Oct. 23, 1962 D. H. RENKERT ET AL 3,059,304

TILE PUNCHING APPARATUS

Filed Feb. 29, 1960 2 Sheets-Sheet 1

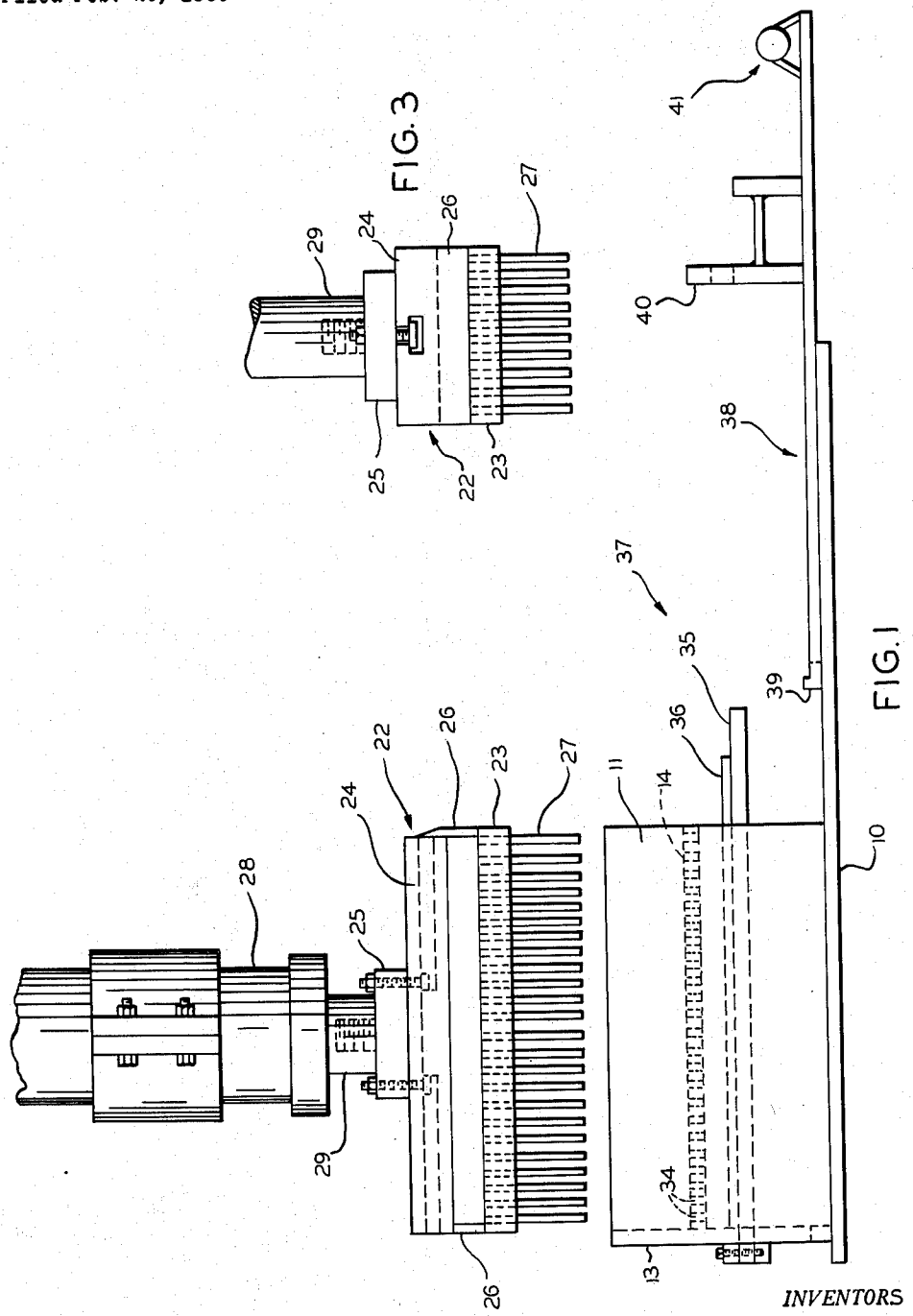


FIG. 1

FIG. 3

INVENTORS
DONALD H. RENKERT
BY JOSEPH H. SCHREIBER

ATTORNEYS

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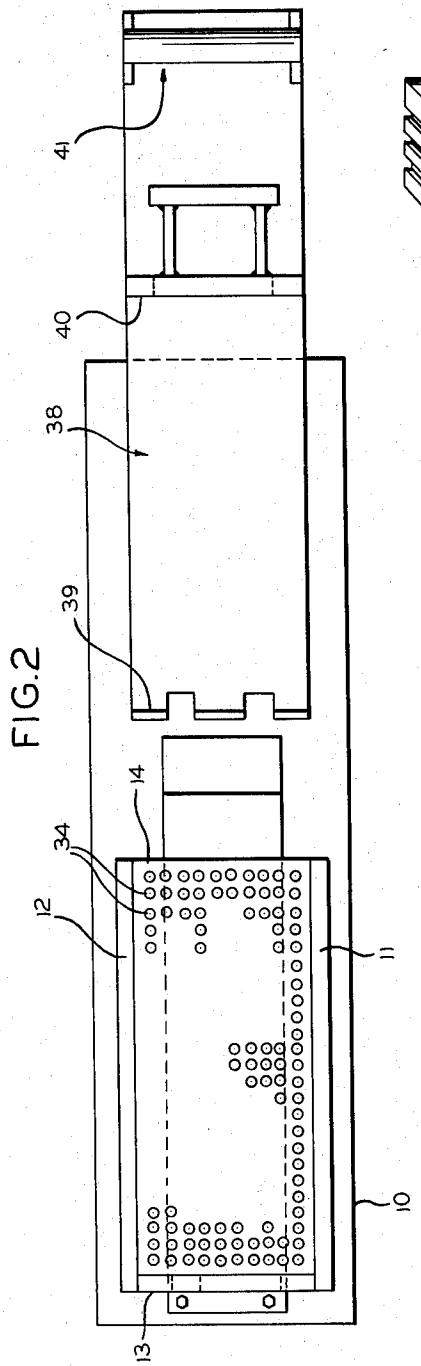


FIG.2

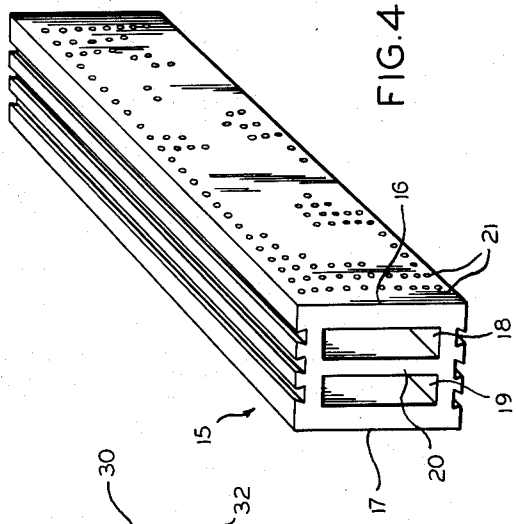


FIG.4

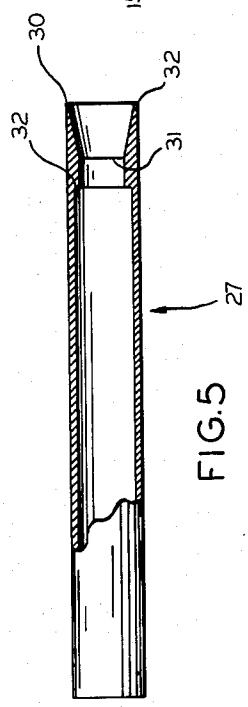


FIG.5

INVENTORS
DONALD H. RENKERT
BY JOSEPH H. SCHREIBER

ATTORNEYS

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TILE PUNCHING APPARATUS

Donald H. Renkert, Canton, and Joseph H. Schreiber, Malvern, Ohio, assignors to Metropolitan Brick, Inc.

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3 Claims. (Cl. 25—1)

The present invention is directed to the art of clay tile elements and is particularly concerned with certain new and useful improvements in an apparatus for forming a plurality of small apertures in the wall of a clay tile element.

