United States Patent

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[45] Patented **Oct. 19, 1971**
Continuation-in-part of application Ser. No. 603,778, Dec. 22, 1966, now abandoned.

[54] **HOT STAMPING DIE STRUCTURE FOR HOT STAMP DECORATING**
9 Claims, 4 Drawing Figs.

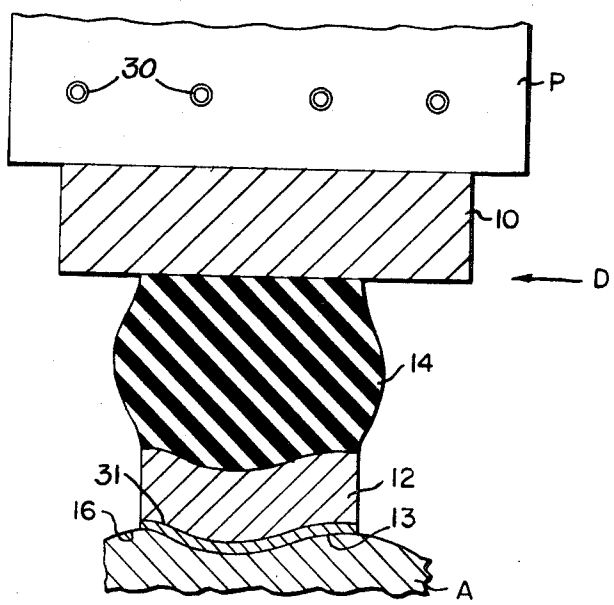
[52] **U.S. Cl.** **101/9, 101/31, 101/379**
[51] **Int. Cl.** **B44b 5/02**
[50] **Field of Search** 101/426, 376, 379, 31, 34, 27, 9, 18, 11

[56] **References Cited**
UNITED STATES PATENTS

477,627	6/1892	Carpenter	101/31
1,164,742	12/1915	Moore	101/31
3,296,958	1/1967	Liepelt	101/31
1,071,527	8/1913	Pannier	101/376
1,071,626	8/1913	Pannier	101/376
1,519,481	12/1924	Bing	101/376
2,028,712	1/1936	Swan et al.	101/379
2,163,948	6/1939	Huebner	101/379
2,351,660	6/1944	Campbell	101/27
2,722,038	11/1955	Freund	101/31 X
2,738,618	3/1956	Hilder	101/379
2,781,278	2/1957	Harmon	101/426 X
2,858,633	11/1958	Kane	101/27

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ABSTRACT: A hot stamping die for decorating the irregular surface of an article utilizing a laminated die comprised of a pair of spaced-apart plates having a layer of resilient material sandwiched therebetween. the die is heated and the outermost plate is deformed to match the irregular contour of the surface to be decorated in the stamping operation.



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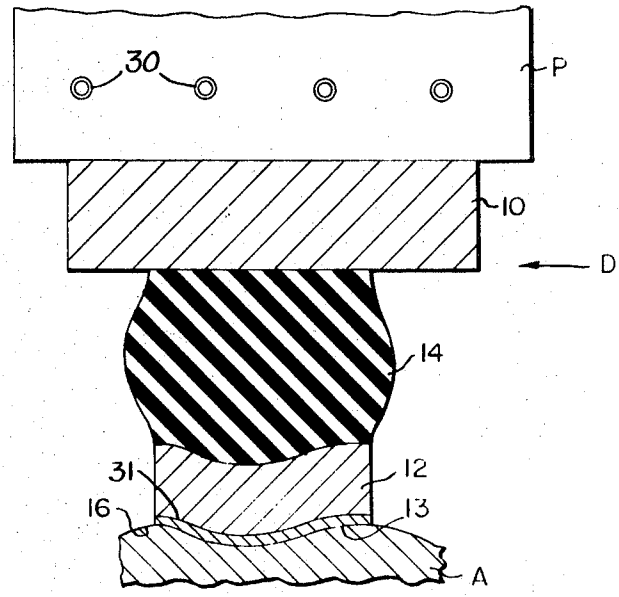


FIG. 1.

