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SOUND AMPLIFYING HORN FOR GRAMOPHONES, LOUD SPEAKERS, AND OTHER LIKE SOUND REPRODUCING APPARATUS

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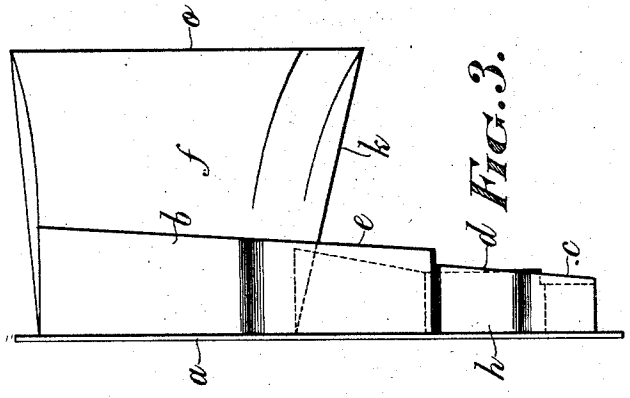


FIG. 3.

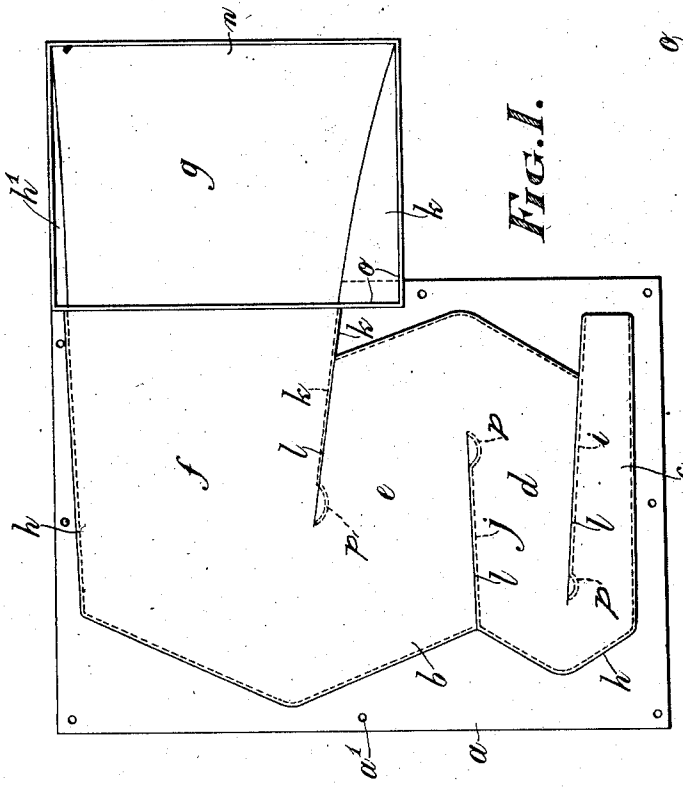


FIG. 1.

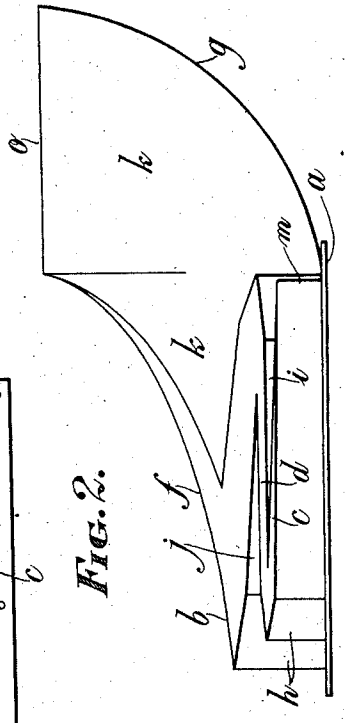


FIG. 2.

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SOUND-AMPLIFYING HORN FOR GRAMOPHONES, LOUD SPEAKERS, AND OTHER LIKE SOUND-REPRODUCING APPARATUS.

