April 30, 1963 M. J. PRESTIA 3,087,577

CEILING TILE WITH SOUND ATTENUATING AND VISUAL EFFECTS

Filed Jan. 18, 1960 2 Sheets-Sheet 1

Fig. 1.

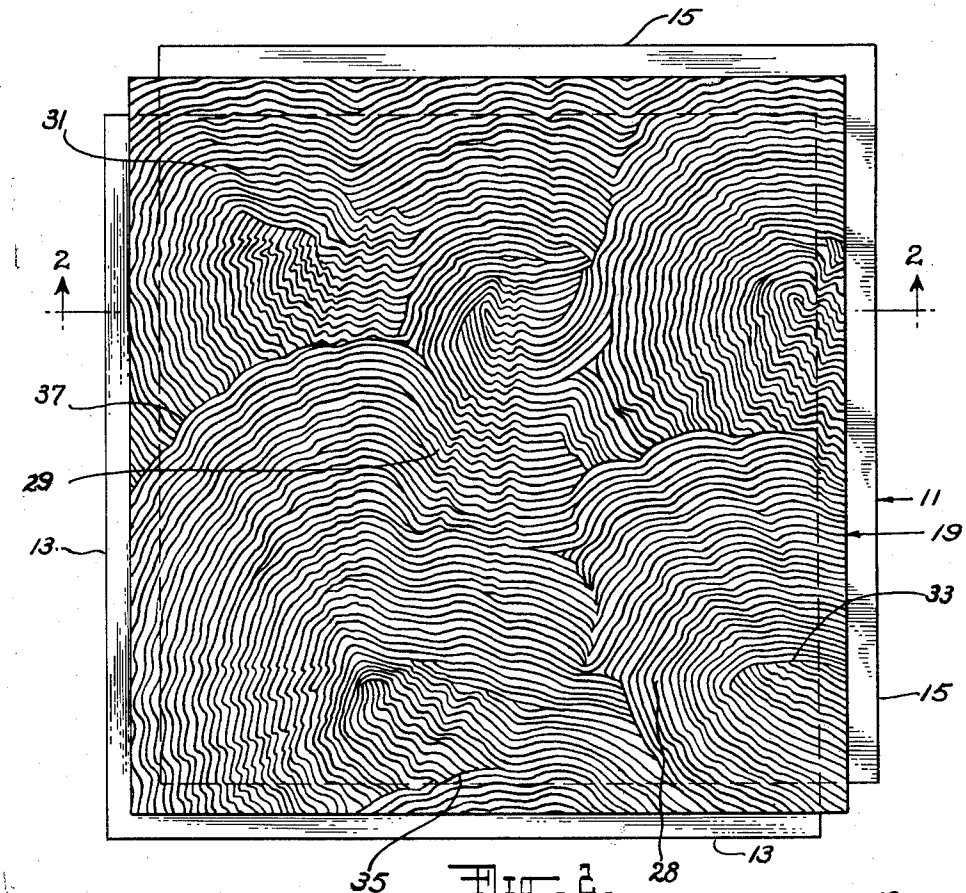


Fig. 2.



Fig. 3.

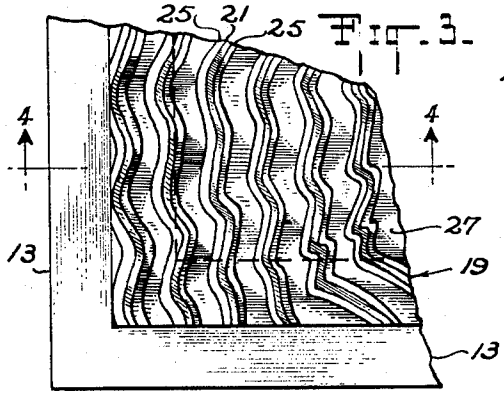
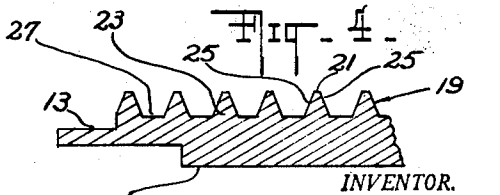


Fig. 4.



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FIG. 5.