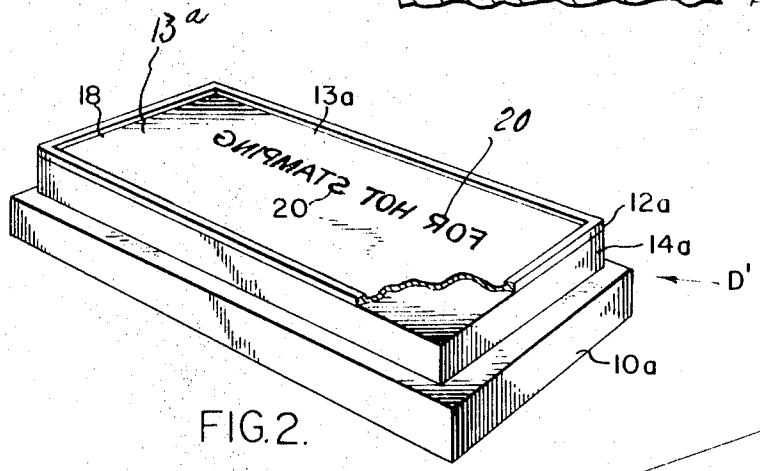


FIG. 2.

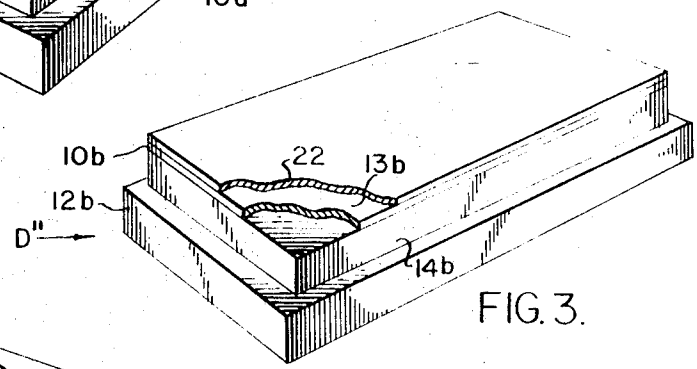


FIG. 3.

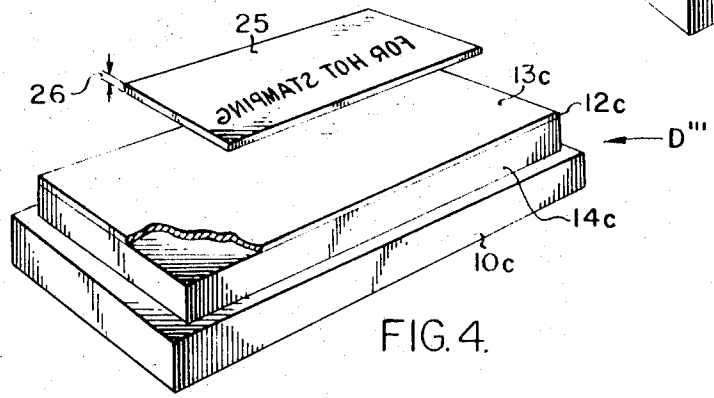


FIG. 4.

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HOT STAMPING DIE STRUCTURE FOR HOT STAMP DECORATING

This application is a continuation-in-part of U.S. application Ser. No. 603,778 filed in the U.S. Pat. Office on Dec. 22, 1966, now abandoned.

The present relates to the art of hot stamp decorating the irregular surface of an article by utilizing a silicone rubber cushion between two sheets of metal and hot stamp decorating the article with a sheet surface deformed to the irregular surface.

Briefly, according to the present invention, there is provided a hot stamping die for decorating the irregular surface of an article including a pair of spaced apart plates having a layer of resilient material sandwiched therebetween. Heat is applied to the die to apply the decorative material to the article and one of the plates is utilized to stamp the part. The stamping plate is deformed temporarily so that its stamping surface matches the irregular surface of the article being decorated.

With the above in view, other advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, in which:

FIG. 1 is an enlarged, side elevational view, in section, of an embodiment of the die, mounted on a platen and in engagement with a part;

FIG. 2 is a perspective view of a preferred embodiment of the die formed according to the invention;

FIG. 3 is a perspective view illustrating yet another embodiment of the die formed according to the invention, and

FIG. 4 is a perspective view illustrating a further modification of the die formed according to the invention.

Referring now to the drawing, a die formed according to the present invention is shown generally at D and includes a pair of spaced apart plates **10** and **12** having a layer of resilient material **14** which does not deteriorate when heated at hot stamping temperatures, preferably silicone rubber in the 50–80 durometer range, sandwiched therebetween. The stamping surface **13** of plate **12** is shown in engagement with the irregular surface **16** of an article A. The rubber-metal die forms, in general shape and appearance a rubber sandwich, and it will be so referred to as the specification progresses. This rubber sandwich can be made using an adequate thickness of rubber between a pair of metal plates of predetermined thickness, and this thickness is determined by the particular part being stamped. A thick rubber layer provides more flexibility, and the less uniform the part being stamped, the thicker the rubber layer should be. However, the thicker rubber layer requires a higher temperature for stamping inasmuch as the rubber has certain heat insulating characteristics which are disadvantageous.