Clay tile elements are sometime provided with apertures in the exposed wall face thereof, which apertures are for the purpose of improving the acoustical properties of a room defined by walls built from such clay tile elements. In forming holes of this general character, it has been customary in the art to either use extremely fine needles for forming such holes by a piercing action or using drills for forming the holes in such walls. The use of needles has the disadvantage of a lack of uniformity in the size of the hole. The use of drills for removing material from the wall face of the tile and for thereby forming a plurality of small apertures is time consuming and expensive. The major purpose of the present invention is the provision of a new method and apparatus for forming such apertures, which method and apparatus form the apertured wall face by removing material therefrom and thereby avoiding unnecessary stresses in the tile, while at the same time providing a uniform size of aperture and avoiding the expense of the formerly known drill method of forming such apertures.

A related purpose of the invention is the provision of a new and improved punching element for punching an aperture through the shell like wall of a load bearing tile element and which does not unduly impair the wall strength of the tile.

Other purposes of the invention will appear from time to time in the course of the ensuing specification and claims when taken with the accompanying drawings in which:

FIGURE 1 is a front elevation of the tile punching assembly constituting the present invention;

FIGURE 2 is a top view of the apparatus illustrated in FIGURE 1;

FIGURE 3 is an end view of the portion of the assembly illustrated in the FIGURES 1 and 2;

FIGURE 4 is a perspective view of a typical shell like tile element provided with apertures as formed by the use of the present invention; and

FIGURE 5 is a cross sectional view of a typical punching element utilized in the invention.

Referring specifically now to the drawings and in the first instance to FIGURE 1, the numeral **10** designates a supporting frame member in the general form of a base plate. Suitable supporting legs (not shown) may be used with the base plate. Upstanding from the frame member **10**, are plates **11** and **12** which together with an end plate **13** and a stripper plate **14** define a tile receiving compartment, which is open ended at the end thereof opposite to the end plate **13**. The compartment thus defined is sized and proportioned to receive a clay tile element such as is designated generally at **15** in FIGURE 4. The tile element **15** as seen in FIGURE 4 is of a shell like formation with opposed walls **16** and **17** adapted to define the side walls of a building room. The tile element **15** is provided with internal cavities **18** and **19**, which are separated from one another by a vertically extending web **20**.

One wall of the tile element **15** is adapted to provide acoustical properties as by the use of a plurality of small apertures **21** thereof.

Designated generally at **22** is a punching subassembly. The punching subassembly includes a supporting plate **23** which is spaced beneath an upper plate **24** which in turn is carried by a connecting member **25**. End plates **26** may extend between the plates **23** and **24** so as to support the same unitarily while defining an opening therebetween. The punching assembly has a plurality of punching tubes **27** fixed to the lower surface thereof and extending upwardly within the plate **23**. Each of these punching elements **27** is identical in size and proportion and is shown in detail in FIGURE 5.

The punching subassembly **22** is adapted for vertical reciprocation as by means of an hydraulic cylinder **28** and ram **29** connected to member **25**. The subassembly may be reciprocated by hand under some circumstances in lieu of operation by the hydraulic ram **29**.

The punching elements may be arranged in rows or may be randomly arranged in other patterns so as to provide a random distribution of the punches while at the same time having the punches more or less uniformly distributed over the pressing face of the plate **23**. As shown in the drawing the punches are arranged symmetrically in 10 rows with 24 such punches in each row. This arrangement and number of punches is suitable for use with the wall of a tile element having a 13 inch length and a 5⅜ inch height as is typically illustrated in FIGURE 4.

Each of the punching elements **27**, one of which is particularly shown in FIGURE 5, is identical. Each such element is of a generally tubular formation. These elements have one end thereof provided with a sharp cylindrical edge **30**, which is on the lower ends of these elements. The inner tubular wall of the elements is of expanding width from the edge **30** upwardly or towards the other end of the elements to a point designated at **31**, which defines a shoulder of cylindrical form. Another shoulder is defined at **32**. It is preferable to have the inner surface of the elements between the points **31** and **32** of generally uniform cross sectional open area. The tubular wall of the element **27** from the shoulder **32** to the other end of the element is of uniform thickness thereby providing an open cross sectional area therein greater than the open cross sectional area at the shoulders **31** and **32**. The contracted inner surface of the element which leads from the sharp edge **30** thereof is gradually tapered and preferably has a six degree inclination with relation to the outer wall of the element.