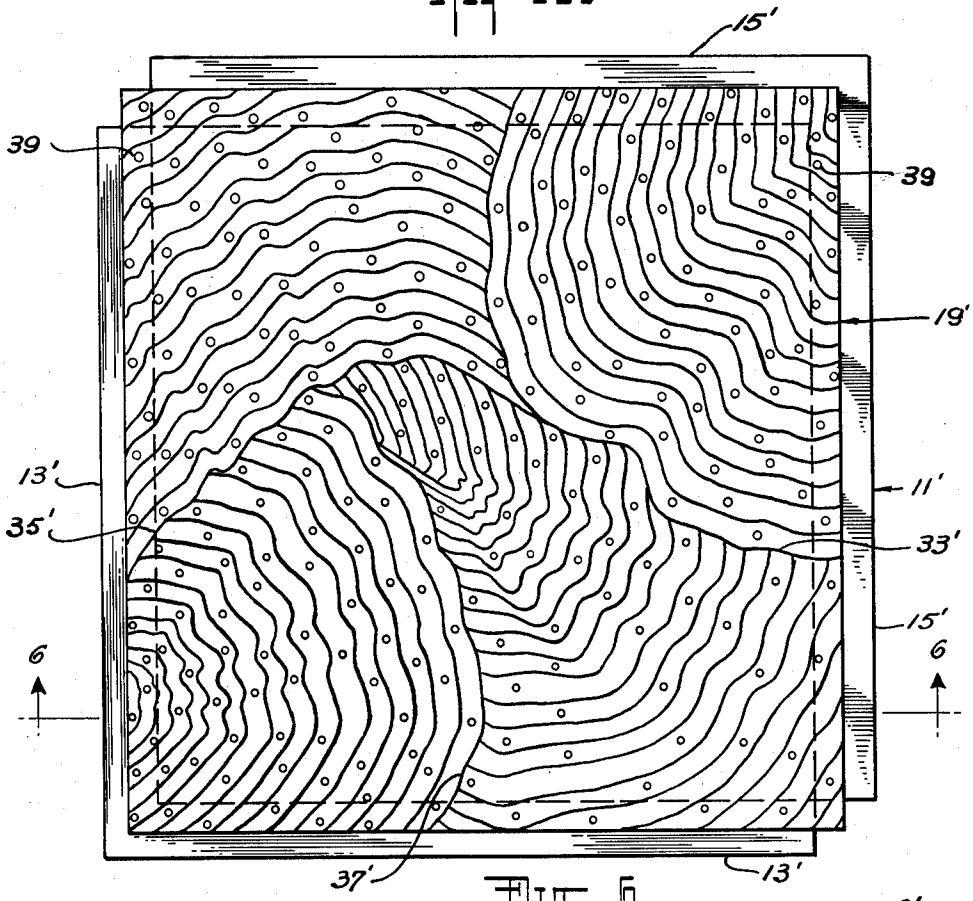


FIG. 6.

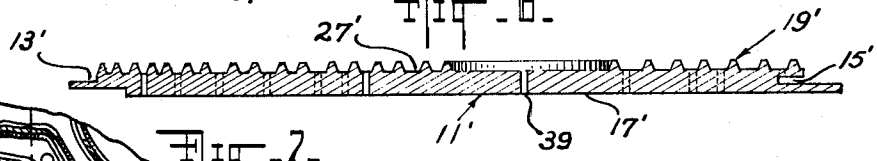


FIG. 7.

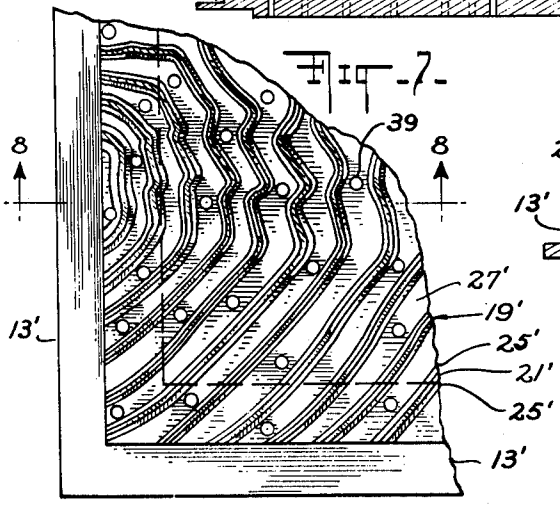
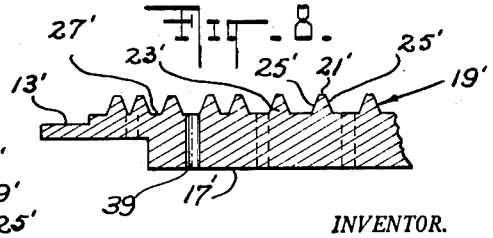


FIG. 8.