In practice, the metal layer **12** can be very thin shim steel. To obtain good results when stamping surfaces having raised designs thereon, a very thin shim steel, 0.005 to 0.010 inch thick may be used. This metal is thin enough to readily flex to fit the irregular surface **16** of part A.

In this sandwich construction, the steel layer **10** can be 0.005 to 0.010 inch thick while steel layer **12** can be 0.010 to 0.015 inch thick on the opposite side. The layer **10** should be conveniently cemented to a platen P using a suitable commercially available die bonding film adhesive and the platen P can be heated to a suitable temperature in any conventional manner, such as by electrical heating elements **30** carried by the platen in the manner as is more particularly disclosed in U.S. Pat. No. 2,722,038, issued Nov. 1, 1955. In this case, the stamping side **12** can be etched or sand blasted sufficiently to leave approximately 0.005–0.010 inch at the thinnest areas to permit flexing, and most interesting etched designs can be obtained.

Referring now to FIg. 2, the die D′ includes the metal layers **10*a*** and **12*a*** in the sandwich which can be both formed of copper with a rubber core **14*a*** therebetween, and experience indicates that 0.040 inch thick copper is ideal for both plates.

If desired, plate **10*a*** may also be formed of aluminum whereas plate **12*a*** may be formed of zinc or other suitable material. A suitable design **20** can be etched or sandblasted on plate **12*a***. The stamping face **13*a*** layer **12*a*** can be etched via the photo engraving process, leaving 0.005–0.010 inch backing as shown at **18** while the raised design portion **20** remains 0.032 inch thick. This particular die has proven particularly successful in the hot stamping of treated automotive instrument panels and should prove invaluable in hot stamping any treated metal surface.

The sandwich process using copper engraved plates is ideal for the printing of display cartons since a certain amount of "makeready" can be eliminated, thus saving considerable time and labor, and it is recommended that the copper rubber sandwich be used for applications involving temperatures not to exceed 350° F. because bonds are inherently poorer between copper and rubber than steel or aluminum and rubber.

Referring now to the embodiment in FIG. 3, the sandwich die D″ is similarly formed with metal layers **10*b*** and **12*b*** having a layer of silicone rubber **14*b*** sandwiched therebetween. A layer of chrome **22** is placed over the outer surface **13*b*** of plate **12*b*** to provide a hard face having good wearing qualities and adding corrosion resistance. Both steel and copper dies can be chrome plated to a degree which does not deleteriously affect their flexibility.

Referring now to FIG. 4, a die D‴ is a modification of the embodiment shown in FIG. 1 and is particularly well suited for imprinting designs in the part. Plates **10*c*** and **12*c***, and rubber layer **14*c*** corresponds to plates **10** and **12** and rubber layer **14**, respectively. Secured to the outer surface **13*c*** of the plate **12*c*** with a suitable die bonding film is an engraved plate **25** which may suitably be made from copper. When a design or lettering is to be imprinted in the part, it is recommended that plate **25** be formed of 0.032 inch thick copper, etched out to a desirable 0.005 to 0.010 inch thickness as shown at **26**, leaving 0.005–0.010 shell. In this instance, plate **12*c*** is formed of 0.005–0.010 inch thick steel. The steel layer **12*c*** bonds better to the rubber than does copper while copper plate **25** provides increased flexibility in the etching of designs therein. The die D‴ is particularly adapted to the hot stamping of irregular metal surfaces and other high temperature applications up to 450° F. The particular temperature to which the die is heated will depend upon the particular material being stamped. Thus, it may be seen that the die shown in FIG. 1 may be quickly and easily converted to a die for stamping designs on a part by attaching plate **25** to the outer surface **13*c*** of plate **12*c***.

Where a shallow concave or convex shape is to be decorated, successful dies for this purpose can be made using dead soft, or one-half hard, 1/32-inch-thick aluminum with a rubber core of 1/321/16 inch thickness, and etching out the design on the copper side for the stamping. The die then can be easily formed to the shape required. Aluminum to rubber bonds are good up to 500° F., but should not be operated at this temperature for long periods of time as both rubber and bond will break down. Practical operating temperature for this embodiment range between 350° F. and 450° F.

