Sept. 23, 1952 C. M. MUGLER 2,611,434

CORING OR PERFORATING DEVICE

Filed Jan. 12, 1948 2 SHEETS—SHEET 1

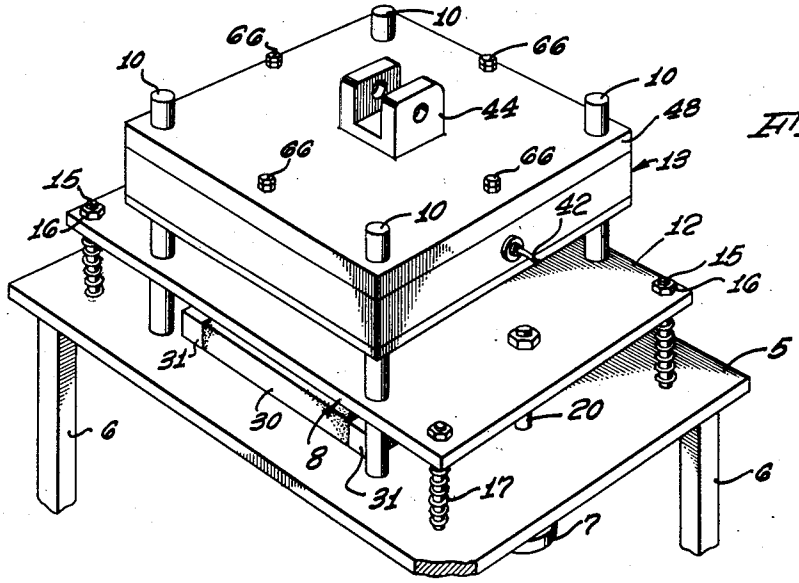


FIG. 1.

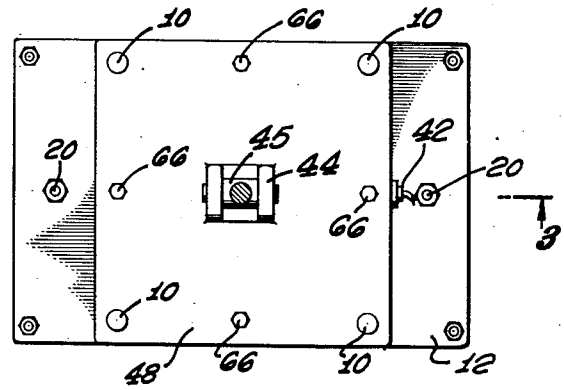
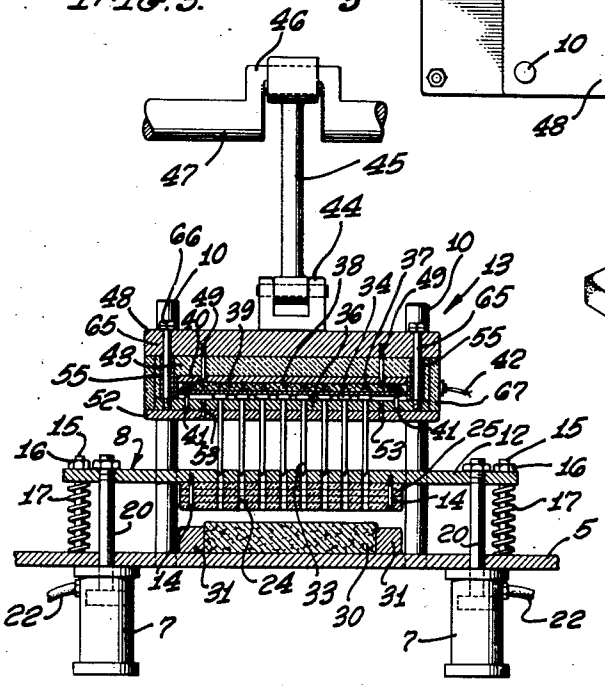


FIG. 2.

FIG. 3.



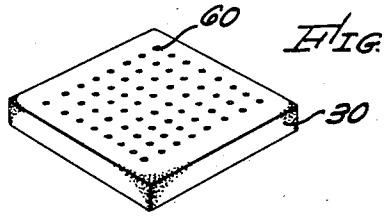


FIG. 4.