Application filed November 17, 1926, Serial No. 148,932, and in Great Britain May 31, 1926.

This invention refers to improvements in or relating to sound amplifying horns for gramophones, loud speakers, and other like sound-reproducing apparatus, and it has for its object to provide a horn of improved and simplified construction which will give a maximum of length for a given overall size, thus rendering the improved horn especially suitable for building into or for use in connection with portable gramophone and like cabinets.

Now according to the present invention the improved sound amplifying horn, which is preferably built up from sheet metal, fibre, wood or other material, is of zigzagged or sinuous formation so that the sides of the various straight portions of the horn can be closely nested together to effect economy in space and so that the partition walls can each be made common to two straight portions of the horn to effect an improvement in the resonance of the horn and economy in material.

In order that the present invention may be clearly understood and more readily carried into effect, it is hereinafter described with reference to the accompanying drawings, in which

Figure 1 is a plan view of a sound amplifying horn, specially constructed for use in connection with a portable gramophone;

Figure 2 is a side elevation thereof, and

Figure 3 is an end elevation thereof.

Preferably the horn is as shown formed with one side *a*, which may form the bottom, flat, or horizontal, and the other side *b* shaped and bent so as to provide inclined or gradually rising sides or upper portions to the various sections *c*, *d*, *e*, *f*, of the horn. It is not, however, essential that one side should be entirely flat, although this is preferable where the horn is to be used in a horizontal position. In other cases it may be found more convenient to arrange the horn in a vertical plane and to shape both sides so that all sections of the horn can be kept in one medial plane. In the case, however, of a portable gramophone, the arrangement first described will be found to be most convenient, owing to the fact that the smaller sections such as *c*, *d*, and *e* of the horn provide the space necessary for the accommodation of the motor and for the swivelling portion of the tone-arm.

In one of the simplest forms of construction shown in the drawings, the lower or base portion of the sound amplifying horn may be formed from sheet metal which is shaped to provide the lower side or portion of four sections of the horn *c*, *d*, *e* and *f*, and which terminates in an upward flare *g* serving to direct the sound waves in an upward direction. It will be understood, however, that the number of sections is not limited to four, but may be of any number determined by the length of horn desired and the space available for enclosing the horn. The said base portion is turned up or provided at its edges with an upstanding flange or wall *h* of varying height, and also, in the case of a four-section horn *c*, *d*, *e*, *f*, with three intermediate partition walls, *i*, *j* and *k* which extend alternately inwards from opposite sides and serve to divide the base portion up into the four sections *c*, *d*, *e*, *f*. The partition walls *i*, *j*, *k*, merge into the marginal walls or flanges *h* of the lower base portion *a* and also are of varying heights such as are required to give the required gradually increasing area to the amplifying horn. The base *a*, to which the outer walls *h* of the horn are soldered or otherwise secured, may be of the exact shape or outline of the horn, though I prefer to superimpose these walls *h* upon a base of larger size (as shown) which is pierced with suitable holes *a'* for enabling same to be fixed rigidly to a board forming part of a gramophone case. The purpose of this is twofold in that it enables the horn to be built into its cabinet in proper alignment and in that it enables metallic sounds to be more effectively damped out by the placing of suitable absorbent or non-sound conducting materials between the metal base *a* and the wooden base board. The upper portion *b* is alternatively slit from opposite sides as indicated at *l* and shaped to rest upon the upstanding marginal edges *h* of the base member *a* and on the partition walls *i*, *j*, *k*, and it resembles in appearance a zigzagged rising pathway, starting from the smaller or tone arm end *m* of the sound amplifying horn and gradually rising until it stops short of the upturned and rounded end *n* of the bottom plate *a* to provide an upward exit opening *o*. In some cases where the sound is to be projected outwards and not upwards (as shown), the upper portion *b* may be made to extend to a line parallel and coextensive with the base member *a*, or the exit opening may be arranged wholly or partially in the plane

