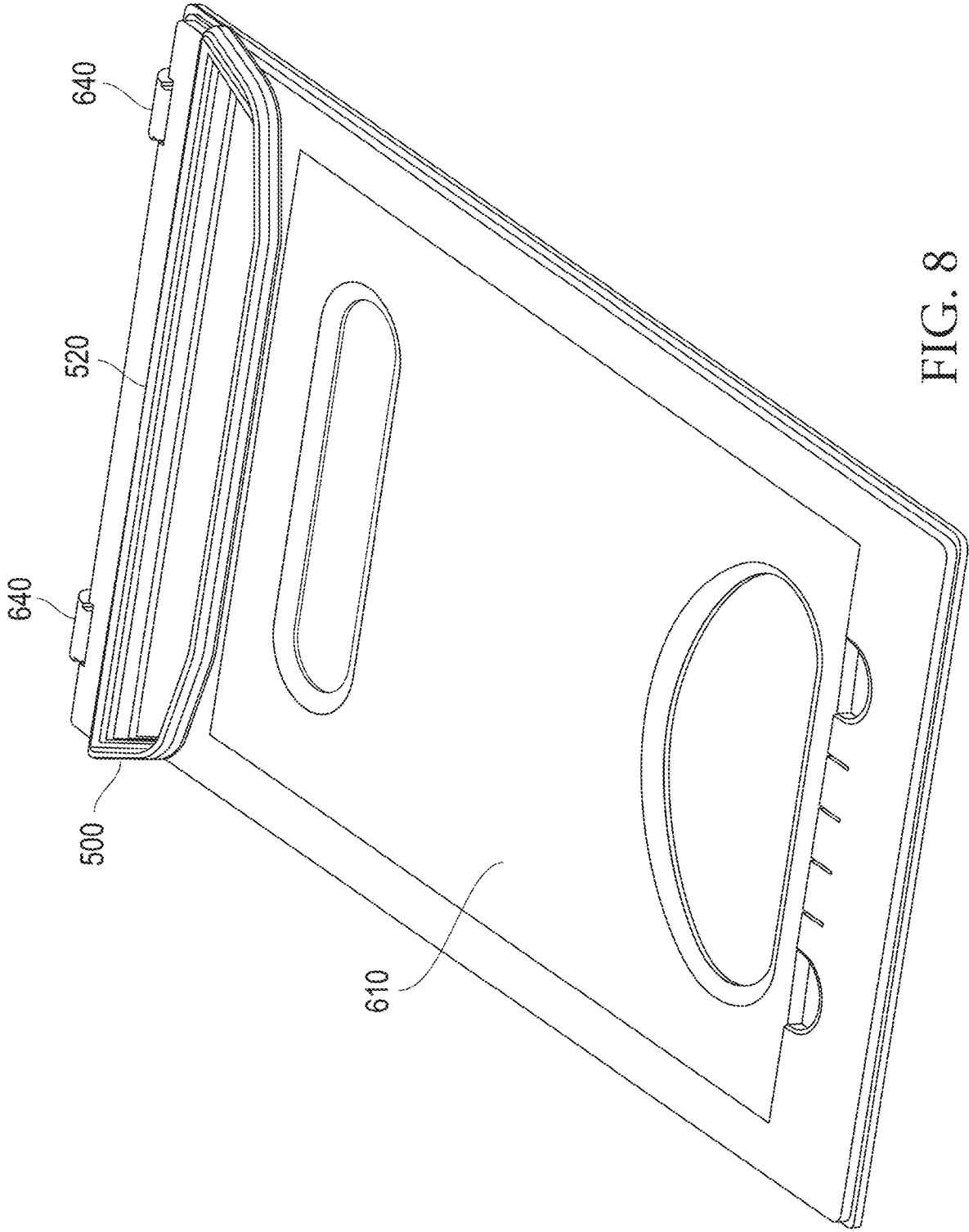


FIG. 8

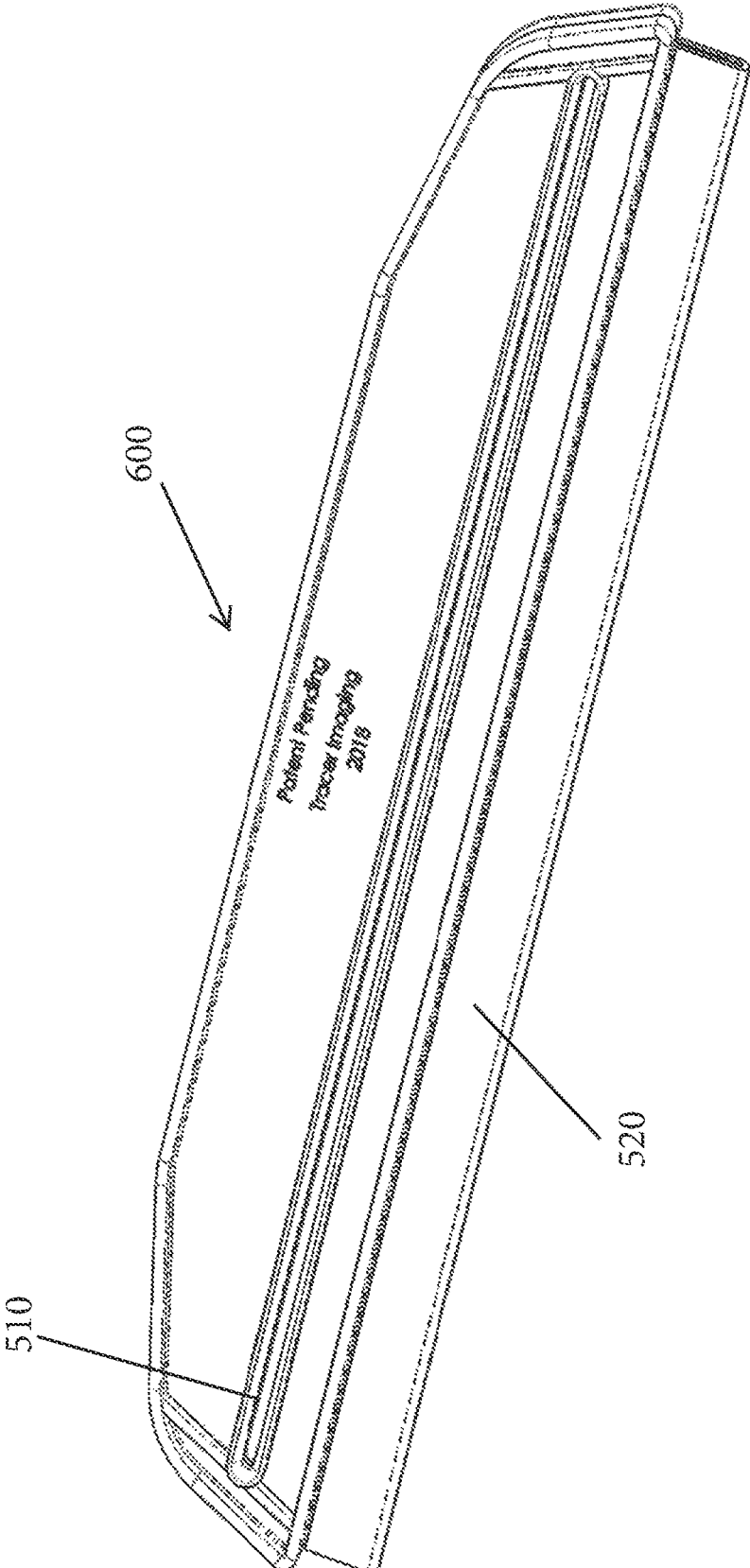


FIG. 9

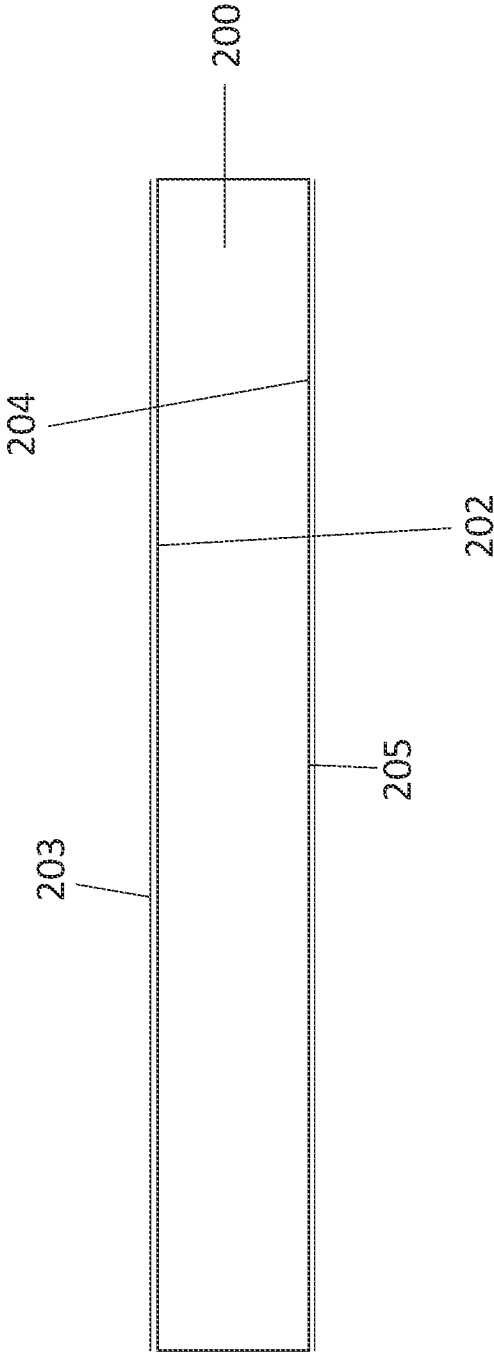


FIG. 10

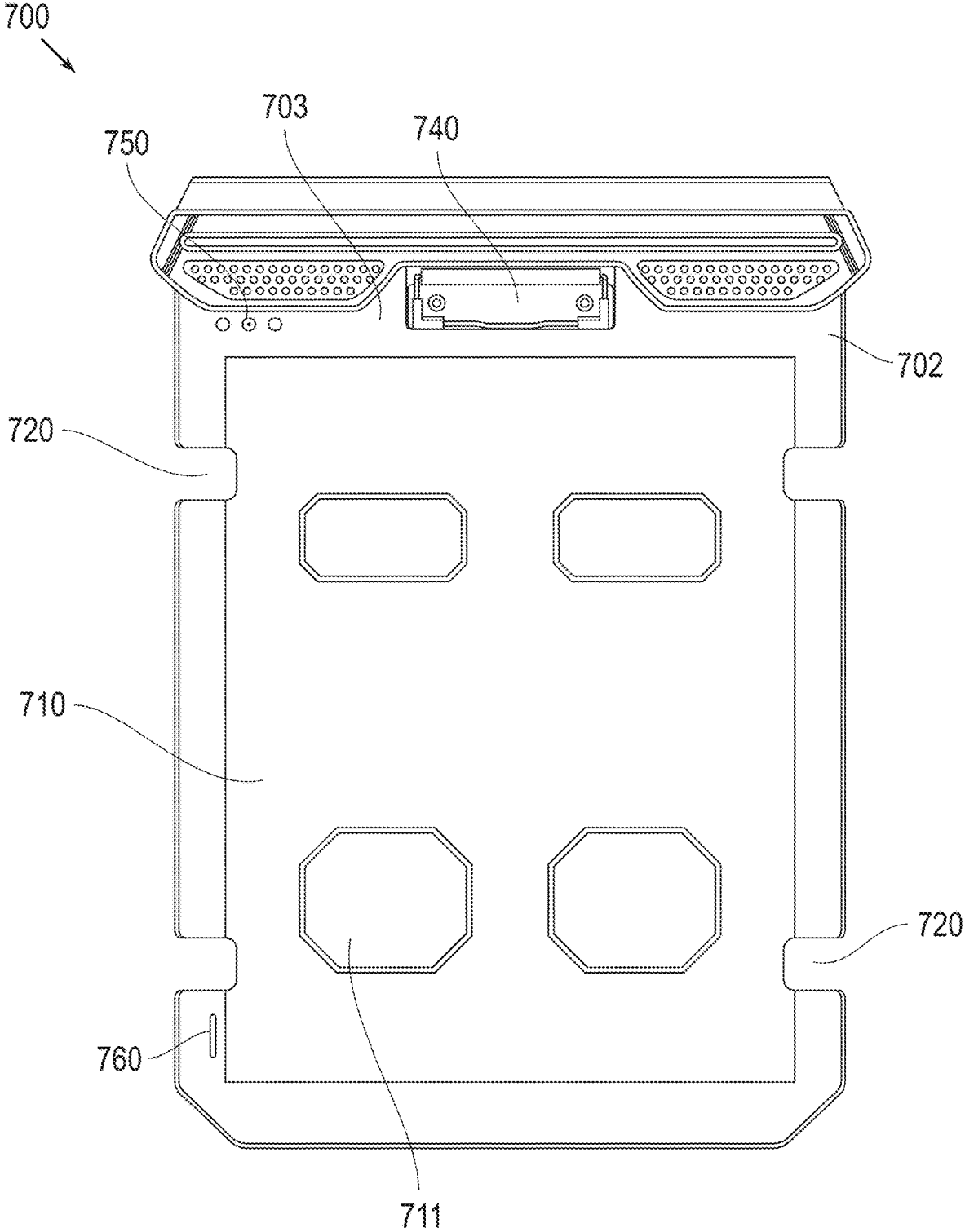


FIG. 11

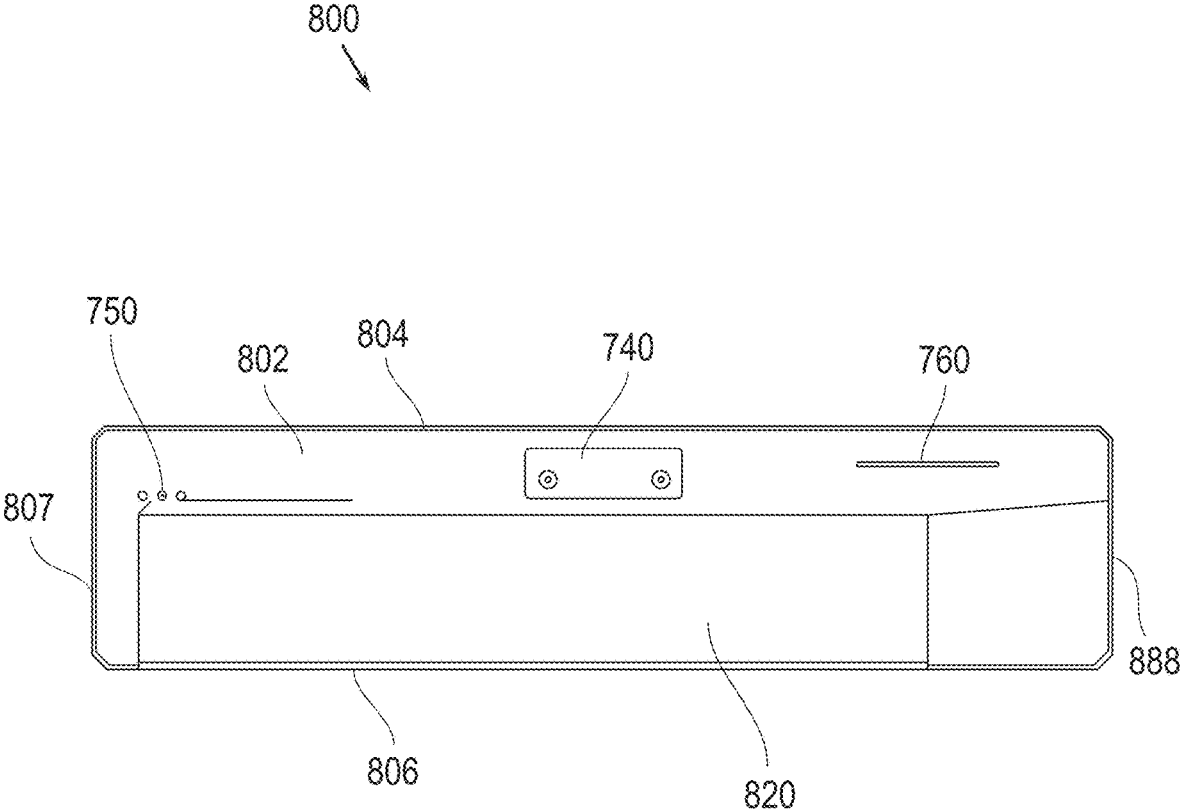


FIG. 12

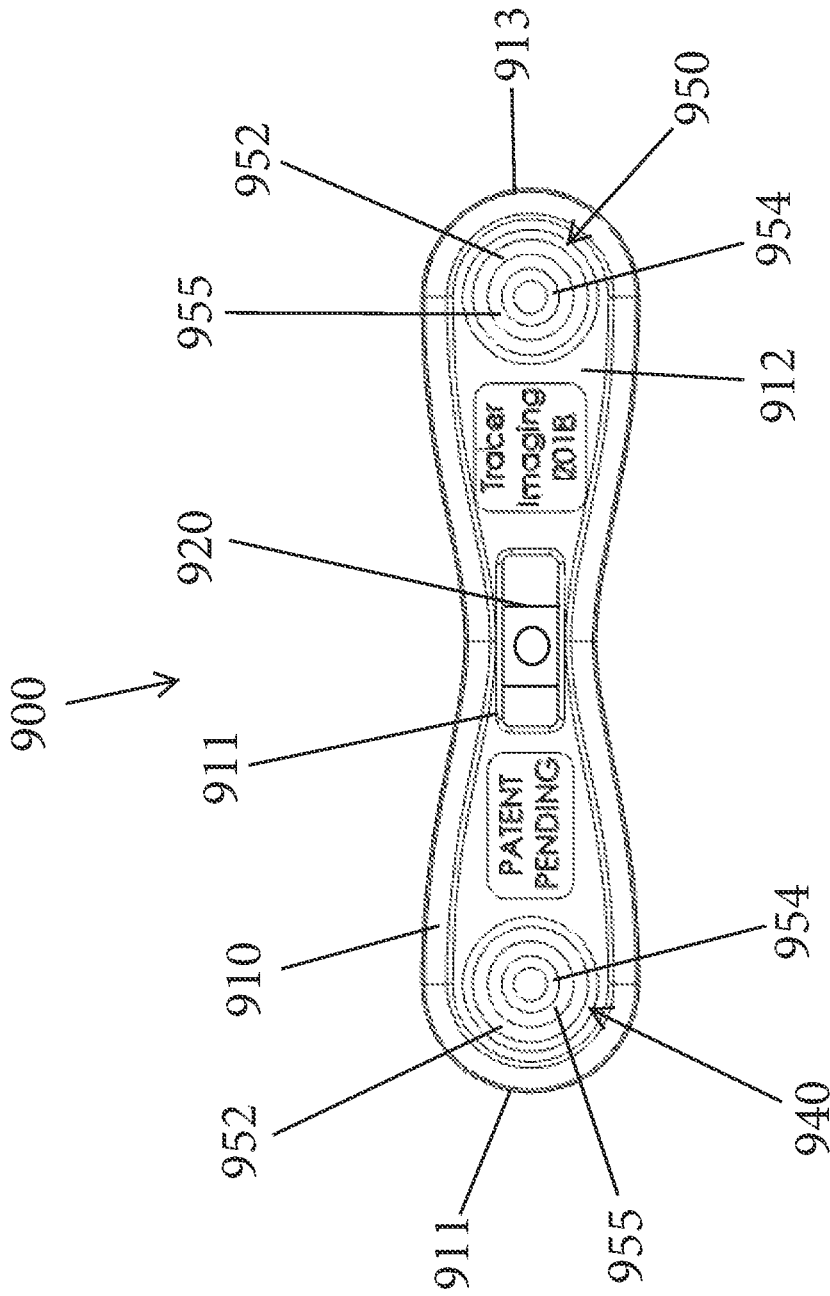


Fig. 13

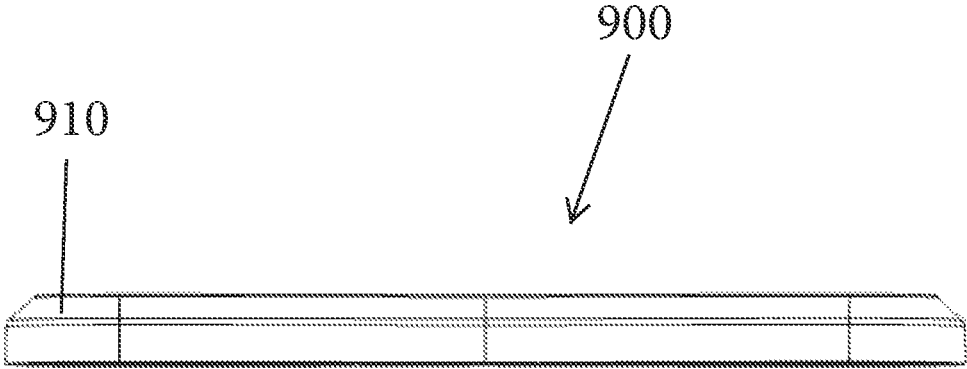


Fig. 14

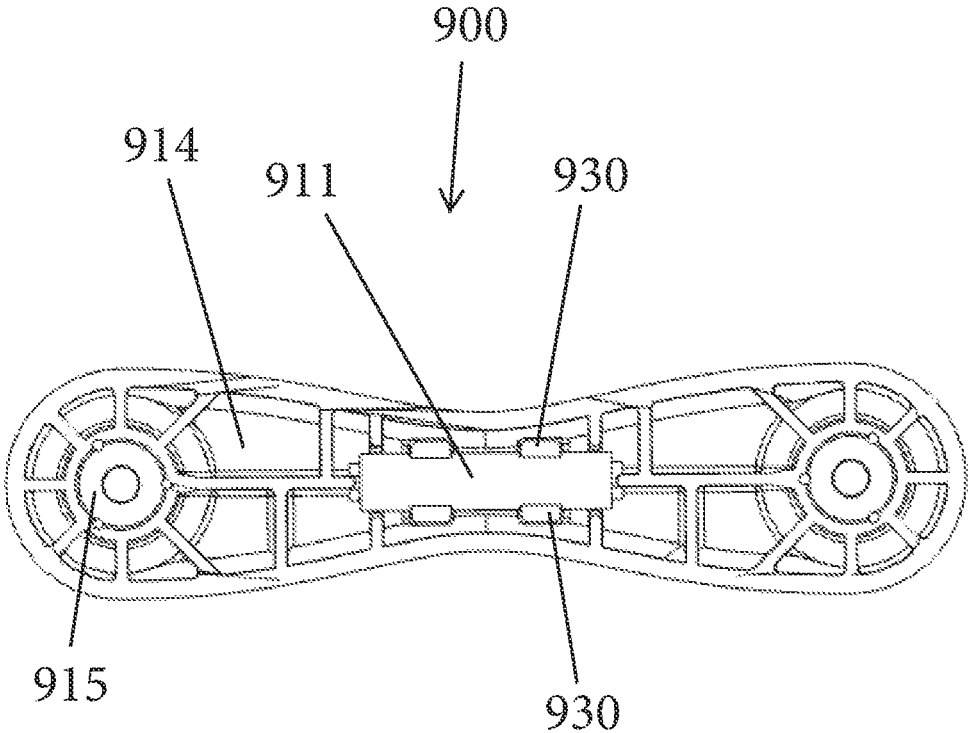


Fig. 15

SYSTEM AND METHOD FOR APPLYING AN IMAGE TO A SUBSTRATE TO FORM A DISPLAY ARTICLE

CROSS REFERENCE TO RELATED APPLICATION

The present application is a divisional of U.S. patent application Ser. No. 16/445,321, filed Jun. 19, 2019, which claims priority and is related to U.S. patent application No. 62/687,660, filed Jun. 20, 2018; U.S. patent application No. 62/721,010, filed Aug. 22, 2018, and U.S. patent application No. 62/807,873, filed Feb. 20, 2019, each of which is hereby expressly incorporated by reference in its entirety.

TECHNICAL FIELD

The present invention is directed to printed products and in particular, relates to an improved system and method for printing or otherwise displaying an image, indicia, or object on a substrate, such as a ferrous metal substrate or other type of substrate, as well as mounting hardware.