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CEILING TILE WITH SOUND ATTENUATING AND VISUAL EFFECTS

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6 Claims. (Cl. 181—33)

This invention relates to a novel ceiling tile of a construction which so reflects light that the ceiling gives a viewer the striking visual impression of a moving or changing surface, much like that of a fine silk fabric. This visual effect is accompanied by a muting of audible sound by the ceiling tiles, which deadening of objectionable noise is also due in part at least, to the tile construction.

Ceiling tiles have been made of cellulosic materials, usually a rough paperboard, and have sometimes been perforated or otherwise surface modified to improve their sound deadening action and to make them suitably decorative or ornamental. Ceilings, walls and floors have been decorated or enhanced with designs which include pluralities of substantially parallel curved lines. However, never before have ceiling tiles been made of the structure described herein. The ceiling tiles of the prior art would not have the desired properties of those of this invention nor would they be useful in replacement thereof.

In accordance with the present invention there is provided a ceiling tile which simultaneously helps to deaden undersirable noise and presents to a viewer ever-changing curved areas of light and shadow, giving the visual impression of a silk-like surface, comprising a substantially flat base capable of being nailed, stapled or cemented to a ceiling, means on such base for interconnecting said tile with other such tiles for assembly on a ceiling and a surface portion containing alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units comprising a plurality of projected and depressed curves, ending where they contact other such units. In greater particularity, such a ceiling tile comprises a substantially flat base capable of being nailed, stapled or cemented to a ceiling, means on said base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material containing alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units of at least about ten pairs of projected and depressed curves, said units ending where they contact other units, the curvatures of most of the units being less than semicircular, the projecting areas being at least one millimeter high and being repeated at least every centimeter, with the top of the projecting curve being of lesser area than the bottom, said tile surface projections and depressions being uninterrupted by other projections or depressions which would tend to destroy the silk-like appearance thereof.

The great advantages of the invention and the various objects of it will be apparent from the following detailed description, taken together with the accompanying drawing in which:

FIG. 1 is a plan view of a ceiling tile with only line representations of the projecting curves being given;

FIG. 2 is a vertical section of such tile along plane 2—2;

FIG. 3 is an enlarged plan of a corner section of a ceiling tile, showing the upper face and sides of the projections, as well as the depressions;

FIG. 4 is an enlarged vertical section of a corner portion of a tile taken along plane 4—4 of FIG. 3;

FIG. 5 is a plan view of another embodiment of the invention, again with only line representations of the projecting curves being given, but this time with projections spaced farther apart and with openings or perforations in the depressions;

FIG. 6 is a vertical section of such tile along plane 6—6;

FIG. 7 is an enlarged plan of a corner section of such a ceiling tile, showing the upper face and sides of the projections, as well as the depressions; and

FIG. 8 is an enlarged vertical section of a corner portion of such tile along plane 8—8.

Numeral 11 represents a ceiling tile which helps deaden undesirable room noise and at the same time is of distinctive and attractive appearance since it presents to a viewer ever-changing curved areas of light and shadow, giving the impression of a silk-like surface. Around the border of ceiling tile 11 there extend tongues 13 and groove portions 15. Tiles 11 are nailed, stapled or cemented to a ceiling or furring strips, not shown. If cemented, the adhesive is applied to the substantially flat base 17 which is the obverse of the curved surface to be described later. It may be considered that tongues 13 and groove portions 15 are also parts of base 17; the tiles may be cemented, nailed or stapled at those points. In assembly of the tiles of a ceiling in the conventional manner only the curved portion of the tile will be visible to a viewer and that will meet very closely with the curved portion of adjacent tiles, giving the appearance of a ceiling made entirely of sections or units of curved concentric ridges. If it is desired, the edges of the tiles may be beveled not shown, which would interrupt the continuity of the ceiling pattern. The present tiles may also be employed as only part of a ceiling tile pattern, although it is highly preferred, for maximum effect, to construct the entire ceiling thereof. However the tiles may be positioned or placed on a ceiling, the interconnecting or interlocking means on the tiles, which is preferably the tongue and groove sides thereof, will keep the ceiling flat and regular in appearance and will not allow some tiles to sag or to lose contact with the ceiling.

