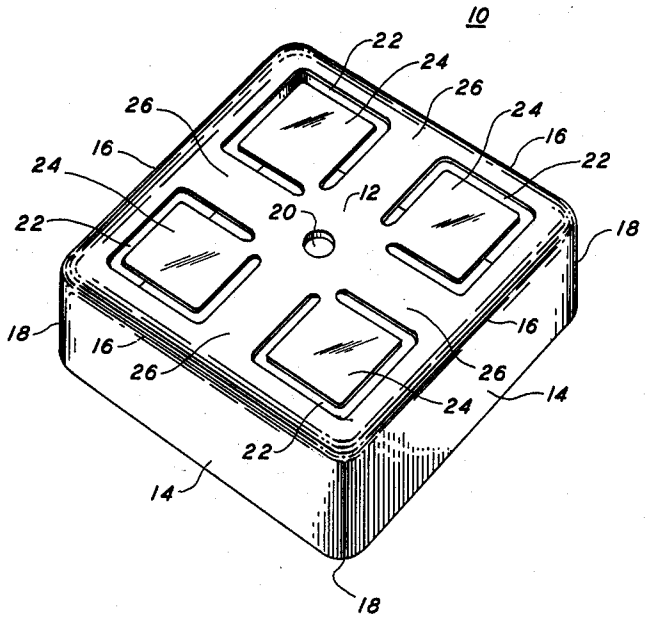
Sept. 3, 1963 H. J. HERSHEY ETAL 3,102,510

GONG

Filed Dec. 6, 1961



INVENTORS: H. J. HERSHEY
R. A. SPENCER

BY Harry L Newman

ATTORNEY

United States Patent Office 3,102,510 Patented Sept. 3, 1963

3,102,510
GONG

Harold J. Hershey and Robert A. Spencer, Indianapolis, Ind., assignors to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York

Filed Dec. 6, 1961, Ser. No. 157,488
3 Claims. (Cl. 116—148)

This invention relates to gongs for ringers and particularly to polygonal gongs having planar surfaces.

Although not limited thereto, this invention is particularly applicable to telephone ringers of the type wherein the ringer motor is enclosed within the gong, and in order to reduce the space occupied by the ringer to a minimum, the gong is a rectangular cup shaped member having a planar crown and planar sides.

Such a gong does not generate as pleasing a sound as the hemispherical gong commonly used in ringers, and the reason is that a polygonal gong, when struck, has a short period of reverberation, or in other words, is rapidly damped as compared to the period of reverberation of the hemispherical gong.

An object of this invention is to provide a polygonal gong having an improved tone quality.

This object is attained in accordance with one feature of the invention by removing portions of the gong's crown adjacent to each juncture of the sides thereby to reduce the rigidity of the gong across the diagonals.

This and other features of the invention will be readily understood from the following detailed description made with reference to the accompanying drawing.

In the drawing a perspective view of a gong designed in accordance with the present invention is shown.

The gong comprises a square cup shaped member **10** having a planar crown **12** and planar sides **14**. At the juncture of the crown with the sides horizontal rounded corners **16** are provided and at the juncture of the sides with each other, vertical rounded corners **18** are provided. An aperture **20** in the center of the crown is used to secure the gong to a ringer motor, not shown, such as disclosed in the above-identified application.

It has been discovered that in a gong of this shape the sound radiating surfaces are to a large degree limited to the horizontal and vertical rounded corners **16** and **18**, respectively. The vertical rounded corners **18** are responsible for the radiation of the fundamental frequency of the gong and its first overtone, the fundamental frequency being the lowest frequency at which the gong sustains reverberation and the first overtone being the next higher frequency at which the gong sustains reverberation.

The horizontal corners **16** do not provide sustained reverberation as do the vertical corners **18** but they do generate a discreet frequency when the gong is struck. The planar sides **14** appear to serve only as a means of transmitting vibration from one vertical corner to the other, while the planar crown **12** appears to act somewhat like a vibrating disc in that it provides high frequency components to the sound generated by the gong.