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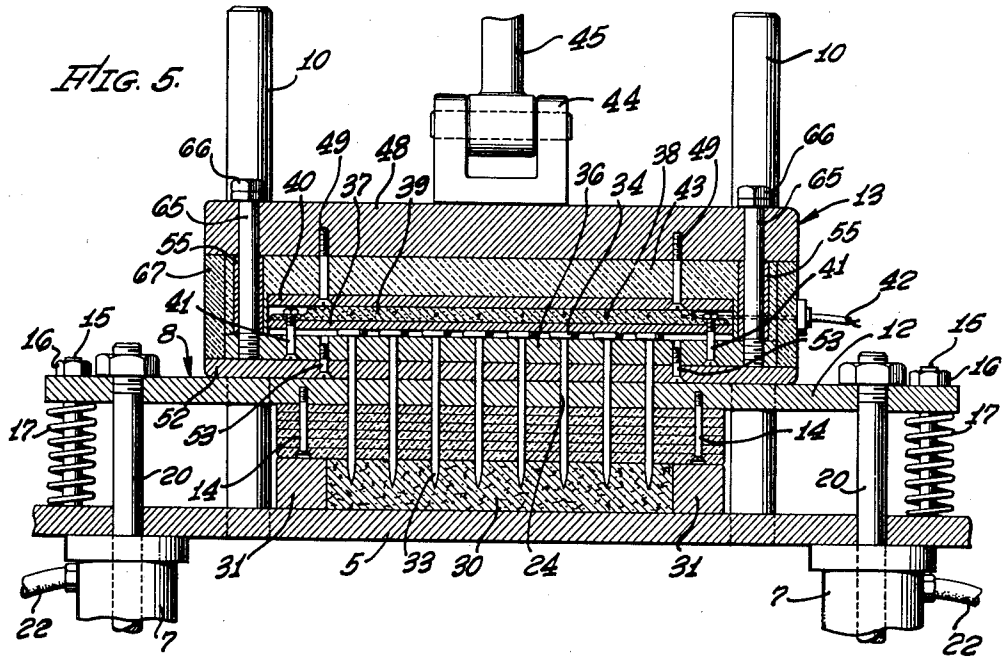
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Sept. 23, 1952 C. M. MUGLER 2,611,434

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Filed Jan. 12, 1948 2 SHEETS—SHEET 2

FIG. 5.



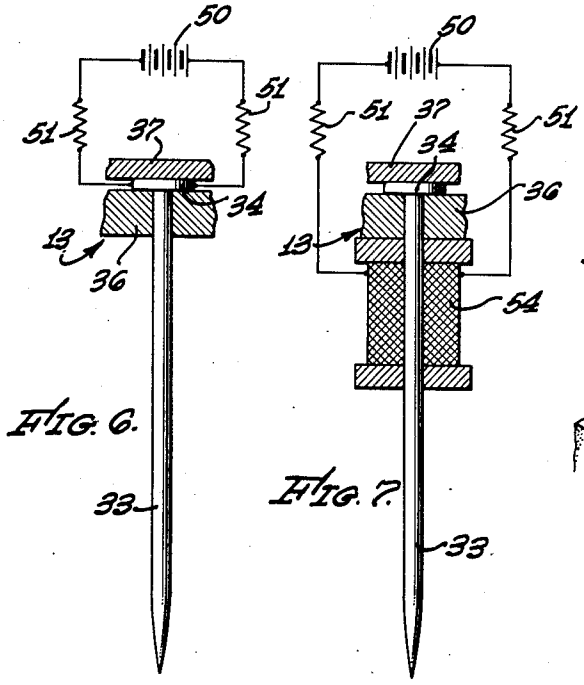
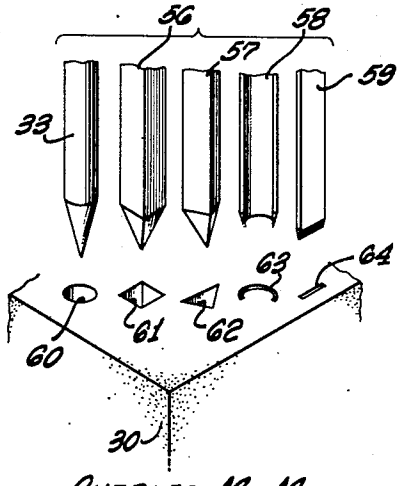


FIG. 6.