BACKGROUND

Prints and photographs are used in a vast number of consumer products including framed wall displays and other products that are intended to be displayed, such as on a table or desk, etc. Prints and photographs can be formed on a number of different mediums including but not limited to different types of paper substrates, including photograph paper, etc.

One other type of medium on which a print can be formed is a metal substrate. As one can imagine, printing on a metal substrate (e.g., an aluminum sheet) raises certain challenges. One conventional technique comprises a roller printing process in which a metal substrate is fed into a special printer without bending the metal substrate. The metal substrate has previously undergone a process in which it is specially coated and the print dyes infuse directly into this specially coated aluminum sheet. This is a direct pass-thru process in which the metal sheet is fed through the roll-fed printer. One deficiency of this technique is that in the final product, the printed image is exposed (formed on the fascia) and can thus be scratched and it is easy to impart smudges on the printed front surface of the product. In addition, many printers do not have a direct sheet pass-thru option.

Another technique for transferring a print onto a metal substrate is a process in which the print is transferred onto the front surface of a plastic substrate (e.g., sheet) which includes an adhesive layer along its back surface. The plastic substrate is then mated to the metal substrate by bonding the adhesive back layer of the plastic sheet to a front surface of the metal substrate. As with the previously described technique, a main deficiency of this technique is that in the final product (display article), the printed image is exposed and thus can be scratched and it is easy to impart smudges on the printed front surface of the product. In addition, another deficiency with this technique is that it is very difficult to laminate the film with adhesive without the use of expensive and large laminators. Misregistration and air bubbles are two major issues.