In the operation of the preferred embodiment illustrated in FIG. 2, it will be assumed that part A is formed of hardened plastic material. The backup plate **10** is secured to the heated platen P by suitable screws or die bonding film. Heat is thus transferred from the platen P, through plate **10*a***, to the silicone rubber layer **14**, and then to the plate **12**.

The irregular surface **16** of part A is then stamped with the surface **13*a*** and the plate **12*a*** is deformed to match the contour of the irregular surface **16**. The surface of the part plasticizes under the combined heat and pressure of the die D′. The design **20** etched on plate **12*a*** is then impressed into the irregular surface **16**. The embodiment illustrated in FIG. 4 operates similarly to the embodiment illustrated in FIg. 3.

In the operation of the embodiment illustrated in FIG. 1, the die D is utilized to apply a coating (not shown) to the surface **16** of article A. Before the surface **16** is stamped with the surface **13** of plate **12**, a strip of foil **31** is placed therebetween.

The foil may suitably comprise a film of "Mylar" or cellophane carrier having a coating or pigment vacuum deposited on one side thereof. A release agent is applied between the cellophane and pigment to enable release of the coating when suitable temperature and pressure is applied by die D. A suitable sizing agent may be placed on the outer surface of the pigment to facilitate the bonding of the pigment to the surface **16** of article A. The foil may also comprise what is commonly referred to in the art as "roll leaf" and may suitably be a layer of precious metal, such as gold. In this embodiment, when the surface **16** is stamped with the surface **13**, the coating is transferred from the cellophane carrier to the surface **13**. The plate **12** is deformed temporarily to match the contour of the surface **16** to enable a uniform and continuous coating to be applied.

The rubber sandwich process is one that is ideal for use as die cost is considerably less, the appearance of the stamped part is improved, and quantity is enhanced.

From the foregoing description it will be obvious that I have perfected a very simple, practical, and inexpensive hot stamping process and die for hot stamping plastic and painted metal parts of all kinds.

I claim:

1. A hot stamping die construction for decorating under heat and pressure an irregular surface of a plastic part to be decorated, said construction comprising a relatively thin, flexible first metal plate having substantial shear strength and having a stamping surface adapted to bear against said irregular surface of said part, said plate being of such flexibility as to enable it to be deformed temporarily to conform to the irregular surface of said part; a second metal plate spaced from said first metal plate; a layer of resilient, heat-conductive, synthetic rubbery material of substantial thickness relative to that of the first metal plate and sandwiched between and secured to said first and second plates; means for mounting said second plate on a platen adapted to be moved toward and away from said part and operable to press said first plate against said part under sufficient pressure to conform said first plate to said surface of said part; and means for applying sufficient heat to said first plate through said second plate and said rubbery material while said first plate bears against and conforms to the surface of said part to enable heating and decorating of said surface of said part by deforming same.

2. The construction set forth in claim **1** wherein said first plate is steel.

3. The construction set forth in claim **1** wherein said first plate is copper.

4. The construction set forth in claim **1** wherein said first plate is aluminum.

5. The construction set forth in claim **1** wherein said stamping surface of said first plate has a coating thereon of metal harder than the metal of which said first plate is formed.

6. The construction set forth in claim **1** wherein said first plate has secured to its stamping surface a copper plate.

7. The construction set forth in claim **1** wherein said first plate is heated to a temperature not exceeding 500° F.

8. The construction set forth in claim **1** wherein said resilient material is silicone rubber.

9. A hot stamping die construction for decorating under heat and pressure an irregular surface of a part to be decorated, said construction comprising a relatively thin, flexible first metal plate having substantial shear strength and having a stamping surface adapted to bear against said irregular surface of said part, said plate being of such flexibility as to enable it to be deformed temporarily to conform to the irregular surface of said part; a second metal plate spaced from said first metal plate; a layer of resilient, heat-conductive, synthetic rubbery material of substantial thickness relative to that of the first metal plate and sandwiched between and secured to said first and second plates; a thin layer of film having a release coating thereon interposed between said first plate and said part to be decorated; means for mounting said second plate on a platen adapted to be moved toward and away from said part and operable to press said first plate against said part under sufficient pressure to conform said first plate to said surface of said part; and means for applying sufficient heat to said first plate through said second plate and said rubbery material while said first plate bears against and conforms to the surface of said part to enable the release coating on said film to be transferred to said part.