FIG. 7.

FIG. 8.



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Patented Sept. 23, 1952 2,611,434

UNITED STATES PATENT OFFICE

2,611,434

CORING OR PERFORATING DEVICE

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Application January 12, 1948, Serial No. 1,803

6 Claims. (Cl. 164—90)

1

This invention relates to piercing, holing, perforating, or coring mechanisms, and particularly to a device for partially perforating or piercing a material normally difficult to make clean-cut, accurate, and symmetrical holes therein.

Devices or punches for making holes or apertures in materials are well-known, the present invention, however, performing an operation whereby a multiplicity or plurality of apertures are made in a material in which it is difficult to cut or punch smooth, uniform, and sharp holes. It has been found that the desired type of opening cannot be made simply by inserting a pointed punch or rod and withdrawing it from the material. Since a large number of holes partially through the material are desired, the simultaneous making of the holes has been difficult to perform with known equipment.

With the present invention, not only are a large number of clean-cut holes possible, but they are uniform and may be of different shapes. The particular material being cored is Fiberglas which has been molded with a resinous binder, or other similar type of binder, into squares or tiles of rectangular form, and which have been found to have desirable sound absorbing characteristics. By the use of such tile, acoustic absorption can be increased, and the sound absorption characteristic may be controlled by the number, diameter, spacing, and depth of the holes in the material. The material has several important features; namely, it is fire proof, it may be decorated by painting or otherwise, it is termite-proof, and it is almost indestructible by the elements. It has been found, however, that by coring the material as mentioned above, it is provided with increased sound absorbing qualities and may be given a predetermined sound absorbing characteristic within the audio range. Furthermore, it can be repeatedly painted with any type paint after punched, without any decrease in sound absorption.

The principal object of the invention, therefore, is to facilitate the coring of a solid or felted material.

Another object of the invention is to provide an improved coring device for Fiberglas blocks or tile.

A further object of the invention is to provide a device for punching a large number of holes in a Figerglas tile block in which the holes are uniform and clean-cut.

A still further object of the invention is to provide an improved coring device for Fiberglas, mineral, or rock wool fiber tile.

2

Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the appended claims, the manner of its organization and the mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings, forming a part hereof, in which:

Fig. 1 is a perspective view of the coring or punching device of the invention.

Fig. 2 is a plan view of the device shown in Fig. 1.

Fig. 3 is a cross-sectional view of the invention taken along the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of the product obtained after passing through the invention.

Fig. 5 is an enlarged cross-sectional view showing the invention in a coring position.

Figs. 6 and 7 are detailed views showing modifications for heating the punching rods, and

Fig. 8 is a perspective view of varying shapes of punching rods which may be used in the invention.

Referring now to the drawings, in which the same numerals refer to like elements, a base plate 5 is mounted upon suitable legs or posts 6, and under which are attached a pair of hydraulic cylinders 7. Slidably mounted on four posts 10, the posts being mounted on the base plate 5, is an index-pressure unit 8 including a backing plate 12 and insulator plate 25 and a punch rod actuating and heating unit 13. The plate 12 is of material having a very low thermal expansion. Between the plate 12 and the base plate 5 are studs 15 with their associated nuts 16 and surrounded by coil springs 17. A pair of piston rods 20 pass through the base plate 5 and the plate 12, and are adapted to pull the plate 12, and, consequently, the plate 25 toward the base plate 5 when air or other hydraulic fluid is forced into the cylinders through conduits 22. When the hydraulic pressure is released, the springs 17 will raise the plate 12 to the nuts 16 of the studs 15.

The plate 12 and plate 25 are fastened together by bolts 14, or other suitable means, and are provided with a plurality of indexing holes 24. The plate 25 is formed of a number of laminated sheets of asbestos or similar heat insulating material. Attached to the base plate 5 to position the article 30 to be perforated, are guides or runners 31, these guides having a height slightly less than the width of the block or tile 30, so as

to limit the compression of the block 30 to a predetermined degree. Other guides of different heights may be used for other materials. A similar back stop is provided to further position or align the material.

