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METHOD AND APPARATUS FOR APPLYING DESIGNED INDICIA TO ARTICLES
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4 Claims

ABSTRACT OF THE DISCLOSURE
A method and apparatus for the stamping of roll leaf on the surface of articles, wherein the leaf itself is sensitized in the desired areas to form a predetermined design prior to advancement of the leaf to the stamping position of the apparatus, and followed by the overall hot, pressurized application of the leaf to the article, to effect transfer thereof restricted to the sensitized areas of predetermined design. Preferably, however, the article is first sensitized in the areas of the desired decorative indicia by the application of a priming coating. Subsequently, the article with its decorative prime coating is inserted in the stamping machine and subjected to the overall hot, pressurized application of the leaf, resulting in the transfer therefrom of only the restricted areas previously sensitized by the prime coating.

BACKGROUND OF THE INVENTION
The decoration of articles by the process of hot stamping is well known in the art and widely practiced commercially, especially for the application of indicia to plastic articles, such as containers and the like. Such process uses roll leaf which is readily available in all colors including metallic gold and silver. In practice the decorating has been accomplished by impressing the leaf between a heated die, and the article to be decorated, whereby the pigment or colors on the leaf transfer to the article in the areas contacted by the hot die. In order to obtain a pattern of decoration, such as artistic design or printing, a die of the desired corresponding surface characteristics must be employed. Since these dies are commonly fabricated from metal, such as brass or steel, they are quite difficult and hence expensive to produce.

The quality of decoration and consequently the acceptance of the finished product, achieved by this prior art process is highly dependent upon uniform engagement between the indicia-bearing die, the leaf and the article. Any improper engagement therebetween results in a failure to completely transfer the indicia. Prevention of such improper engagement is aggravated by the fact that the die is necessarily of rigid material and hence the article to be stamped must conform to the die geometry for effective results. Because most plastic and glass articles are usually molded there is considerable dimensional variations from piece to piece, as well as surface irregularities, thus making it necessary to apply great pressure between the die and the article in order to assure conformation to the contour. Such force may produce permanent deformation of the article, breakage, or in the case of thermoplastic materials a deep marring of the surface where the die engages high spots on the article. In an effort to minimize production shrinkage, due to this distortion and breakage, resort has been taken to the use of a silicone rubber die flexible enough to conform to article irregularities. This, however, has failed as a solution to the problem because such silicone rubber dies have poor dimensional stability, short service life, and are very limited in the extent they can compensate for such irregularities.

SUMMARY OF THE PRESENT INVENTION
It is accordingly the object of the present invention to provide a method and apparatus for the dependable stamping of articles with very intricate indicia, by the use of a plain resilient die and imposition of sensitized decorative indicia on the article itself which reacts with the colored leaf under low die pressure and temperature conditions, to form a decorative copy with very fine detail and outline sharpness of the indicia in colored leaf directly on the surface of the article regardless of irregularities thereof.

The foregoing objects together with others which will become readily apparent to those skilled in the art as the following description proceeds, are achieved in accordance with the present invention by the provision of a stamping machine wherein a ribbon of desired color leaf is intermittently fed from a supply spool to a take-up spool. The article to be stamped with the precise pattern of desired decoration or indicia is placed upon a support forming a part of the machine and in the performance of the method of the present invention the intricately patterned indicia is superimposed as a sensitized material either directly on the surface of the colored leaf or preferably on the article. Thereafter a heated die then moves to apply relatively low temperature heat and low pressure to the colored tape sandwiched between the die and the article on the machine support. The temperature and pressure of the die and the characteristics of the sensitized material are such that the latter reacts to transfer the colored leaf directly to the article as accurately and precisely delineated by the sensitized material on the surface of either the colored leaf or the article itself.

The present invention may be further appreciated by reference to the accompanying drawings wherein:

FIG. 1 is a cross-sectional view of simulated gold leaf of the type employed to deposit a precise pattern of desired decoration or indicia on the surface of an article.

FIG. 2 is a schematic illustration showing one modification which the method of accurately applying indicia to the surface of an article may take, and

FIG. 3 is a schematic illustration showing a further preferred modification of the method constituting the present invention.