The invented tiles contain alternating projecting and depressed curvilinearly disposed areas which are concentrically dispositioned in groups which are referred to herein as units; such units end where they contact other units and all contain a plurality of projected and depressed curves. Curved projection 19 is trapezoidal in cross section, having a flat top 21 of lesser area than the base thereof 23. Slanted sides 25 are well suited for best light reflection. Sides 25 bound a depression 27 which separates projections or ridges 19.

In the drawing one embodiment of the invention is illustrated well by FIG. 1. In this view only the center lines of the ridge tops are shown, to best illustrate the disposition of the tile face curvature, because of the closeness of the ridges in the tile drawn and the confusing appearance that would result if all surfaces of projections and depressions were shown. The tile drawn is a reduction of a tile measuring one foot by one foot but other sizes, larger and smaller, can also be used, providing that the ridge and groove measurements are correct for good sound absorption and the startling visual effect typical of the invented tiles. As will be seen from the drawing the ridges are wavy curves parallel to other ridges and depressions. These curves, for a satisfactory tile in accordance with the invention, must be in units of at least ten pairs of ridges and depressions; these units should be less than semicircular and are usually more than thirty degrees. The projections are at least a millimeter high and are repeated at least every centimeter, the ratio of ridge height to spacing being preferably from 1:1 to 1:7. Usually neither height nor distance between ridges should be less than 1 millimeter nor greater than 5 millimeters.

The units of curves may be circular arcs; the parallel curves may have a common focus which does not move. Alternatively, and the alternative is preferable, the focus may change in a unit but should still be so located that a line drawn from arc midpoint through the focus for each portion of the curve will converge to a point which may be designated as a super focus. Thus, a scalloped shape may be obtained. Rather than have the arcs of different centers intersect, it is better to have them gently converge, making a wavy curved unit. Furthermore, curves of diffent units, that is curves whose bisectors do not pass through about the same point, may also be "blended" to avoid the presence of an excess of straight line or angular intersections. A gradual convergence of arcs is illustrated at points **28**, **29**, and **31** while the more abrupt intersection of units is shown at **33**, **35** and **37**.

In the embodiment of the invention illustrated in FIGS. 5–8 the primed numerals have the same significance as the numbers of FIGS. 1–4. It will be noted that the units of curves contain fewer pairs of curves and also possess intermediate openings **39** which, as shown, pass clear through the tile. The holes are so spaced that they seem to further define the arcs where they pass through the tile at the depressed areas thereof. The holes also serve to confine and deaden undesirable noise.

The ridged tile, when in place on a ceiling, reflects visible radiation not absorbed in such a way as to cause a continuous shifting and give the viewer the impression of a silky surface of dancing highlights. Due to the curves and their disposition the reflections change gradually and also alter to all viewers throughout the room. This effect may be increased or varied by having the ridge sides of a different and lighter color than the ridge top and/or depression. It is also assisted by upwardly directed ceiling lighting and by moving lighting effects. This latter method of illumination gives rise to unique and beautiful lighting of the ceiling even when the viewer is completely stationary.

The channels in the tile surface also serve to confine audible radiation within them and reflect it to an absorbing surface. The inwardly directing slanted surfaces reflect sound impinging on them in such manner that it is deadened and the attenuated radiation diminishes substantially in amplitude. Where the tile depressions contain openings the ridge sides funnel the sound through and further assist in absorbing noise.

To obtain the desired visual and audio effects the tile surface should be free of other projections and depressions which would tend to destroy the silk-like appearance of the tile. Such interruptions in the surface would obviously detract from the special appearance of the tile and also could be expected to interfere with the sound absorption because they replace the more effective channels of the present tiles.