The perforating or die unit 13, as shown in Figs. 1–5, inclusive, comprises a plurality of punch rods 33 having heads 34 positioned between a metal rod holder plate 36 and a heat conducting plate 37, the latter being of a material such as copper, which has good heat conductivity. To heat the plate 37, a plurality of heating wires or conductors 38 are molded or threaded in the heating plate 39 held in position by a metal plate 40. The heat conducting plate 37 and the heating plate 39 are fastened to rod holder plate 36 by a plurality of machine screws such as shown at 41.

Above plate 40 is a heat insulating pad 43, the pad and plate 40 being fastened to a press shoe 48 by machine screws 49. Electrical energy is supplied to the heating conductors through a cable or cord 42. Thus, as the pad 39 is heated, the heat is distributed to the heads of the punching rods 33 by the conductor plate 37, so that the rods may become heated to any desired temperature required.

On the top surface of the press shoe 48, is a yoke 44, in which a connecting rod 45 is attached, the other end of the rod being connected to the crank 46 of a shaft 47. Thus, rotation of the shaft 47 will oscillate the punch or die unit 13, and, consequently, the punch or perforating rods 33. An insulating pad 52 is attached to plate 36 by screws 53. To orient the punch rods 33 accurately with respect to index-pressure plate unit 8, the rod holder plate 36 is attached to press shoe 48 by precision sleeve spacers 55 through which stripper bolts, such as shown at 65, pass. Nuts 66 are used on the bolts 65. Surrounding the die unit 13 is further insulating material 67.

In operation, the Fiberglas block 30, or other material to be apertured, is inserted between the guide runners 31, hydraulic fluid is introduced in the cylinder 7, and the index and pressure plate combination 8 is brought down on the block 30. The plate 8 may first compress the block 30 or the plate 8 may be forced down by the unit 13 as it is lowered, while the hydraulic unit or other locking device maintains it in position. It is only necessary that the block 30 be under pressure during the coring operation. The shaft 47 is then rotated and the rods 33 pass in and out of block 30 to a predetermined depth approximately ten to fifteen times. At a temperature of approximately 770 degrees F., it was found that Fiberglas may be cored with clean, uniform holes at uniform distances apart very effectively. Although the rods, which may be of copper and chrome plated, are at this temperature, the contact surface of plate 25 is approximately 350 degrees F.

There are several features of the device which enter into the making of the clean-cut holes in the fibrous material: (1) Pressure on the fiber block creates an increased density therein during the coring operation to produce sharp perimeters for the holes; (2) The guiding of the punch rods 33 by the index pressure unit 8 keeps the axes of the rods parallel at all times; (3) The heating of the die rods softens the material and binder to allow them to reform to make a smooth wall for the holes; (4) The oscillation of the punch rods in the holes reforms the fibres by repeated piercing of the material. All of these features are provided in the device described above, and cored blocks are produced which have a plurality of uniform and clean-cut holes.

Referring now to Figs. 6 and 7, the perforating rods 33 may also be heated differently from that shown in Figs. 1 to 5, inclusive. In Fig. 6, the rod 33 is heated from a direct current energy source, such as 50, through protective resistors 51. In this manner, the electrical energy passes directly through the head 34. The rod 33 could also be split and the slot filled with a dielectric material so that the electrical current would actually pass through the sides of the rod, the rod acting as a resistor to electric current and thereby becoming hot. It is understood that alternating current may also be used. An inductive heating method is shown in Fig. 7, whereby the induction coil 54 surrounds the rod. The coil 54 may travel with the rod or the rod 33 could pass through an opening in the coil.

Referring now to Fig. 8, a cylindrical type of rod 33 is shown, together with a square or rectangularly shaped rod 56, a triangularly shaped rod 57, a crescent shaped rod 58, and a slot rod 59. These rods will make holes of the shape indicated at 60, 61, 62, 63, and 64. The type or shape of core hole 63 can be successfully made with the invention, which is not practical with coring or perforating devices now known in the art. It is to be understood that any combination of these rods and other shapes thereof may be used to form pleasing patterns, such as rosettes, stars, and similar geometric designs, for decorative purposes.