It has been discovered that the frequency generated by the horizontal corners **16** is related to the length of the corners, the longer corners in a rectangular gong generating a lower frequency than the shorter corners. It follows that by making the gong square, all four horizontal corners **16** are of the same length, and all four corners then generate the same frequency. This is advantageous in that the energy level at that one frequency is increased and a more commanding signal, a signal more easily heard, is produced.

Furthermore, it has been discovered that the frequencies generated by the vertical corners **18** are not only related

to the height of the corners, but also to the length of the diagonals joining opposite corners. In both instances an increase in dimension results in a lowering of the frequencies.

From the discoveries that the fundamental frequency of the gong is produced by the vertical corners **18** and that the length of the diagonal between corners determines, in part, the frequency of the fundamental, it was deduced that the vertical corners **18** behave very much like a hemispherical gong. A hemispherical gong, when struck, produces its fundamental frequencies at points 90° and 180° disposed from the point of impact and the frequency of the fundamental is determined, in part, by the diameter of the gong. Thus there is a similarity between the vertical corners **18** and the fundamental frequency points of a hemispherical gong. This deduction was substantial when it was determined that the formulas applicable to hemispherical gongs could in fact be used to approximate the signal produced by the vertical corners.

With this knowledge it was inferred that, like the opposite fundamental frequency points on a hemispherical gong, the opposite vertical corners **18** of a quadrangular gong, when vibrating, simultaneously move toward and away from each other. It was then concluded that by facilitating this movement, the reverberation of the corners would be sustained for a longer period of time and the sound of the ringer consequently improved, and this, in fact, is the case.

The movement of the opposite vertical corners **18** is facilitated by reducing the stiffness of the gong across the diagonals, and this is ideally achieved by removing the entire planar crown **12**. However, as the crown serves to support the rest of the gong, the entire crown cannot be eliminated. Instead portions of the crown adjacent to the vertical corners **18** are removed.

In the gong shown, slots **22** are formed in the crown **12** adjacent to each of the vertical corners **18**. The slots extend along the horizontal corners **16** adjacent to the vertical corners **18** and then extend toward the center of the crown, the slots defining square tabs **24**. In this embodiment slots were used to remove portions of the crown inasmuch as the gong encases a ringer motor, and it is therefore desirable to retain as much of the crown as possible, since the gong acts to protect the ringer motor from dust. However, where this is not a factor, the tabs **24** could be eliminated, leaving only spoke-like portions **26** of the crown to support the gong.

It is to be noted that the slots **22** reside entirely on the planar crown **12** and do not extend into the rounded horizontal corners where a useful portion of the signal is produced. The crown with portions thereof removed provides no sound, but since the crown when whole provides only the higher frequencies of the sound generated by the gong and since most people are insensitive to sound at the higher frequencies, no useful portion of the signal generated by the gong is lost.

What is claimed is:

1. A gong for a ringer comprising a polygonal cup shaped member having a planar crown, a plurality of planar sides, a plurality of first rounded corners at the juncture of the crown with the sides, and a plurality of second rounded corners at the juncture of the sides with one another, the crown having openings therein in juxtaposition with the first and second rounded corners, each opening being defined by an edge, each edge generally extending along the first rounded corners and toward the center of the crown.

2. A gong for a ringer comprising a quadrangular cup shaped member having a planar crown, a plurality of planar sides, a plurality of first rounded corners at the juncture of the crown with the sides, and a plurality of

second rounded corners at the juncture of the sides with one another, the crown having portions removed therefrom, the removed portions being in juxtaposition with the second rounded corners and generally extending along the first rounded corners and toward the center of the crown.

3. A gong for a ringer comprising a square cup shaped member having a planar crown, a plurality of planar sides, a plurality of first rounded corners at the juncture of the crown with the sides, and a plurality of second rounded corners at the juncture of the sides with one another, the crown having slots formed therein adjacent to each of the second rounded corners, the slots extending along the first rounded corners and then toward the center of the crown.

References Cited in the file of this patent

UNITED STATES PATENTS

1,635,985 Davis ---------- July 19, 1927

FOREIGN PATENTS

1,076,536 Germany ---------- Feb. 25, 1960