For both visual and audio activity dimensions and proportions of the tile surface features are important. Some of these have already been given but all will be summarized here. The projection height and depression widths should be from 1 millimeter to 1 centimeter, preferably 1 mm. to 5 mm., with a ratio of 1:1 to 1:7. There should be at least 10 such pairs per unit and less than 100, usually less than 50. The holes, preferably circular, in the depressions, should be of 1 to 5 mm. diameter. The ridges are preferably trapezoidal in cross section, smaller at the top. Curved units should be less than 180 degrees and more than 30 degrees, preferably above 45 degrees. If of such dimensions the tile surfaces are always of satisfactory appearance and sound absorbing action.

The invented tiles are made of any suitable construction material. Rough cellulosic fibers may be matted or otherwise deposited or pressed into a sheet. These may be coated with a smoother paper or plastic not shown or may be used in the rough state. Foamed plastics, such as polystyrene, polyurethane and others in either foamed or solid state may be used. Rubber, vinyl, even wood and

metal tiles have some use but the sound absorbent materials, such as the light weight plastics and fibrous cellulosics are preferred.

The special tiles may be made by cutting or pressing a blank tile into shape or the tile may be molded initially. Alternatively, the blank tile may have surface ridges applied thereto by a special brush or lining applicator. Such a ridge coating may even be a conventional paint specially thickened to prevent running together of the ridges. It is preferred to compress paper tile blanks to the correct structure between forming dies. By this method the roots or depressions are of greater density after forming and the ridges are relatively porous. Thus, the thinner parts are of stronger substance and are better able to have holes molded or drilled or punched in them. The other sections of the tile remain porous for better sound absorption. In other embodiments of the invention the base and surface portions are of different materials laminated together, not shown, but they are preferably both of the same substance.

The tiles may be colored to increase the silk-like effect. Partial coloration, not shown, may be used to increase the contrast and make the curves even more distinct.

The present tiles are much more attractive than conventional ceiling covers. The silky appearance gives ceilings an "expensive" look at little or no extra manufacturing cost and also for no substantial extra charge the tiles are more soundproof. These tiles are ideal for ceilings in special rooms, social halls, restaurants and night clubs, as well as in the formal rooms of the home. Unlike conventional plaster or plasterboard ceilings, these tiles do not crack or sag; they are stronger than other ceiling tiles, due in part to the strength of these ribbed structures. Also due to the rib and channel configurations, these tiles do not show dirt badly; in fact, darkening of portions of the tile due to deposition of dust, smoke and so forth, gives the tile a handsome aged appearance and even better defines the curves of the exposed surface.

The present tiles are vastly superior to the plain and figured tiles now available to the public. The ceiling they make is decorative, "interesting" and functional. The structure is novel and the concept of movement of the design is new.

The invention has been described in conjunction with a description of preferred embodiments. The scope of the patent is measured by the claims and is not restricted to the forms shown in the drawings.

What is claimed is:

1. A ceiling tile which simultaneously helps to deaden undesirable noise and presents to a viewer ever-changing curved areas of light and shadow, giving the visual impression of a silk-like surface, comprising a substantially flat base capable of being nailed, stapled or cemented to a ceiling, means on such base for interconnecting said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material containing alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units comprising a plurality of projected and depressed curves, ending where they contact other such units.

2. A ceiling tile which simultaneously deadens undesirable noise and presents to a viewer ever-changing curved areas of light and shadow, giving the visual impression of a silk-like surface, comprising a substantially flat base capable of being nailed, stapled or cemented to a ceiling, means on such base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material containing alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units of at least about ten pairs of projected and depressed curved surfaces, said units ending where they contact other units, the curvatures of most of the units being less than semicircular, the projecting areas being at least one millimeter

high and being repeated at least every centimeter, with the top of the projected curve being of lesser area than the bottom, said tile surface projections and depressions being uninterrupted by other projections or depressions, which would tend to destroy the silk-like appearance thereof.

3. An acoustical ceiling tile which simultaneously deadens undesirable noise and gives a viewer the visual impression of a silk-like surface by presenting to his eyes ever-changing areas of light and shadow which comprises a substantially flat base capable of being nailed, stapled or cemented to a ceiling, means on such base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material containing alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units of ten to a hundred pairs of projections and depressions in segments of thirty to 180 degrees, which end where they contact other units of the same type, the projections being approximately trapezoidal in cross-section, of height from a millimeter to a centimeter, being distributed with the distance between projections being between a millimeter and a centimeter, the tile surface projections and depressions being uninterrupted by other projections and depressions which would destroy the visual impression given of a silf-like surface.