There is therefore a need and desire to provide a system and method for forming a print on a substrate, such as a metal substrate, that overcomes the deficiencies noted above with respect to the conventional techniques.

SUMMARY

A printed product according to at least one embodiment includes a printed sheet having a front face and a rear face.

A printed image is formed along the rear face. The printed product also includes an adhesive coated substrate, such as a ferrous metal substrate, to which the printed sheet is affixed.

A method for forming a printed product comprises the steps of:

printing an image on a rear surface of a clear sheet to form a printed sheet;
positioning the printed sheet relative to an adhesive coated substrate (e.g., ferrous metal substrate) such that the rear surface of the printed sheet faces a top surface of the adhesive coated substrate; and
affixing the rear surface to a top adhesive layer of the adhesive coated substrate by applying pressure to the printed sheet in a direction toward the adhesive coated substrate.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a side perspective view, partially exploded, showing a printed sheet for bonding to an adhesive coated substrate, such as a ferrous metal substrate;

FIG. 2 is a side perspective showing a tool being used to bond the printed sheet to the adhesive coated substrate to form a final product;

FIG. 3 is an enlarged cross-sectional view of a portion of the final product taken along the circle 3 of FIG. 2;

FIG. 4 is a top perspective view of a jig;

FIG. 5 is a top perspective view of the jig with a substrate disposed in a recessed area formed therein;

FIG. 6 is a top perspective view of the jig with a printed sheet being disposed over the jig;

FIG. 7 is a partial cross-sectional view of the jig with the substrate in the recessed area;

FIG. 8 is a top perspective view of the jig with a squeegee tool attached thereto;

FIG. 9 is a perspective view of the squeegee;

FIG. 10 is a cross-sectional view of a printed sheet that forms a part of the product described herein;

FIG. 11 is top perspective view of a jig and squeegee tool according to another embodiment;

FIG. 12 is a top perspective of an alternative jig;

FIG. 13 is a front elevation view of a mount according to one embodiment;

FIG. 14 is a top plan view thereof; and

FIG. 15 is a rear elevation view thereof.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

The present invention, at least in one embodiment, is directed to a system and method for forming a print on a substrate, such as a metal substrate, that overcomes the deficiencies noted above that plague the prior techniques used to print on metal substrates.

Now referring to FIGS. 1-3, a printed metal substrate product 100 can be thought of as being formed of two separate components that are joined together in accordance with the teachings of the present invention as described herein. More specifically, one component comprises a printed sheet (print medium) 200 and the other component comprises an adhesive coated substrate 300. It will be

understood herein that the printed sheet can take any number of forms and is not limited to a print being formed on the sheet but can include images or objects or materials provided along the sheet using other techniques and not limited to a printing process. Thus, in the broadest sense, the sheet **200** is a sheet that includes an image or indicia for display.

The final product, namely, the printed (metal) substrate product, **100** can come in any number of different shapes and sizes. For example, the final product can have a square shape, rectangular shape, oval shape, circular shape, triangular shape, etc. Likewise, the size of the final product can vary. For sake of convenience and to describe an exemplary implementation, the substrate is described as being a ferrous metal substrate; however, as described herein, it will be appreciated and understood that the substrate is not limited to being formed of a (ferrous) metal and also, the image that is to be displayed is not limited to being a printed image but instead can be formed of a non-printed image, a painted surface, indicia, or other material that is to be displayed in the product **100**.

The printed sheet **200** comprises a substrate, such as an optically clear sheet, that has a first side (first face) **202** and an opposite second side (second face) **204**. The first side **202** can represent a front side or top face of the printed sheet **200** and the second side **204** can represent a rear side or bottom face of the printed sheet **200** that in one embodiment has an ink receptive layer (e.g., ink jet receptive coating) formed thereon. The printed sheet **200** is flexible and can be formed of any number of different materials that are suitable for its intended use. The printed sheet **200** can thus be in the form of an optically clear flexible plastic sheet and serves as a carrier for the image to be displayed.

In one embodiment, the ink jet receptive coating can be a clay based coating; however, any other commercially available coatings can be used.

A print (printed image) (generally indicated at **201** in FIG. **3**) is formed on the second side **204** of the printed sheet **200**. The print can be formed by any number of suitable techniques and is formed of inks that are deposited on the second side **204** of the printed sheet **200**. The printed sheet **200** includes no adhesive layer or other layers. Unlike the techniques described above with respect to conventional print on metal techniques, the present method forms the print on the rear face (second side **204**) of the printed sheet **200** and thus, the print is not formed on an outwardly exposed surface that can be contacted and scratched and smudged. Instead the print is formed on the surface that faces toward the metal substrate itself and thus, the printed sheet **200** itself protects the integrity of the print. As discussed herein, the image to be displayed by sheet **200** is not limited to being a printed image (such as a photo, etc.) but can be in the form of a painted image, objects, or materials deposited onto the sheet **200** for display.

It will also be appreciated that any number of different ink printing techniques can be used to deposit the print on the second side **204**. Alternatively, as described herein, an image can be formed on the sheet **200** using other means besides a printed process and thus, the term "printed sheet" not only covers a sheet having an image formed thereon by printing as well as other techniques used to impart the image onto the sheet.

Anti-Reflective, Hard Coated Printed Sheet

In one embodiment shown in FIG. **10**, the printed sheet **200** comprises an anti-reflective, hard coated printed sheet that has a print (ink jet) receptive second side **204**. In FIG.

10, the print **201** is eliminated for ease of illustration. Along the first side **202**, a first layer (coating) **203** is deposited and along the second side **204**, a second layer (coating) **205** is deposited. As described herein, the first layer **203** comprises the scratch resistive, anti-reflective coating that represents the outwardly facing face of the printed sheet **200**, while the second layer **205** comprises an aqueous ink receptive coating that permits the print **201** to be formed thereon.

In particular, the printed sheet **200** has an applied coating that offers the desired properties of being anti-reflective and also is a hard coating (increased hardness). In one embodiment, the printed sheet **200** comprises a polyethylene terephthalate (polyester) substrate that has a coating applied thereto to at least one surface, such as the first side **202** that faces outward.

The coating can be applied to the base material (e.g., PET) using any number of different techniques. For example, a reverse gravure process can be used to applied the coating to the substrate. As is known, a gravure coating process, used for producing continuous coatings, uses a gravure roller with depressions or recesses on the surface which control the thickness and uniformity of the coated layer. Ideally the fluid is uniformly "picked out" of the recesses and transferred to the substrate. Typically, these recesses are in a regular pattern in the region where a continuous coating is desired. A reverse gravure coater is one technique for applying the coating and the operation of a gravure coater is similar to that of a differential speed coater but the gravure roller surface moves in the opposite direction to the web (substrate).

The coating applied to the base substrate offers a number of advantageous properties including but not limited to: (1) excellent abrasion and scratch resistance; (2) outstanding for embossing and die cutting; (3) excellent chemical resistance to common household cleaners and industrial solvents; (4) second surface printability with solvent and UV inks, including clearing inks; (5) first surface printability with clear, matte and texture UV cure inks; and (6) excellent anti-glare (anti-reflection) properties. The coating is thus preferably a protective hardcoat offering superior abrasion, scratch, and chemical resistance plastic coating.

The sheet **200** thus offers a novel product element in that one surface is hardcoated to offer the above-mentioned properties, including but not limited to anti-reflective, scratch resistance, etc., and the opposite surface has an aqueous ink receptive coating that permits the print to be formed thereon.

The adhesive coated metal substrate **300** (or substrate formed of another material) thus represents the structure to which the printed sheet **200** is attached to form the complete, final print product.

The adhesive coated metal substrate **300** is formed of a number of different materials and/or structures and in particular, is formed of a base metal substrate **310**. The base metal substrate **310** can be formed of a suitable metal and in one embodiment, the base metal substrate **310** is formed of aluminum and more particularly, of anodized aluminum. As understand, anodizing is an electrolytic passivation process used to increase the thickness of the natural oxide layer on the surface of the metal substrate. Aluminum alloys are anodized to increase corrosion resistance and to allow dyeing (coloring), improve lubrication, or improved adhesion. The anodic layer is non-conductive.

The base metal substrate **310** has a first side (first face) **312** and an opposite second side (second face) **314**. The first side **312** represents a front side or top face of the base metal substrate **310** and the second side **314** represents a rear side

or bottom face of the base metal substrate **310**. The base metal substrate **310** is a rigid substrate; however, depending upon a thickness thereof, it may be possible to bend the base metal substrate **310** when applying a sufficient force thereto.