Referring now to the drawings in detail a section of colored leaf 5 is shown in FIG. 1. of the type which may be employed in accordance with the present invention. Such leaf 5 in this particular instance comprises a series of layers or strata, the top one of which is a plastic film 6, such as cellophane or Mylar, that constitutes the carrier for the actual colored vehicle to be deposited on the article. As seen in FIG. 1, a yellow lacquer 7 is affixed to the plastic film 6 which itself carries a layer of vacuum-deposited aluminum 8. These latter two layers in this particular instance produce a "gold" color, while the bottom layer 9 constitutes an adhesive or sizing agent. In the embodiment shown in FIG. 1 the strip 5 is actually what is commercially known as simulated "gold leaf." In the transfer to an article the colored vehicle, consisting of layers 7, 8 and 9, is removed from the plastic film 6 and deposited on the article 14 (FIGS. 2 and 3) in a preselected design or pattern.

In the modification shown in FIG. 2 the roll of colored leaf 5 is intermittently moved from its feed roll 12 with
the residue of such leaf rewound upon a take-up spool 13 after the "gold leaf" is removed and deposited upon the article 14 carried by the support 15 forming part of the stamping apparatus. During its intermittent travel such leaf 5 is first contacted by a pad 16 carried on the upper surface of a reciprocating piston 17 which lightly contacts the sensitized composite layer 6 between the pistons pad 16 and a pressure block 18. This pad 16 actually constitutes a die since it carries on its upper surface the desired decoration or indicia to be applied in gold leaf to the finished article 14. For this purpose the pad 16 is first coated with a sensitizer by an application roller 19 which picks up such sensitizer from a reservoir 20 and deposits a desired quantity thereof on the upper surface of the pad 16 during reciprocatory movement of the roller 19.

Upon contact of the pad 16 with the lower surface of the colored leaf 5, the sensitizer is transferred to the latter in the precise decorative or indicia pattern on the surface of the pad 16. Thereupon the roll leaf 5 is indexed by the apparatus positioning the decorative sensitized pattern 22 immediately above the article 14 on the machine support 15. Upon reaching this position a heated resilient die 23 contacts the apparatus reciprocates downwardly as seen in FIGS. 2 and 3, thus pressing the colored leaf 5 with its superimposed pattern of sensitized material 22 into surface contact with the article 14 whereupon the colored vehicle of FIG. 1 is transferred to such article in the precise detailed pattern of the sensitized material and leaves only the plastic film 6 and untransferred colored areas as a residue which is intermittently wound upon the take-up spool 13 as new roll leaf is unwound from feed spool 12.

The sensitized material 22 used in the method of FIG. 2 as above described comprises a relatively non-volatile solvent which has a solving effect on the sizing or adhesive layer 9 of the roll leaf 5 used for the stamping. Accordingly, when the pad 16 containing this solvent contacts the roll leaf 5, it activates the latter only over its decorative indicia surface so that when such leaf 5 is pressed by the heated resilient die 23 into contact with the article 14, only the coloring material in the sensitized area of leaf 5 will transfer and adhere to the article 14 to be decorated or stamped. Moreover, by utilization of such solvent, transfer of the indicia-formed leaf to the article occurs at a die temperature considerably lower than the normal minimum temperature previously required for such leaf stamping. In actual practice, transfer in the sensitized areas of the die has been observed at a temperature as much as 100° F., below that of the minimum required for transfer of unsensitized indicia which clearly establishes that no critical temperature control of the stamping die 23 is necessary with the method of the present invention.

The formulation of the sensitizing material has considerable latitude and will vary with the method of application, the nature of the article being stamped and the desired final appearance. One of the simplest formulations for the method of FIG. 2 would be only a solvent such as butyl carbitol or isophorone, applied in an extremely thin layer. However, because of the practical problems in applying a layer sufficiently thin, it is preferable to dilute the active solvent with an inactive volatile solvent, such as isopropyl alcohol. Dilutions of one part active to ten parts inactive have been found satisfactory.

A sensitizer alone is not suitable for applications where the solvent is also a partial solvent for the article being stamped. However, the quantity of solvent remaining in the sensitizer before stamping is highly critical, as an excess causes smearing or failure to transfer and too little also gives transfer failure. When using a sensitizer alone it is necessary to utilize a roll leaf with a sizing or adhesive layer suitable for the material to be stamped. In such instances, the differential transfer is effected by the different critical transfer temperature between sensitized and unsensitized areas and depending upon the solvent may be effected even at room temperature.