It has been found that satisfactory results are obtained with this form of punch if the distance between the shoulder **31** and the sharp end **30** of the punch is approximately $\frac{3}{32}$ of an inch while the distance from the shoulder **31** to the point or shoulder **32** is $\frac{3}{32}$ of an inch. It has also been found that the diameter at the shoulder **32** should be $\frac{1}{64}$ of an inch smaller than the inner diameter of the tube from the point **32** to the upper end thereof. The external diameter of the punching elements is ¼ of an inch, which is intended for use in making ¼ inch diameter apertures in the tile wall.

The plate **14** is spaced from the supporting plate **10** by a distance approximating the width of a tile element with which the apparatus is used. The plate **14** is provided with a plurality of guiding apertures **34**, which are so spaced and arranged in the plate **14** that the punching elements **27** pass therethrough upon the vertical descent of the punching subassembly.

The upstanding walls **11** and **12** and end wall **13** may be extended some distance above the guiding and stripping plate **14**, with the upper extensions thereof positioned to snugly receive the plate **23** upon the descent thereof and thereby guide the plate **23** and punching subassembly.

A backing member 35 extends between the upstanding walls 11 and 12 and is fixed to these walls as well as the end wall 13. The backing member 35 is spaced beneath the stripping and guiding plate 14 so as to snugly receive the wall of the tile element between the stripping and guiding plate 14 and a cushioning pad 36, which is positioned on top of the backing plate 35. The cushioning pad 36 is opposed to the punching elements 27. The cushioning pad 36 may be formed from rubber belting of a relatively tough and yet resilient nature.

A feeding assembly is designated generally at 37. The feeding assembly may consist of a plate 38 which is constrained for sliding movement along the supporting base plate 10 by suitable guides (not shown). The plate 38 may have upstanding flanges 39 thereon, which flanges present an abutment opposed to the end of the tile element positioned on the plate 38. The other end of the plate 38 may have another abutment 40 upstanding thereon and spaced from the flange 39 by a distance approximating the length of a tile element. Any suitable means, such as a handle 41, may be used to reciprocate the feeding assembly 37 toward and into the tile receiving compartment. The upper surface of the plate 38 is so spaced from the lower surface of the stripping and guiding plate 14, when the feeding plate 38 is in the compartment, that the tile is snugly confined between these plates.

In operation, the user, after so placing the tile element on its side on plate 38, then moves the tile into the compartment beneath the stripper plate 14. In this position of the tile, the tile is confined between the flanges 39 and 40, while the wall of the tile which is to be punched is snugly received between the stripping and guiding plate 14 and the cushion 36 of the back-up plate 35. The back-up plate 35 fits into the cavity 18 of the tile so that the tile is thus snugly held in position. After the tile is thus positioned, the operator then causes the descent of the punching subassembly, as through the action of suitable valve controls or the like, to cause operation of the hydraulic ram. As the punching subassembly descends, the punching elements 27 pass through the guiding apertures 34 in the plate 14 and are constrained thereby for vertical movement while the head of the subassembly defined by the plates 23 and 24 are guided by the upstanding portions of the walls 11, 12 and 13.

As the punching elements 27 move through the apertures 34, the sharp ends thereof contact the face of the tile, and provide cylindrical cuts in the face of the tile. As the descent of the pressing head continues, these cylindrical cuts progress into the face of the tile, while the material of the clay tile, which is positioned within the circular area defined by the edge 30, is gradually radially inwardly compressed by the tapered surface and moved upwardly with relation to the punching elements 27. As the descent continues, this material within the punching elements 27 is gradually compressed until the surface 31 passes over this material, at which time a smoothing operation takes place on this material. During further movement of the punching elements, the material within the elements passes the shoulder 32 where the material may possibly undergo some slight expansion. When the punching elements 27 have moved through the wall of the tile in those areas opposed by the cavity 18, the descent is stopped. At this point, the punching elements contact the back-up surface 36. The elements may actually compress this surface slightly which aids in forcing the material within the elements 27 upwardly a slight distance away from the edge 30. Some rows of apertures in the tile may be placed relatively close to the upper and lower edges of the tiles, in which case the punching elements merely descend within these areas without contacting the back-up element 36.