It will be appreciated that the adhesive coated metal substrate **300**, and in particular, the base metal substrate **310** thereof, can come in any number of different shapes and sizes.

The adhesive coated metal substrate **300** also includes an adhesive component, which is generally shown at **400**, for adhering the printed sheet **200**. The adhesive component **400** is configured to act as the bonding agent to bond (attach) the printed sheet **200** to the first side **312** of the base metal substrate **310**. Applicant advantageously has discovered that the present construction eliminates the need for an industrial sized laminator to laminate two structures as was previously done and led to increased cost and complexity.

The adhesive component **400** comprises a multi-layer adhesive structure that is disposed along the first side **312** of the base metal substrate **310**. The adhesive component **400** comprises a carrier **410** that is formed of an optically clear material and can be a flexible thin plastic sheet. For example, the flexible plastic sheet can be formed of PET (polyethylene terephthalate) or any other suitable material. The carrier **410** includes a first side (first face) **412** and an opposite second side (second face) **414**. The first side **412** represents a front side or top face of the carrier **410** and faces away from the base metal substrate **310** and the second side **414** represents a rear side or bottom face of the carrier **410** and faces toward the base metal substrate **310**.

In accordance with the present invention. The adhesive component **400** includes a first adhesive **420** that can be in the form of a first adhesive layer or bottom adhesive layer. The first adhesive **420** is disposed along the second side **414** of the carrier **410** and is intended to act as the bonding agent that fixedly bonds the adhesive component **400** to the base metal substrate **310**. The first adhesive **420** can be in the form of a permanent adhesive layer that is of a type that permanently bonds two structures to one another. Any number of different permanent adhesives can be used as the first adhesive **420**. For example, one suitable permanent adhesive is permanent acrylic (pressure sensitive) adhesive. Preferably, the first adhesive **420** covers the entire area of the second side **414**.

The adhesive component **400** also includes a second adhesive **430** that can be in the form of a second adhesive layer or a top adhesive layer. The second adhesive **430** is disposed along the first side **412** of the carrier **410** and thus faces away from and is not in contact with the base metal substrate **310**. Instead, the second adhesive **430** covers the first side **412** of the carrier **410**. The second adhesive **430** can be in the form of a low-tack adhesive layer that is disposed along the first side **412**. As described herein, the low-tack properties of the second adhesive **430** permits repositioning of the printed sheet **200** on the base metal substrate **310**. The consistency and properties of the second adhesive **430** are such that air bubbles can be removed therefrom when the printed sheet **200** is applied thereto and a tool (described below) is used to apply a force to the printed sheet **200** and smooth out the printed sheet **200**.

Any number of different adhesives can be used as the second adhesive **430**. For example, one low-tack adhesive can be a removable acrylic (pressure sensitive). The low-tack adhesive **430** is forgiving in that it is a gel-like material and is somewhat impervious to air bubbles (which was a common undesired byproduct of using an industrial laminator). As described below, the low-tack adhesive **430**

allows the user to apply the printed sheet **200** using a light amount of pressure as opposed to using a nip-roller/laminator as was traditionally used.

The adhesive component **400** further includes a releasable first release layer **440** that is disposed over the second adhesive **430** to protect and preserve the second adhesive **430** until time for bonding the printed sheet **200** to the adhesive coated metal substrate **300**. Any number of different first release layers **440** can be used and in one embodiment, the first release layer **440** is in the form of an HDPE (high-density polyethylene) material.

The adhesive component **400** in combination with the base metal substrate **310** forms a structure that can be referred to as being a prelaminated metal substrate.

Process for Bonding the Printed Sheet to the Adhesive Coated (Metal) Substrate

In accordance with the present invention and as shown in FIG. 2, a method is provided for bonding the printed sheet **200** to the adhesive coated metal substrate **300**. To prepare the adhesive coated metal substrate **300**, the first release layer **440** is slowly removed to thereby expose the second adhesive **430**. The printed sheet **200** is positioned such that the second side **204** that contains the print faces down toward the exposed second adhesive **430**. The second side **204** is placed in intimate contact with the second adhesive **430** and a tool **500** is used to apply pressure and apply the printed sheet **200** to the exposed second adhesive **430**. In accordance with one embodiment, the tool **500** is in the form of a squeegee that has a handle portion and a flexible blade portion that is configured to contact and ride along the first side (upward facing surface) **202** of the printed sheet **200** to apply a downward force to the printed sheet **200** to press into contact with the exposed second adhesive **430**. Since the second adhesive **430** is preferably a low-tack adhesive, if needed, the printed sheet **200** can be repositioned relative to the base metal substrate **310**. However, the second adhesive **430** allows the printed sheet **200** to be fixedly attached to the base metal substrate **310**.

The squeegee **500** can have a slot **510** formed therein to all the printed sheet **200** to be fed therethrough such that the printed sheet **200** can be held back as the first release layer **440** is removed and the squeegee **500** is moved along the first side **202** of the printed sheet **200**. The squeegee **500** also has a flexible blade **520** which contacts the printed sheet **200**.

Unlike conventional metal substrate print products, the printed image or object or material for display in the present invention is not exposed and accessible along the printed sheet **200**. Instead, the printed image is on the rear surface (second face **204**) of the printed sheet **200** and thus cannot be scratched or smudged or otherwise marred.

In another aspect as shown in FIGS. 4-7, a jig **600** can be provided to assist the user in attaching the printed sheet **200** to the adhesive coated metal substrate **300**. The jig **600** has a body that has a recessed portion **610** which is sized and shaped so as to be complementary to the adhesive coated metal substrate **300**. Thus, the recessed portion **610** can be in the form of a rectangular shaped recessed portion in which the adhesive coated metal substrate **300** sits.

As shown in FIG. 4, the jig **600** has a top surface **602** along which the recessed portion **610** opens. There is also a peripheral border formed around the recessed portion **610**. Within the recessed portion **610**, a first opening **620** is formed, as well as a second opening **630**. The first opening **620** is located proximate a first end and the second opening

630 is located proximate a second end opposite the first end. As illustrated, the first opening **620** and the second opening **630** have different shapes and/or sizes. The first opening **620** has an oblong shape and is configured such that a user can access the underside of the base metal substrate **310** and apply a force thereto for dislodging the adhesive coated metal substrate **300** and the attached printed sheet **200** from the recessed portion **610**.

The second opening **630** has a different shape and is sized and shaped so that a person's hand can be inserted so that the second opening **630** acts as part of a handle which allows the user to easily carry the jig **600**. The illustrated second opening **630** has a curved edge and an opposing flat edge against which the user's fingers can rest when carrying the jig **600**. The jig **600** can also be hung using this opening.

The top surface **602** of the jig **600** has a number of features that assist in the use of the jig **600**. In particular, the top surface **602** has a first portion **603** that is formed along a first end of the jig **600** and the top surface **602** has a second portion **605** that is formed along a second end of the jig **600**. Both the first portion **603** and second portion **605** are located outside of the recessed portion **610**. Within the second portion **605**, there is one or more recesses **611** that are in communication with the recessed portion **610** and are positioned along the second end of the recessed portion **610** so that when the base metal substrate **310** is inserted into the recessed portion **610**, the second end of the base metal substrate **310** is accessible and exposed within the one or more recesses **611**. In the illustrated embodiment, there are two recesses **611** with each recess **611** having a semi-circular shape.

Between the recesses **611** within the second portion **605**, there is a plurality of first locating indicia **615** to assist in positioning of the printed sheet **200**. The illustrated first locating indicia **615** are in the form of four spaced lines (line segments). It will be appreciated that more or less than four lines can be used. The lines can be recessed in the jig surface or they can be printed onto the top jig surface.

The first portion **603** also has a number of features. For example, there can be a first area **621** that is intended to mark an area in which a piece of tape can be disposed in order to temporarily hold the printed sheet **200** in place above the adhesive coated metal substrate **300**. Below the first area **621** there is a second locating indicia **623** in the form of a crosshair symbol. The second locating indicia **623** is located between the first area **621** and one end (top edge) of the recessed portion **610** of the jig. The second locating indicia **623** can be recessed relative to the top surface or can be printed thereon or otherwise formed. The use of these two locating features is described below.

The jig **600** also includes retaining features to detachably hold/retain the squeegee **500** when not in use. For example, along one end of the jig within the first portion **603** above the first area **621** there is a pair of clips **640** that are integrally formed as part of the jig. The clips **640** can be L-shaped clips with a top wall **642** that defines a space **643** located therebelow and into which the squeegee **500** is inserted. The jig **600** also includes a pair of upstanding protrusions **650** that are spaced apart and generally located below the clips **640**. The protrusions **650** are shaped and sized to be received within the slot **510** formed in the squeegee **500** for holding the squeegee **500** in place. The illustrated protrusions **650** have a rectangular shape. The protrusions **650** can be located so that they are received within end regions of the slot **510**.