By reference now more particularly to the method of the present invention depicted by FIG. 3, it differs from that above described and shown in FIG. 2 merely in the fact that the sensitized material 22, forming the precise pattern of desired decoration to be embossed in colored leaf, is deposited directly upon the article 14 itself rather than first on the roll of colored leaf 5. Such sensitized material 22 in this modification is made somewhat less critical so far as the solvents are concerned and comprises inks or paints of the type commonly used for decorating plastic articles but in such instance utilizing a desired solvent. These inks generally consist of resin, pigments and a solvent system. When formulated to proper viscosity, they may be applied to the article by flexographic, offset, rotogravure, silk screen, or spray methods. In this particular modification the ink is first applied to the article to be stamped by one of these above mentioned methods. After such application of the inked decorative indicia to the article, the ink is partially dried by exposure to air generally at elevated temperature. It is, however, critical that the ink retain therein a portion 23 of the low volatility solvent after partial drying. This function to subsequently activate the colored leaf to effect proper transfer thereof and in some cases for the resin of the ink to serve as an active surface to promote leaf transfer.

Also, when using an ink type sensitizer, the roll leaf used must have a sizing compatible with the residual of the ink, since the leaf will actually be adhering to this resin coating rather than the substrate. In some few cases differential transfer can be effected by the difference in affinity of the leaf size for the resin of the ink, as opposed to the material of the article as in FIG. 2, but even in these instances the residual solvent in the ink materially improves differentiation. A further advantage in using ink as the sensitizing material resides in the fact that after the desired indicia has been applied to the article, it may be held for a matter of days, depending upon the solvent, etc., before passing through the stamping machine to apply the colored roll leaf to the sensitized ink pattern.

It should accordingly be obvious to those skilled in the art from the foregoing that a method and apparatus for the stamping of articles has been shown and described wherein colored roll leaf is applied to the article to form a precise decorative design or indicia thereon with detailed exactitude and fidelity. Such is accomplished by superimposing a sensitized material in the form of a solvent of the desired pattern or indicia to the roll leaf, and then applying relatively low temperature and pressure between such leaf and the article with a resilient die, to thus transfer the colored leaf in the precise form of the pattern or indicia onto to the surface of the article despite irregularities thereon. Preferably, however, the sensitized material in its desired pattern or indicia is applied directly to the article as an ink, which makes it possible to hold the article for a considerable period of time before completing fabrication thereof, by affixing the colored leaf to the sensitized pattern or indicia with relatively low temperature and pressure from a resilient die and regardless of surface irregularities on the article.

Although several embodiments of the present invention have been herein shown and describe it is to be understood that still further modifications thereof may be made without departing from the spirit and scope of the appended claims.

I claim:

1. The method of stamping an article with colored leaf to form a precise pattern or indicia thereon despite surface irregularities of said article comprising:
(a) forming the desired pattern or indicia as a sensitized layer of material,
(b) disposing such sensitized layer of material between the colored leaf and the article carried by a support, and
(c) applying relatively low temperature and pressure with a resilient die to said colored leaf during contact with said article, to cause the colored leaf to deposit upon the surface of said article in the precise detailed pattern or indicia as originally formed by said sensitized layer of material.

2. The method of stamping an article with colored leaf to form a precise pattern or indicia on said article as set forth in claim 1 wherein:

said sensitized layer of material in the form of a desired pattern or indicia is deposited on the surface of said colored leaf and operates as a solvent to cause removal of the colored vehicle from the carrier and the deposition thereof on the surface of said article, when said relatively low temperature and pressure is applied theretofore.

3. The method of stamping an article with colored leaf to form a precise pattern or indicia thereon as set forth in claim 1 wherein:

said sensitized layer of material in the form of a desired pattern or indicia is deposited on the surface of said article as an ink or paint, which activates the colored leaf and causes transfer of the colored vehicle to said article precisely as outlined by said sensitized ink or paint, when said relatively low temperature and pressure is applied thereto.

4. The method of stamping an article with colored leaf to form a precise pattern or indicia on said article as set forth in claim 1 wherein:

said sensitized layer of material in the form of a desired pattern or indicia comprises a relatively non-volatile solvent which activates the colored leaf only over its indicia-patterned surface to effect transfer of the colored vehicle to the article when said relatively low temperature and pressure is applied between said colored leaf and said article.

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