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(54) **Method of making fired clay or ceramic articles.**

(57) A drawing is made of a pattern which it is desired to form into an impression in a clay or ceramic article, e.g. a brick or tile. A relatively thick printing plate has the pattern formed in its surface, by etching or laser cutting, to a depth of 1mm to 5mm. The plate is then itself used as a wall portion of a mould in which the clay or ceramic material is pressed. The resultant pressed body is then removed from the mould and fired. A very high degree of detail can be formed on the clay or ceramic article in this way.

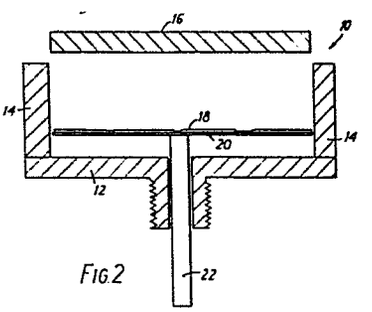

FIG 2

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METHOD OF MAKING FIRED CLAY OR CERAMIC ARTICLES

This invention relates to a method of making fired clay or ceramic articles, and in particular to making an article having an impression on at least one of its surfaces.

Hitherto it has not been thought possible to produce a detailed surface structure on a fired clay or ceramic article. Examples of these are bricks and tiles. Somewhat coarse surface structures have been achieved by relatively crude methods, and in some cases a die-stamping type of operation has been used, but the degree of detail which has been obtainable with such methods has been dissappointing.

It is well known to prepare a printing block from artwork by optical techniques. In this case a printing block is formed which has a surface structure representing the desired two-dimensional image to be printed, this surface structure being etched just deep enough to provide a clear basis for holding the ink to produce the resultant print while avoiding putting ink on regions which are not to be printed.

British Patent GB-PS 512,992 of 1939 has described the use of a printing block produced by an etching process in the manufacture of articles formed of synthetic resin (plastics) materials. In that patent the etched block is used to produce a mould cavity wall either by stamping deformable metal with the block, or by electroplating the block. The detail produced on the mould cavity wall is thus much diminished and furthermore the process is complicated.

The present invention provides a method of making a fired clay or ceramic article having an impression in at least one of its surfaces, comprising the steps of preparing a two-dimensional drawing in the shape of the desired impression; providing a metal plate; transferring the drawing with the use at least in part of optical techniques into a relatively deep surface structure on the

plate which is the negative of the desired impression on the article; forming a mould having a cavity of which the plate forms a wall portion; introducing a mouldable clay or ceramic material into the mould cavity; applying pressure to the material to form the desired three-dimensional impression on its surface; removing the thus-formed clay or ceramic body from the mould; and firing the body.

The image may be transferred onto the plate by optical imaging on a light sensitive area followed by selective etching, as is conventional for the production of printing blocks. Alternatively, the plate may be shaped by a laser driven by a computer which optically senses the drawing. In either event the drawing is reliably transferred into variations in the surface structure of the plate.

The resultant plate is then used as part of the mould cavity. To this end the surface structure on the plate should be relatively deep, and is desirably at least 1mm and preferably 2mm deep.

With this method we have found it possible to produce a finely-detailed impression of exceptional quality on the clay or ceramic article, such as a brick or tile. Previous methods have enabled the formation of only relatively coarse patterns and the provision of detailed patterns of the type that we are able to produce has been thought to be impossible to obtain with clay or ceramics.

The invention will be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a drawing of one relatively simple pattern which it is desired to reproduce on a clay brick;

Figure 2 is a sectional view through a simple mould for use in making the brick; and

Figure 3 is a sectional view through an alternative mould for use in the method.

The production of a clay brick with an impressed pattern will first be described by way of example. Figure 1 shows a drawing of the desired impression, the detail around the edge of

of the feathers and in the region of the crown is fairly fine, and we have found it possible to produce considerably more detailed structures than that.

The first step is the production of a printing plate having raised formations corresponding to a desired decorative impression to be formed in the brick. Artwork corresponding to the impression is made up in a conventional way, for example by drawing or by photography. This two-dimensional artwork is then photographed and optically transferred by a conventional method as an etch resist on a surface of a relatively thick steel printing plate, such as of 8 gauge (4mm) steel.

The printing plate is next etched in the usual acid bath, e.g. a nitric acid bath, to a relatively great depth, of 1mm to 3 mm, typically 2mm, (or, if a thicker plate is used, 4mm to 5mm) to leave raised formations corresponding to the decorative pattern. Parts of the surface which are left unprotected by the etch resist applied photographically to the surface are etched away. After etching in the bath an etching pen can be used to clean up the printing plate and to add extra detail.