To detachably retain the squeegee **500** on the jig **600**, the squeegee **500** is positioned on its side and the blade **520** is inserted into the spaces **643** of the two clips **640** and is

frictionally held in place below the top walls **642**. After positioning the blade **520** in place, the squeegee **500** is lowered and the protrusions **650** are received within the slot **510** resulting in the body of the squeegee being retained on the jig **600**. FIG. **8** shows the squeegee **500** in this retained position on the jig **600**.

Alternative Metal Substrate

In another embodiment, the base metal substrate **310** is not formed from a brushed aluminum material but instead is formed from a material other than a brushed aluminum material; however, the material has been processed so that it has a brushed aluminum-like appearance. As is known in the industry, brushed aluminum is quite expensive compared to other materials; however, it has a very attractive appearance due to its brushed and reflective nature and there is heavily used. One other disadvantage of brushed aluminum is that is a non-ferrous material and therefore, objects cannot be mounted to aluminum with the use of magnets.

In accordance with one embodiment of the present invention, the base metal substrate **310** can comprise a ferrous metal substrate that has been processed to provide an outer appearance similar to a brushed aluminum appearance. As is known, a brushed metal look comprises a unidirectional satin finish. It is desired to produce a metal substrate that is not streaky and is of photo quality and therefore, processing of the metal can create a consistent background that is desired for the applications described herein.

Besides offering an attractive appearance, one of the benefits of using a printed ferrous metal substrate is that the final, finished product **100** can be hung using magnets since magnets will attach to the ferrous metal and as mentioned herein, the cost of the ferrous metal material is significantly less than the cost of aluminum.

In accordance with one processing technique, the starting material to form the base metal substrate **310** is a sheet of 1008 steel. The base steel is either hot dipped galvanized (HDG) or electro-galvanized (EG) and is typically formed as a coil. As is well known, a galvanized sheet is a cold rolled carbon steel sheet coated with a layer of zinc on two sides by a continuous galvanizing process. The process results in a layer of zinc deposited on each side of the steel sheet that is tightly adhering to the steel through the formation of an iron-zinc alloy bonding layer that is formed by a diffusion process.

In order to impart the brushed aluminum look to the galvanized steel sheet, the galvanized steel sheet is finished by a gravure printing process in which steel sheet is gravure printed and is then clear coated. The gravure printing process imparts the brushed aluminum look and the clear coating acts a protectant layer.

As is generally known, in gravure printing, an image is acid-etched on the surface of a metal cylinder in a pattern of cells. The cells are recessed into the cylinder. The cylinder is etched with cells of different depths. These cells hold the ink that is transferred to the substrate. The cells are filled with ink and another substrate, in this case the base metal substrate **310**, is pressed against the inked cylinder on a rotary press, and the image is transferred directly to the substrate. This is one technique for imparting the brushed aluminum look.

After clear coating the gravure printed HDG steel sheet, the formed non-aluminum base metal substrate **310** is then recoiled. Additional processing, including cutting and deburring, can be subsequently performed.

Other metal options include but are not limited to a ferritic grade of stainless, e.g., 430, which make the substrate very magnetic (either a 2b or #4 finish) or a cold rolled, tinplated, bright finish, low carbon steel can be used.

Matte Finish

In another embodiment, the top surface of the base metal substrate **310** can include a coating that is designed to provide a matte finish to the top of the base metal substrate **310**. This option provides a different finished look for the base metal substrate **310**.

Whiteness of Substrate Finish

In another embodiment, a coating can be applied to the metal substrate to increase the whiteness of the background. Standard ink jet printing applies depositing CMYK inks onto a substrate. CMYK refers to four inks used in printing, namely, cyan, magenta, yellow and key. The CMYK model works by partially or entirely masking colors on a lighter, usually white background. The ink reduces the light that would otherwise be reflected. In the case of using a metal substrate, the metal substrate does not have a white color and since the CMYK inks do not impart whiteness, a coating should be added to the substrate to increase the “whiteness”. This coating can be a white colored coating or silver metallic coating or other suitable coatings and in particular, the coating can be a PVDF, polyester or acrylic resin continuously applied at coil level utilizing a roller coating method. Aluminum chips or pigmented mica are added to resin to create a metallic look.

Method for Applying the Printed Sheet **200** to the Adhesive Coated Metal Substrate

First, the adhesive coated metal substrate **300** is inserted into the recessed portion **610** of the jig **600**. When the adhesive coated metal substrate **300** is disposed in the recessed portion **610**, it sits proud in that the top surface of the adhesive coated metal substrate **300** sits slightly above the top surface **602** of the jig as shown in FIG. 7. As discussed above, the release layer **440** is thus exposed above the top surface **602** of the jig. Since the release layer **440** sits above top surface, when it is removed, the exposed adhesive also is preferably above the top surface **602** so that the printed sheet **200** is layered on top of the exposed adhesive at a location slightly above the top surface **602**.

The printed sheet **200** is then positioned. It will be appreciated that the printed sheet **200** can have additional markings to assist the user in properly positioning the printed sheet **200** so that the printed image is facing downward toward the jig **600**. For example, the printed sheet **200** can have indicia or markings that make it immediately clear which side is facing up. For example, the printed sheet **200** can have the words “top” or “front” or both words printed on the sheet in a cut-off area that is later removed. This marking(s) allows the user to immediately understand where and how to place the printed sheet **200**.

Once the printed sheet **200** is properly positioned (with printed image facing downward), the printed sheet **200** is registered relative to the jig **600**. The printed sheet **200** includes third and fourth locating indicia (markings) **235**, **245** that are complementary to the first locating indicia and second locating indicia **615**, **623**, respectively. When properly registered, the third locating indicia **235** is placed in registration with the first locating indicia **615** and the fourth

locating indicia **245** is placed in registration with the second locating indicia **623**. The third locating indicia **235** can thus be in the form of spaced lines printed on the sheet **200** and the fourth locating indicia **245** can be in the form of a crosshair symbol printed on the sheet **200**.

Once all of the indicia are placed in registration, the printed sheet **200** is temporarily secured to the jig **600** by placing a piece of tape in the first area **621** with the tape extending across an edge (end) of the printed sheet **200**. To securely attach the printed sheet **200** to the adhesive coated metal substrate **300**, the unsecured end of the printed sheet **200** is lifted and fed through the slot **510** of the squeegee **500** (i.e., the unsecured end is folded back on top of the printed sheet in a direction toward the secured end of the printed sheet). By inserting the printed sheet **200** through the slot **510**, the user can still use the squeegee **500** with one hand. This action exposes the release layer **440** that extends across the top of the adhesive coated metal substrate **300**. The release layer **440** is removed by using the user’s other hand and pulling it in a direction away from the secured end of the printed sheet **200**. This action reveals the second adhesive **430** and then the user continuously meters the printed sheet **200** back out of the slot **510** onto the exposed second adhesive **430** and the squeegee **500** is used to apply a downward force to the printed sheet **200** to press the printed sheet **200** onto the exposed second adhesive **430**.

As mentioned above, the second side **204** that contains the print faces down and is secured to the exposed second adhesive **430**.

The second adhesive **430** is a “gooey” consistency thereby allowing air bubbles to be taken out when the printed sheet **200** is applied thereto and the squeegee **500** is used to apply a force to the printed sheet **200** and smooth out the printed sheet **200**.

The user continues to remove the release layer **440** and applies the printed sheet **200** to the second adhesive **430**. The squeegee **500** is slowly moved along the exposed top surface of the printed sheet **200** to adhere the printed sheet **200** to the second adhesive **430** and remove any bubbles between the printed sheet **200** and the adhesive coated metal substrate **300**. The resulting product is a reverse printed sheet **200** securely adhered to the adhesive coated metal substrate **300**.

Alternatively, the jig **600** can include two posts that accept the printed sheet **200**. The printed sheet **200** thus can have two holes formed therein. The two holes can be formed using any number of techniques including use of a hole puncher. It will be appreciated that the printed sheet **200** can have a perforated portion in which the two holes are formed such that once the print portion of the printed sheet **200** is affixed to the adhesive coated metal substrate **300**, the perforated portion can be removed. The two holes are designed to align the printed sheet **200** in perfect (optimal) position relative to the adhesive coated metal substrate **300** and on top of the adhesive coated metal substrate **300**.

It will also be appreciated that the subcomponents described herein, such as the adhesive component **400** and the sheet **200** (including the two-sided coated version), can be used also on non-metal surfaces, such as glass prints, acrylic prints, natural wood prints, ceramic, etc., as well as the metal surfaces described herein.