The punching subassembly or pressing head is then elevated toward the position illustrated in FIGURE 1 and the tile is withdrawn from the compartment as by means of retrograde movement of the supporting plate 38. The tile is then removed from the supporting plate 38 and ready for drying. A new tile to be punched is then positioned on the supporting plate 38 and the process is repeated.

During subsequent processes, vertical descent of the punching elements 27, upon contact with the opposed wall face of the tile, causes a continued lifting of the material within the punching elements. For example, upon the second descent of the pressing head, contact of the knife edges 30 with the material in the wall of the tile and subsequent movement thereof, causes the material being cut by the edge 30 to force the previous material within the elements 27 in an upward direction. Thus, subsequent operations on successive tile elements cause incremental movement of the material removed from the walls of the tiles through the punching elements 27, until this material is forced outwardly of the elements 27 at the open upper ends thereof and within the clean out space defined between the plates 23 and 24. The material so deposited on the upper surface of plate 23 may be removed from time to time by any suitable means, as for example by the use of an air hose or the like.

The stripper plate 14 not only guides the punching elements, but exerts a cleaning action on the elements as they move through the plate.

It is preferred to operate the press with relatively short strokes, so that the elements 27 are in the apertures of plate 14 at all times, the elements being withdrawn, after each punching operation, only high enough to clear the tile.

For best results with an apparatus described herein, the tiles should be punched within several hours after "hacking" or cutting of the green column. The tiles should have a moisture content of approximately 15 to 18 percent.

The use of the particular form of punching elements described and illustrated herein is highly advantageous in that the material caused to move within the elements maintains a generally cylindrical form and is easily moved upwardly within these elements during descent of these elements and subsequent operations on subsequent tile elements.

It should be understood that whereas the invention is shown and described with a power pressing operation and hand feed for the tile bodies, the feeding apparatus may also be power operated, and the entire operation may be made automatic through the use of suitable controls.

Whereas we have shown and described an operative form of the invention, it should be understood that this showing and description thereof is to be taken in an illustrative or diagrammatic sense only. There are many modifications in and to the invention which will be apparent to those skilled in the art and which will still fall within the scope and spirit of the invention. The invention, therefore, should be limited only by the scope of the hereinafter appended claims.

We claim:

1. A punching element for use with the formation of apertures within the walls of shell-like clay tile, including a generally elongated tubular element, said element having a generally uniform external diameter, said element having a relatively sharp edge at one end thereof, said element having an inner, open cross sectional area of decreasing extent from said sharp edge to a point spaced from said sharp edge, the inner surface of said element being inclined to the axis of said element at an angle on the order of approximately 6° so as to define said cross sectional area of decreasing extent, said element

having a generally uniform internal diameter from the point of termination of said decreasing cross sectional area for an additional small distance to a shoulder defined within the interior of said tube, said tube having a larger internal diameter from the shoulder to the other end of said tube.

2. The structure of claim 1 wherein the distance of said shoulder from the sharp edge of said element is approximately ¼ of an inch.

3. The structure of claim 1 wherein the internal diameter of the tube at said shoulder is approximately 1/64 of an inch less than the internal diameter of the tube from said shoulder to the other end of said tube.

References Cited in the file of this patent

UNITED STATES PATENTS

1,737,847	Mottinger	Dec. 3, 1929
1,862,633	Ramsay	June 14, 1932
2,075,038	Hutchinson	Mar. 30, 1937
2,376,742	Wempe	May 22, 1945
2,424,474	MacGregor	July 22, 1947
2,598,975	Coulter	June 3, 1952
2,822,599	Webb	Feb. 11, 1958

FOREIGN PATENTS

1,093,338	France	Nov. 17, 1954
650,829	Germany	Oct. 2, 1937