The next step is the pressing of an unfired clay brick in a mould which has a cavity corresponding to the shape and size of the brick and which includes the printing plate as a wall portion. A suitable mould 10 is illustrated in Figure 2 and consists of a steel bed 12 which forms the floor of the mould and four wall members 14 which are upstanding on the bed and which correspond to two side faces and two end faces of the brick. The four walls are arranged on the bed to be movable away from a brick after pressing. The mould is completed by a roof 16 which extends parallel to the floor and which can be loaded to apply pressure to an unfired brick positioned in the mould.

The printing plate 18 is attached, by screws or bolts, to an inner surface of the mould with its raised formations facing into the mould cavity. As shown, the plate 18 is attached to an ejection plate 20 which is in turn mounted on a rod 22. The rod 22 passes through a hole in the bed 12 and is used to remove the brick after moulding. If desired, further plates can be attached

to other inner surfaces of the mould, for forming impressions on other faces of a brick. The walls of the mould are arranged so that the heads of the plate-attachment screws or bolts do not come into contact with the brick during pressing.

A green clay body having dimensions corresponding to the mould cavity and extruded in the conventional way is now introduced to the mould. The clay used should be sufficiently fine to take the embossed detail of the plate, though we have found that a reasonably fine brick clay will work perfectly adequately. A coating of machine oil or vegetable oil may be applied on the surfaces of the body at this stage to assist in the freeing of the body from the mould after pressing. The walls 14 of the mould are next closed around the body and pressure applied to the roof 16 to force the clay into contract with the surfaces of the mould including the raised formations of the printing plate or plates 18.

After relieving the pressure, the walls of the mould are moved away from the body which is then carefully transferred to a kiln for firing.

The method has been found to be surprisingly effective in transferring detail to the brick, and the quality of the end product has been consistently very high. The method thus has the very considerable advantage that relatively intricate and detailed patterns can be embossed on clay articles with a surprisingly high degree of accuracy and without the need for specially hand forming of a die member, for example.

By using a multi-stage etching process, formations of various heights or depths of relief can be formed in the plate, e.g. of depths of 2mm, 3mm and 4mm respectively.

The method is not limited to bricks and tiles: by use of a suitably-shaped mould other fired clay articles, for example plaques or medallions, having surface impressions may be formed. The method is particularly suited to the production of articles having decorative crests, shields and other finely-detailed features on their faces. For such uses potters' clay may be found

suitable.

The printing plate having the raised formations may be used to print a pattern substantially identical to the impression in the clay article on paper or card, for example on packaging material for a decorative brick or tile made by the method of this invention. Similarly, the plate, in conjunction with a corresponding negative plate (produced by etching a surface protected by a negative resist) may be used to emboss such packaging.

An alternative method of transferring the image from the artwork onto the printing plate is by means of a laser. In this case the drawing is fed into an optical reader which supplies an electrical analogue of the drawing to a computer. The computer controls a machine tool which moves the laser and the plate relative to one another in such a way as to cut the desired pattern to the required depth. Such apparatus is now available for the preparation of printing blocks generally.

Another example of the method is in providing impressions on ceramic articles, e.g. tiles. Preferably steatite ceramics are used, these being vitrified fluxed soapstone (talc) materials. First a printing plate is prepared by either of the methods described above. As an alternative to steel, magnesium can successfully be used to form the printing plate. The use of steatite ceramics enables the formation of very detailed structures by the method of this invention, so the two-dimensional drawing can be considerably more detailed than that of Figure 1.

The plate is used in a press 30 as shown in Figure 3. The press comprises a frame structure 32 supporting two etched plates 34 and 36 for printing of the two opposed surfaces of a tile. The plates can be coated with a parting layer and for this purpose polytetrafluoroethylene (PTFE) as sold under the Registered Trade Mark "Teflon" is suitable. The lower plate 34 is attached to the surface of an ejection plate 38, as in Figure 2, mounted on an ejection rod 40. A mould 42 surrounds the lower plate 34.

The lower plate on its supporting structure can be

raised by a pressing jack 44. Ceramic materials in granular form can be gravity fed into the mould, and the plate 34 is then raised until the upper surface of the tablet bears against the upper plate 36. Pressure is then applied sufficient to force the pattern to be impressed on the surface of the ceramic material. The ceramic tablet is subsequently removed from the mould and fired in the usual way.

The particular combination of measures employed in these examples has proved to be most surprisingly effective in transferring intricate and detailed patterns onto clay or ceramic articles. The methods make use of the detail which it is possible to produce in a drawing and are able to preserve this detail by optically producing a deeply structured printing plate which is directly used as part of a mould receiving the clay or ceramic material. In this way it has been found that it is possible to transfer this degree of detail to otherwise unpromising materials in the form of clay or ceramics.