I claim:

1. A device for simultaneously punching a plurality of holes distributed over the entire area of a rectangular tile of fibrous and resinous material, comprising a rectangular base plate for supporting said tile during the coring operation, guides having a height less than the thickness of said tile for positioning said sheet on said plate, a rectangular index-pressure plate adjacent said base plate, means for bringing said index-pressure plate into contact with the surface of said tile at a predetermined pressure determined by the difference between the height of said guides and the thickness of said tile, said plate and guides increasing the density of said tile determined by the fibrous and resinous nature of said tile, a rectangular punch plate adjacent said index-pressure plate, a plurality of punch rods having one end of each rod attached to said punch plate, said rods being uniformly distributed over the area of said plate and adapted to pass through holes in said index-pressure plate for aligning and guiding said rods into said tile, means for heating said rods, and crank means for moving said rods in said holes and into said tile.

2. A device for simultaneously punching a plurality of holes distributed over the entire area of a rectangular tile of fibrous and resinous material, comprising a rectangular base plate for supporting said tile during the coring operation, guides having a height less than the thickness of said tile for positioning said sheet on said plate, a rectangular index-pressure plate adjacent said base plate, means for bringing said index-pressure plate into contact with the surface of said tile at a predetermined pressure determined by the difference between the height of said guides and the thickness of said tile, said plate and guides increasing the density of said tile determined by the fibrous and resinous nature of said tile, a rectangular punch plate adjacent

said index-pressure plate, a plurality of punch rods having one end of each rod attached to said punch plate, said rods being uniformly distributed over the area of said plate and adapted to pass through holes in said index-pressure plate for aligning and guiding said rods into said tile, crank means for moving said rods in said holes and into said tile, means for uniformly heating said rods at the heads thereof to a temperature of substantially 770 degrees F. as they pass into said tile and pressure is applied thereto by said index-pressure plate.

3. A device for simultaneously punching a plurality of holes distributed over the entire area of a rectangular tile of fibrous and resinous material, comprising a rectangular base plate for supporting said tile during the coring operation, guides having a height less than the thickness of said tile for positioning said sheet on said plate, a rectangular index-pressure plate adjacent said base plate, means for bringing said index-pressure plate into contact with the surface of said tile at a predetermined pressure determined by the difference between the height of said guides and the thickness of said tile, said plate and guides increasing the density of said tile determined by the fibrous and resinous nature of said tile, a rectangular punch plate adjacent said index-pressure plate, a plurality of punch rods having one end of each rod attached to said punch plate, said rods being uniformly distributed over the area of said plate and adapted to pass through holes in said index-pressure plate for aligning and guiding said rods into said tile, crank means for moving said rods in said holes and into said tile, said rods having large heads positioned in said punch plate and electrical means for heating said heads.

4. A device for simultaneously coring the entire area of a tile having a certain fibrous and resinous nature with holes of a predetermined and final size, comprising a base plate for supporting said tile during the coring operation, guides for positioning said tile on said plate and for predetermining the pressure applied to said tile, a rectangular pressure plate having a surface in a plane parallel with the surface of said base plate

and adapted to contact one entire face surface of said tile, means for moving said pressure plate into contact with the said surface of said tile between said guides, said guides having a height less than the thickness of said tile to limit the movement of said pressure plate toward said base plate, said pressure plate and guides providing a certain density in said tile determined by the fibrous and resinous nature of said tile, a rectangular punch plate having a surface in a plane parallel with the surfaces of said pressure plate and base plate, a plurality of punch rods having their heads within said punch plate and distributed over the area of said punch plate, heat transfer means in contact with said heads of said punch rods, means for uniformly heating said heat transfer means, and means independent of said pressure plate moving means for moving said punch plate and said rods through openings in said pressure plate and into said tile while under pressure of said pressure plate.

5. A device in accordance with claim 4, in which said means for moving said pressure plate includes hydraulic members, and said means for moving said punch plate is a crank and rod combination.

6. A device in accordance with claim 4, in which a heating insulating pad is positioned between said pressure plate and said tile.

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