4. An acoustical ceiling tile which simultaneously deadens noise and gives a viewer the visual impression of a silk-like surface by presenting to his eyes ever-changing areas of reflected light and shadow which comprises a substantially flat straight sided, light weight, fibrous base of sound absorbent material capable of being nailed, stapled or cemented to a ceiling, means on said base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material which comprises alternating, curvilinearly and concentrically disposed compressed depressed and less dense projecting areas, in units of ten to a hundred pairs of projections and depressions in segments of thirty to 180 degrees, which end where they contact other units of the same type, the projections being approximately trapezoidal in cross-section, of height from one millimeter to one centimeter, distributed parallel to other projections in the same unit as distances therefrom from one millimeter to one centimeter, the ratio of projection height to said distance being from about 1:1 to 1:7, said tile surface projections and depressions being uninterrupted by other projections and depressions which would destroy the visual impression given of a silk-like surface.

5. An acoustical ceiling tile which simultaneously deadens undesirable noise and gives a viewer the visual impression of a silk-like surface by presenting to his eyes ever-changing areas of reflected light and shadow which comprises a substantially flat, straight sided, light weight base of sound absorbent material capable of being nailed, stapled or cemented to a ceiling, means on said base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of sound absorbent material which is like that of the base and comprises repeated parallel alternating projecting and depressed curvilinearly disposed areas concentrically dispositioned in units of ten to a hundred pairs of projections and depressions in segments of thirty to 180 degrees, which end where they contact other units of the same type, the projections being approximately trapezoidal in cross-section, of height from a millimeter to one centimeter, distributed parallel to other projections in the same unit at distances therefrom from one millimeter to one centimeter, the ratio of projection height to said distance being from about 1:1 to 1:7, the projections being free from surface discontinuities while the depressions contain openings of width up to that of the depression, which openings serve to accentuate the lines of the projections and depressions, thereby increasing the pleasing silk-like appearance of the ceiling tile and at the same time cooperating with the sound channelling, confining and reflecting projections to deaden undesirable noise, the tile surface projections and depressions being uninterrupted by other projections and depressions than herein described which would destroy the visual impression given of a silk-like surface.

6. An acoustical ceiling tile which simultaneously deadens undesirable noise and gives a viewer the visual impression of a silk-like surface by presenting to his eyes ever-changing areas of reflected light and shadow which comprises a substantially flat, straight sided, light weight base of cellulosic, fibrous, sound absorbent material capable of being nailed, stapled or cemented to a ceiling structure, tongue and groove edges on the base for interlocking said tile with other such tiles for assembly on a ceiling and a surface portion of fibrous, cellulosic sound absorbent material which comprises repeated wavy parallel alternating projecting and depressed curvilinearly and substantially concentrically disposed areas in units of ten to fifty pairs of projections and depressions in segments of thirty to 180 degrees and containing a variety of sizes of such segments within the range given, the segments ending where they contact other units of the same general type, the projections being approximately trapezoidal in cross-section, of height from one to five millimeters, at a distance of one to five millimeters from other projections in the same unit, the ratio of projection height to said distance being from 1:1 to 1:7, the projections being free from surface discontinuities while the depressions contain circular holes which penetrate the surface portion and the base, said holes being of a diameter of one to five millimeters and not exceeding the distance across the depressed area, the holes serving to accentuate the curves of the projections and depressions and thereby increase the pleasing visual silk-like appearance of the ceiling tile and at the same time cooperating with the soundproofing reflecting projections to deaden undesirable noise, the tile surface projections and depressions being uninterrupted by other projections and depressions than herein described which would destroy the visual impression given of a silk-like surface.

References Cited in the file of this patent

UNITED STATES PATENTS

420,929	Church	Feb. 11, 1890
800,931	Meeker	Oct. 3, 1905
2,248,233	Heritage	July 8, 1941
2,954,838	Nuorivaara	Oct. 4, 1960
2,967,583	Jack	Jan. 10, 1961
3,035,657	Lemon	May 22, 1962

FOREIGN PATENTS

460,404	Great Britain	Jan. 27, 1937
1,123,134	France	June 4, 1956