of the horn. One of the partition walls *k* and also a portion of the outer upstanding side wall of the lower plate are shaped as at *h'* to co-operate with the curved or upwardly flared portion *g* of the horn. At the turns or bends at the ends of the horn sections, the upstanding side wall *h* provided on the lower plate is preferably bent at an angle or V as best shown in Figures 1 and 2 so as to provide a better reflecting surface for the sound waves and to prevent their being pocketed, whilst the free inner ends of the partition walls *i*, *j* and *k*, may also be slightly curved or rounded as shown at *p* so as to ensure that the sound waves will be slightly compressed or retarded just before they pass the turn or bend.

Another important feature of the improved zigzag horn which contributes largely to its rigidity of construction and purity of tone is the arrangement whereby the gradually enlarging sections of the horn are connected together to the three intermediate partition walls, that is to say, the edge of the inclined roof of each zigzag section on that side of the division wall toward the entrant end of the horn is secured to the side of the division wall below the upper edge and gradually inclines upwardly and finally is secured to the upper edge of the division wall. This construction forms a powerful stay which strengthens the wall and to a great extent prevents vibration or repercussion which may occur on one wall first of all and then on the other side thereof as the sound wave traverses the passage way.

It will be seen that by the present invention, I am enabled to construct an extremely portable horn in a simple, strong and workmanlike manner from flat steel material, and that it is readily possible to provide a horn constructed of different materials, according to the quality of the tone required which is not possible in the case of horns of circular cross section. For instance, the base portion *a* can be made of metal and the upper portion *b* of wood, fibre or other material designed to effect any desired variation in the tonal quality of the sound. Further, I am enabled to provide a horn containing a flare of accurate dimensions in its gradual enlargement from the smallest to largest diameter or square and by the utilization of a common wall or division nested in zigzag fashion, I secure an increase in horn length of 30 per cent within any given space over the ordinary self-contained sinuous type of horn.

What I claim is:—

1. A sound amplifying horn constructed on uninterrupted side walls and edge walls, said edge walls being of gradually increased height from the entrant end of the horn, and division walls of gradually increased height projecting inwardly from opposite edge walls successively from the entrant to the exit end of the horn, the division walls being secured throughout their lengths to the side walls.

2. A sound amplifying horn constructed of uninterrupted side walls and edge walls, and division walls projecting inwardly from opposite edge walls successively from the entrant to the exit end of the horn, the division walls being secured throughout their lengths to the side walls and being increasingly spaced apart from the entrant to the exit end of the horn, one of the side walls being increasingly spaced from the other from the entrant end of the horn.

3. A sound amplifying horn constructed of sheet material and comprising two side walls, spaced edge walls secured to and between the side walls, division walls projecting alternately from the opposite edge walls and secured throughout their lengths to one of the side walls, the other of the side walls being slitted in line with the division walls to permit a portion of such slitted side wall to be secured to a division wall at an upward advancing inclination to the upper edge of said wall while permitting the immediately adjacent slitted portion of the side wall to be secured to the upper edge of the division wall.

4. A sound amplifying horn comprising a sound amplifying space defined by side walls and edge walls, one of the side walls being formed to present a sinuous path throughout which the said side wall inclines increasingly upward relative to the other side wall, and division walls arranged interiorly of the space and defining with the inclined portion of the side wall a tortuous passage of gradually increasing area from the entrant end of the horn.

5. A sound amplifying horn comprising spaced side walls connected by edge walls to define a sound amplifying space, a series of partitions secured alternately to the respective edge walls and projecting toward and terminating short of the opposite edge wall, said partitions being increasingly spaced apart from the entrant end of the horn to define a tortuous passage in the sound amplifying space, each edge wall opposite the free end of the partition being deflected to direct the sound from one side of the division wall to the opposite side in the direction of sound travel.

In testimony whereof I have hereunto signed my name.

HENRY JOHN CULLUM.