In other words, the main (base) substrate is not limited to being base metal substrate **300** but instead can be formed of any number of other materials including but not limited to glass, plastic substrates, such as acrylic substrates, wood and any other suitable material that provides a backing to which the print can be adhesively bonded using techniques described herein.

In the event that the base substrate is glass or a transparent acrylic material, the order of the assembled parts is different than that shown in FIG. 1. In particular, the order of the parts is generally reversed in that the bottom layer is the sheet 200 that has the print (image) formed of the top surface and the adhesive component 400 is provided and bonded to the print side of the sheet 200 and since the base substrate is transparent, as in the case of a glass or acrylic substrate, this type of base substrate is laid over the permanent adhesive side of the adhesive component 400 with the print image on the sheet 200 being below (behind) the base substrate. In other words, the base substrate is actually the structure that the viewer views the print image through and is thus the forward most part of the assembly which is in direct contrast to the implementation shown in FIG. 1 in which the base substrate 310 is the rearward most part of the assembly. In any event, the print itself is still protected since it faces inward toward the base substrate and this arrangement can offer a fully transparent look since all of the parts can be formed of transparent materials.

Accordingly, the base substrate 310 is not limited to being formed of a metal material but can be formed of any number of materials, such as those discussed herein. The assembly process is the same or essentially the same in that the print sheet and adhesive component (double sided adhesive carrier sheet) is used to mount the print sheet to the substrate, which again can be in the form of a metal sheet or other material, such as glass or plastic material (transparent or opaque in nature).

Alternative Jig Constructions

In another aspect as shown in FIG. 11, a jig 700 can be provided to assist the user in attaching the printed sheet 200 to the adhesive coated metal substrate 300. The jig 700 is similar to the jig 600 and includes a main body that has a recessed portion 710 which is sized and shaped so as to be complementary to the adhesive coated metal substrate 300 shown in the present figures. Thus, the recessed portion 710 can be in the form of a rectangular shaped recessed portion in which the adhesive coated metal substrate 300 sits.

As shown in FIG. 11, the jig 700 has a top surface 702 along which the recessed portion 710 opens. There is also a peripheral border formed around the recessed portion 710. Within the recessed portion 710, one or more openings 711 are formed. The openings 711 allow for venting and also provides access to the underside of the base metal substrate 310 and reduced weight of the jig.

The top surface 702 of the jig 700 has a number of features that assist in the use of the jig 700. In particular, the top surface 702 has a first portion 703 that is formed along a first end of the jig 700. The first portion 703 is located outside of the recessed portion 710.

Along opposing sides of the jig 700 are a plurality of notches (slots) 720 and in particular, in the illustrated embodiment, each side of the jig 700 has a pair of notches 720. In the illustrated embodiment, each notch 720 is U-shaped. One end of the notch 720 lies within the recessed portion 710 and thus allows access to the adhesive coated metal substrate 300 for dislodging the completed product by applying a force to the underside of the adhesive coated metal substrate 300 (e.g., as by using a fingertip or tool, etc.).

The first portion 703 also has a number of features. For example, a fixation member 740 can be provided for temporarily locating and holding the printed sheet 200 in place above the adhesive coated metal substrate 300. In the illustrated embodiment, the fixation member 740 is in the

form of a clip, similar to a traditional school clip board, that is spring biased to a closed position and is open by applying a force to the clip. The fixation member 740 in the illustrated embodiment is centrally located. The fixation member 740 is thus located along a top edge of the recessed portion 710.

The first portion 703 also includes other locating features such as a first locating member 750 in the form of a protrusion (e.g., a round pin) that protrudes upwardly from the top surface. The protrusion 750 is located outside of the recessed portion 710 along the top edge thereof and is intended to be received within a complementary locating hole formed in the printed sheet 200. For example, a hole can be punches in the upper left corner of the printed sheet 200 and then the printed sheet 200 is placed on the protrusion 750 to couple the printed sheet 200 to the jig 700. The coupling allows for free rotation of the printed sheet 200 relative to the jig 700.

A second locating member 760 is provided and is in the form of a rib that is located along one side of the jig 700. In the illustrated embodiment, the second locating member 760 is positioned along the left side near the bottom left corner outside of the recessed portion 710. The second locating member 760 is in the form of a linear raised rib. When the second locating member 760 is in the illustrated position, the second locating member 760 is positioned to seat against the bottom left corner of the printed sheet 200. The printed sheet 200 is first coupled to the protrusion 750 by passing the protrusion 750 through the hole formed in the left corner of the printed sheet 200 and then the printed sheet 200 is swiveled (rotated) about the protrusion 750 until the left side (edge) of the printed sheet 200 is placed against the second locating member 760. This positioning of the printed sheet 200 ensures that the printed sheet 200 is in the desired registration relative to the underlying metal substrate 300.

It will be appreciated that the size, shape, and/or position of the second locating member 760 can be varied and the illustrated characteristics are only exemplary in nature and not limiting. For example, the second locating member 760 can be located along the right side of the jig 700 (right side of the printed sheet 200).

FIG. 12 illustrates another jig 800 that is similar to the other jigs. The jig 800 is thus formed of a jig body that has a top surface 802, a top edge 804, a bottom edge 806, a left side 807, and a right side 808. Along the top surface 802, a recessed portion 820 is formed. The recessed portion 820 is open along the bottom edge 806 and is configured to receive the printed sheet 200. Thus, unlike the recessed portion in the other jigs, the recessed portion 820 is only enclosed along three edges since it is not enclosed along the bottom edge 806. This type of construction allows for only a portion, such as a top portion or a side portion of the final product to be disposed within the recessed portion 820 and then, as the work progresses, the substrate and printed sheet can be shifted within the recessed portion 820.

Outside the recessed portion 820 there is the fixation member 740 for temporarily locating and holding the printed sheet 200 in place above a substrate which can be a non-metal substrate, such as a polymer-based substrate or any other suitable substrates, that can include the adhesive layer described herein. The fixation member 740 can thus be a clip to hold the printed sheet 200.

In this embodiment, the printed sheet 200 can be formed a non-transparent material, such as a paper stock material or can be formed of a transparent material such as the ones disclosed herein.

The jig 800 has the protrusion (pin) 750 that locates the printed sheet 200 in the manner described herein and also

includes the second locating member **760** which can be a linear shaped rib that is located outside the recessed portion **820** and can be located near the top edge **804** of the jig. In other words, the protrusion **750** and the second locating member **760** can be located within a perimeter border area that surrounds the recessed portion **820**. The second locating member **760** thus is formed at a position at which the printed sheet **200** will contact and seat against when properly positioned on the jig **800**.

FIGS. **13-15** depict a mount **900** that is intended to display a mountable product (e.g., a final printed product) that includes the metal substrate **300** or similar structure as the rear component. The mount **900** can thus be considered to be a wall mount that can be secured to a support surface, such as a wall. The mount **900** is intended to permit the mountable product to be easily hung in a variety of different locations.

The mount **900** is formed of a mount body **910** that has a front face **912** that faces outward from the support surface and an opposing rear face **914** that faces the support surface. The mount body **910** further has a first end **911** and an opposing second end **913**. The mount body **910** has an elongated shape and can have an hourglass shape as shown in that the center portion of the mount body **910** can have a waist that has a smaller width than the widths are the ends **911, 913**.

The center portion of the mount body **910** can have a window **911** formed therein. The mount **900** also includes a level **920**, such as a bubble level, that is held within the mount body **910** in registration with the window **911**. The mount **900** can be used to make sure that the mount **900** is properly oriented and level when mounted to the support surface (e.g., a wall). The level **920** is viewable from the front face **912** to permit the user to adjust the mount **900** during the mounting process. FIG. **15** shows the level **920** removed.

It will be appreciated that the level **920** can be permanently attached to the mount body **910** or it can be detachably coupled to the level body **910**. In the illustrated embodiment, the level **920** is inserted along the rear face **914** and held in place by two pairs of clips **930**. The two pairs of clips **930** are formed of flexible fingers that, under user force, flex open to receive the level **920** and then flex back to capture and hold the level **920** in place. The level **920** is thus cradled in place and held with a friction fit. To remove the level **920**, the user simply pulls the clips **930** outward to release the level **920**.

It will be appreciated that the mount body **910** can be constructed such that the level **920** is inserted and removed from the front face **912**. In other words, the clips **930** can be formed along the front face **912** about the window **911** to allow the insertion and holding of the level **920** in the manner described herein (e.g., friction fit). As described below, the construction allows for removal of the level **920** after the mount **900** is secured to the support surface (wall) in a level manner.