CLAIMS

1. A method of making a fired clay or ceramic article having an impression in at least one of its surfaces, comprising the steps of:

preparing a two-dimensional drawing in the shape of the desired impression;

providing a metal plate;

transferring the drawing with the use at least in part of optical techniques into a relatively deep surface structure on the plate which is the negative of the desired impression on the article;

forming a mould having a cavity of which the plate forms a wall portion;

introducing a mouldable clay or ceramic material into the mould cavity;

applying pressure to the material to form the desired three-dimensional impression on its surface;

removing the thus-formed clay or ceramic body from the mould; and

firing the body.

2. A method according to claim 1, in which the pattern is transferred from the drawing to the plate by coating the plate with a light-sensitive material, imaging the drawing onto the coating, and selectively etching the plate in an etching bath.

3. A method according to claim 1, in which the pattern is transferred from the drawing to the plate by electronically reading the drawing and controlling a laser in accordance therewith to cut an image on the plate.

4. A method according to claim 1, 2 or 3, in which the plate is formed of magnesium.

5. A method according to any preceding claim, in which

the material is a steatite ceramic material.

6. A fired clay or ceramic article made by a method in accordance with any preceding claim.

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FIG. 1

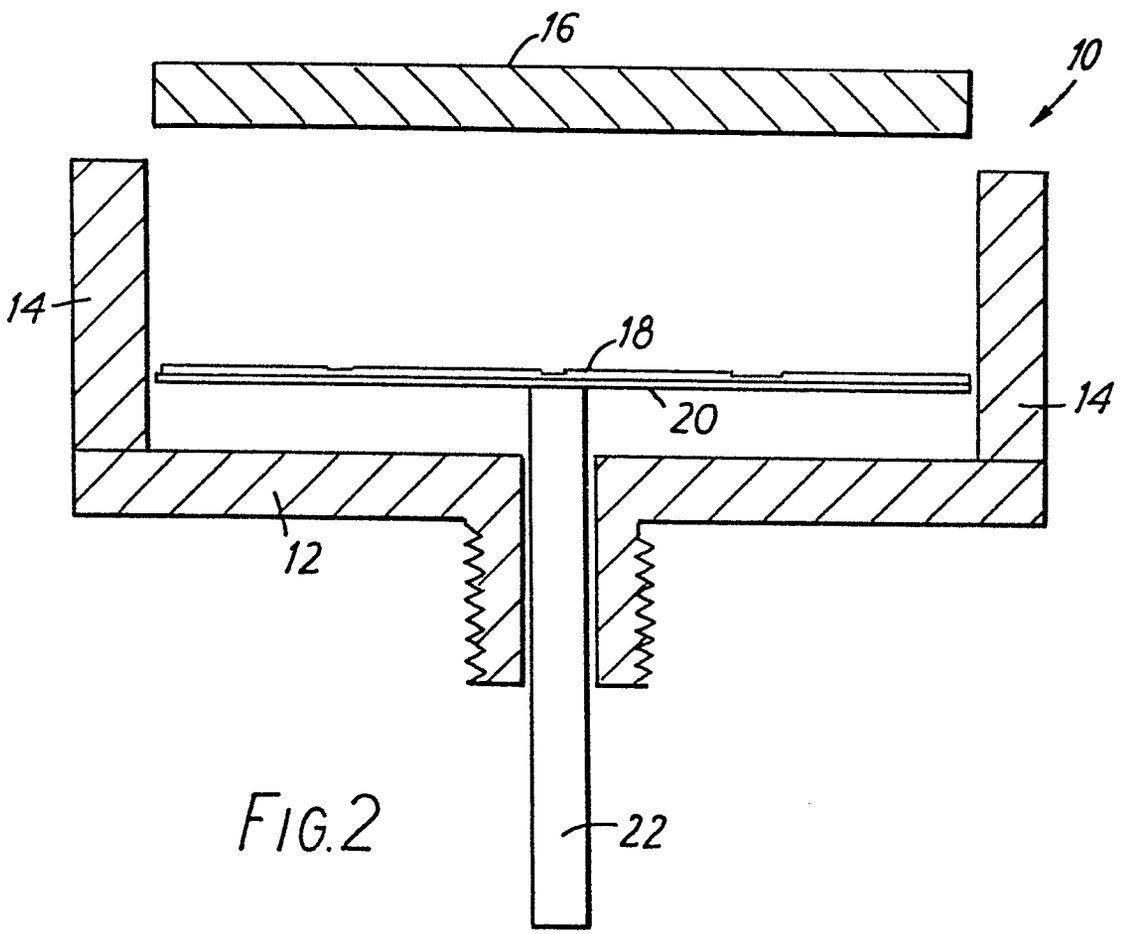

FIG. 2

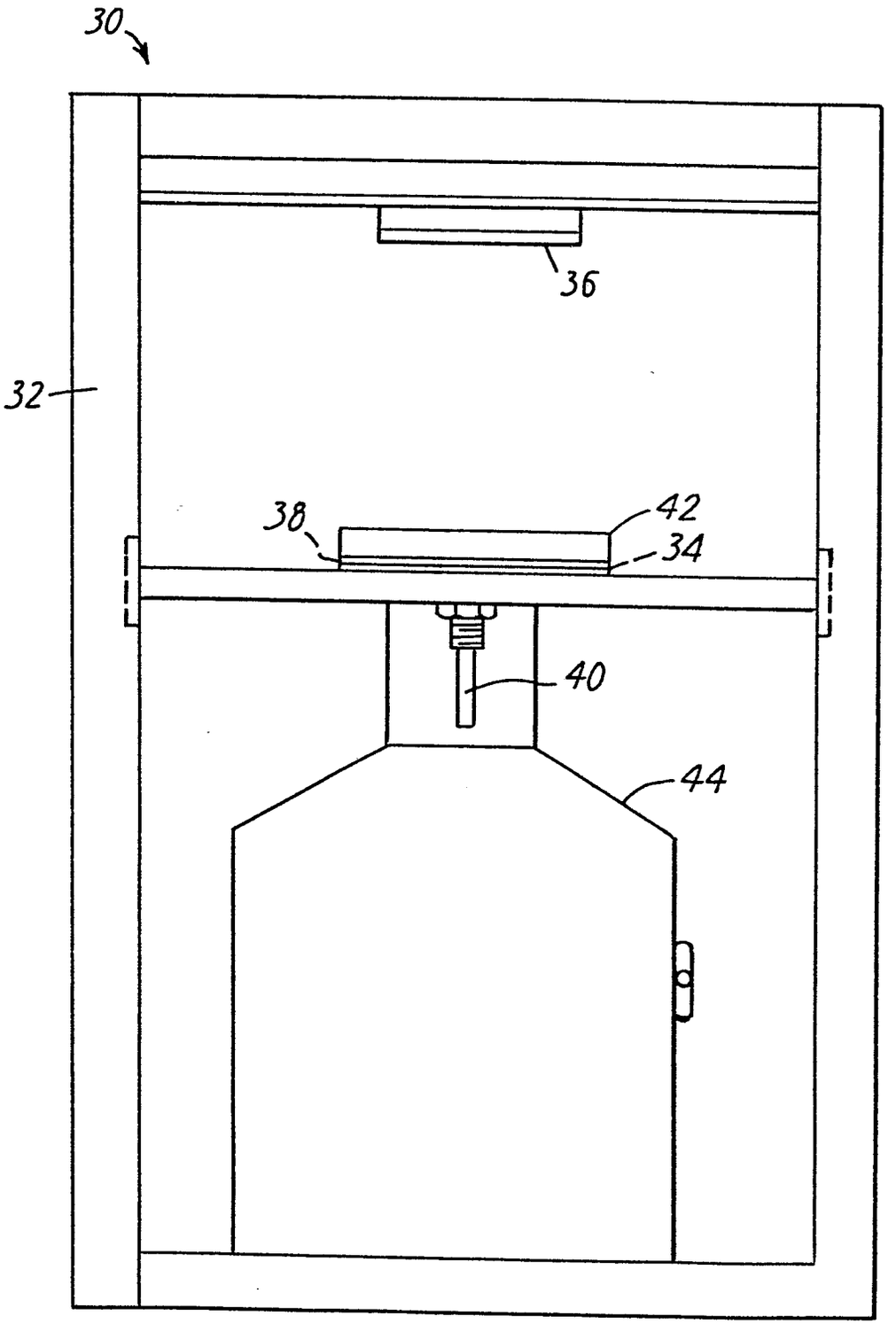

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

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Application number

EP 82 30 5545

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	FR-A-2 383 898 (R. CAPRON)		B 44 C 1/24 B 28 B 3/04 B 28 B 7/00 C 04 B 33/00 C 04 B 35/00 C 04 B 35/20

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

B 28 B 3/00
B 28 B 7/00
B 44 C 1/00
B 44 C 3/08
B 44 C 5/04

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	11-01-1983	STROUD J.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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