The mount body **910** has a first mounting member **940** and a second mounting member **950** that is spaced from the first mounting member **940**. In the illustrated embodiment, each of the first mounting member **940** and the second mounting member **950** can be in the form of at least one magnet. More particularly, the first mounting member **940** is received within a first recessed area formed in the mount body **910** along its front face **912** and the second mounting member **950** is received within a second recessed area formed in the mount body **910** along its front face **912**. The first and second recessed areas can be concave shaped recessed or circular or cylindrical shapes recesses that each has a floor

structure **915** as shown in FIG. **15**. The floor structure **915** has a flat (planar) disk shape with a center hole formed therein.

Each of the first mounting member **940** and the second mounting member **950** can be in the form of one or more cup magnets and in particular, each of the first mounting member **940** and the second mounting member **950** can include a pair of cup magnets, namely, a first cup magnet **952** and a second cup magnet **954** located inside the first cup magnet **952**. As is known, a cup magnet is a magnet that is inset into a steel cup that assist in mounting and increase their holding force. The cup magnets can be neodymium cup magnets.

In other words, the first cup magnet **952** has a greater diameter than the second cup magnet **954** and radially surrounds the second cup magnet **954**. Between the first cup magnet **952** and the second cup magnet **954**, a spacer **955** (e.g., a plastic annular shaped spacer) is provided to space the first cup magnet **952** and the second cup magnet **954**. By having spaced apart first cup magnet **952** and the second cup magnet **954**, there are two annular shaped magnetic contact surfaces to which the metal base substrate **300** can be attached as described herein. Thus, along the front face, each of the first mounting member **940** and the second mounting member **950** has two magnetic contact surfaces as a result of having two distinct magnets.

The magnets and spacer are thus concentric with respect to one another. Since the magnets have cup shapes, there is a center hole that passes through each of the magnets and also the spacer has a center hole. A fastener, such as a countersunk screw, passes through this aligned center hole to attach the mount body to the support surface (wall).

The magnets and spacer can be secured within each of first and second recessed areas using conventional techniques such as adhesives, bonding agents, mechanical means, etc.

Once the mount **900** is placed against the support surface (wall) and the level **920** is used to level the mount **900**, the mount **900** is securely attached to the support surface by passing two fasteners through the center holes that pass through the first mounting member **940** and the second mounting member **950** and the fasteners are anchored into the support surface (wall).

In the embodiment in which the level **920** can be removed from the front face **912** as when the clips that hold the level **920** in place are accessible along the front face, the level **920** can be removed from the front face once the mount **900** is securely attached to the support surface. The level **920** can then be used to level the final print product that is attached to the mount **900**. For example, the mountable product can be one of the ones described herein that has a metal backing (e.g., metal base substrate **300**) or similar structure that is attracted to the magnets and held in place against the mount **900** by magnetic attraction. In other words, to attach the mountable product to the mount **900**, the metal backing (substrate **300**) is positioned against the front face of the mount body **910** and held in place by magnetic force; however, the mountable product can be repositioned by lifting it away from the magnets and then repositioning it and placing it back into contact with the magnets. As mentioned, in the embodiment in which the level **920** can be removed, the level **920** can then be placed along the top edge of the mountable product to allow the product to be leveled and optimally positioned against the mount **900**. The removable level **920** can have a casing or housing that has at least one planar portion to allow it to sit flush against the top edge of the mountable product.

The level 920 can then be stored separately or discarded after the mountable product is mounted.

It will be appreciated that the mountable product can take any number of different forms and is not limited to being a printed product but instead, any product with a metal backing or other backing that can be held in place by magnets can be used. For example, a metal substrate with an engraving or etching formed on its front surface can be used with the mount 900.

Notably, the figures and examples above are not meant to limit the scope of the present invention to a single embodiment, as other embodiments are possible by way of interchange of some or all of the described or illustrated elements. Moreover, where certain elements of the present invention can be partially or fully implemented using known components, only those portions of such known components that are necessary for an understanding of the present invention are described, and detailed descriptions of other portions of such known components are omitted so as not to obscure the invention. In the present specification, an embodiment showing a singular component should not necessarily be limited to other embodiments including a plurality of the same component, and vice-versa, unless explicitly stated otherwise herein. Moreover, applicants do not intend for any term in the specification or claims to be ascribed an uncommon or special meaning unless explicitly set forth as such. Further, the present invention encompasses present and future known equivalents to the known components referred to herein by way of illustration.

The foregoing description of the specific embodiments will so fully reveal the general nature of the invention that others can, by applying knowledge within the skill of the relevant art(s) (including the contents of the documents cited and incorporated by reference herein), readily modify and/or adapt for various applications such specific embodiments, without undue experimentation, without departing from the general concept of the present invention. Such adaptations and modifications are therefore intended to be within the meaning and range of equivalents of the disclosed embodiments, based on the teaching and guidance presented herein. It is to be understood that the phraseology or terminology herein is for the purpose of description and not of limitation, such that the terminology or phraseology of the present specification is to be interpreted by the skilled artisan in light of the teachings and guidance presented herein, in combination with the knowledge of one skilled in the relevant art(s).

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example, and not limitation. It would be apparent to one skilled in the relevant art(s) that various changes in form and detail could be made therein without departing from the spirit and scope of the invention. Thus, the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A jig for affixing a sheet to a substrate to form a final product comprising:

a base having a top edge, a first side and a second side, the base having a recessed portion formed along a front face thereof for receiving the substrate;

a retaining member configured to hold the sheet, the retaining member being located outside the recessed portion;

a first guide member formed outside the recessed portion and configured to locate and hold a first portion of the sheet;

a second guide member formed outside the recessed portion and configured to locate a second portion of the sheet such that in combination with the first guide member the sheet can be placed in a target registration relative to the substrate.

2. The jig of claim 1, wherein the first guide member comprises a pin for reception in a hole formed in the sheet to restrict lateral movement of the sheet but permit rotation of the sheet and the second guide member comprises a rib for placement against one edge of the sheet.

3. The jig of claim 2, wherein the first guide member and the second guide member are formed along the first side of the base.

4. The jig of claim 2, wherein the first guide member and the second guide member are formed along the top edge.

5. The jig of claim 1, wherein the retaining member comprises a clip for holding a top edge of the sheet.

6. The jig of claim 1, further including at least one notch formed along one of the first side and second side of the base, an inner end of the notch being in communication with the recessed portion to permit removal of the substrate.

7. The jig of claim 1, wherein the sheet comprises a transparent sheet with a printed image formed along a rear face thereof and the substrate comprises an adhesive coated metal substrate to which the sheet is affixed.

8. The jig of claim 7, wherein the adhesive coated metal substrate comprises a prelaminated structure including a base metal substrate along with an adhesive component formed along a top surface of the base metal substrate.

9. The jig of claim 8, wherein the adhesive component comprises a carrier having a first face and an opposing second face; a first adhesive layer formed along the second face and in contact with the top surface of the base metal substrate; a second adhesive layer formed along the first face of the carrier for bonding the printed sheet to the adhesive coated metal substrate.

10. The jig of claim 9, wherein the first adhesive layer comprises a pressure sensitive permanent acrylic adhesive and the second adhesive layer comprises a pressure sensitive removable acrylic adhesive.

11. A jig for affixing a sheet to a substrate to form a final product comprising:

a base having a top edge, a first side and a second side, the base having a recessed portion formed along a front face thereof for receiving the substrate;

a retaining member configured to hold the sheet, the retaining member being located outside the recessed portion;

a first guide member formed outside the recessed portion and configured to locate and hold a first portion of the sheet;

a second guide member formed outside the recessed portion and configured to locate a second portion of the sheet such that in combination with the first guide member the sheet can be placed in a target registration relative to the substrate; and

a squeegee detachably coupled to the base at a location outside of the recessed portion and between one end of the base and the retaining member.

12. The jig for claim 11, wherein the squeegee has a rear edge that has a recessed center section that accommodates the retaining member when the squeegee is coupled to the base.

13. The jig of claim 11, wherein the first guide member comprises a pin for reception in a hole formed in the sheet to restrict lateral movement of the sheet but permit rotation of the sheet and the second guide member comprises a rib for placement against one edge of the sheet and the retaining member comprises a clip for holding a top edge of the sheet. 5

14. The jig of claim 11, wherein the base includes a border around the recessed portion, the base further including at least one pair of notches formed along the first side and second side of the base, an inner end of each notch being in communication with the recessed portion to permit removal of the substrate. 10

15. The jig of claim 11, further including a plurality of through openings formed in the recessed portion.

16. The jig of claim 11, wherein the base includes a pair of protrusions that engage and hold the squeegee. 15

17. The jig of claim 11, wherein the retaining member is disposed between the first guide member and the second guide member.

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