Mar. 6, 1923. 1,447,183

T. C. ROBERTS

METHOD OF AND APPARATUS FOR SECURING A MATRIX SHELL TO A SUITABLE BACKING

Filed Dec. 27, 1919 2 sheets-sheet 1

Fig. 1.

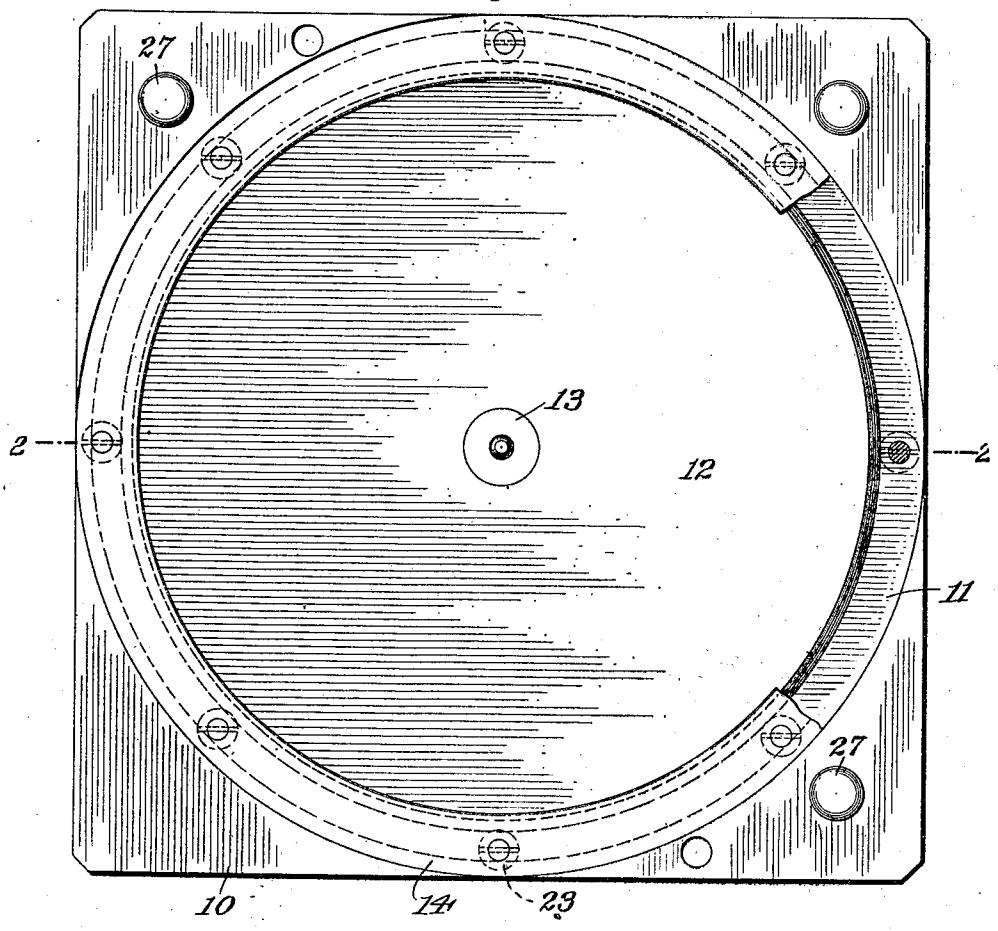

Fig. 2.

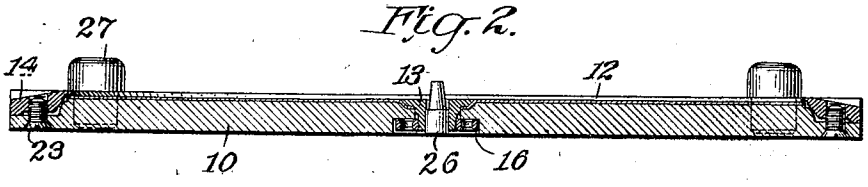

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Fig. 3.

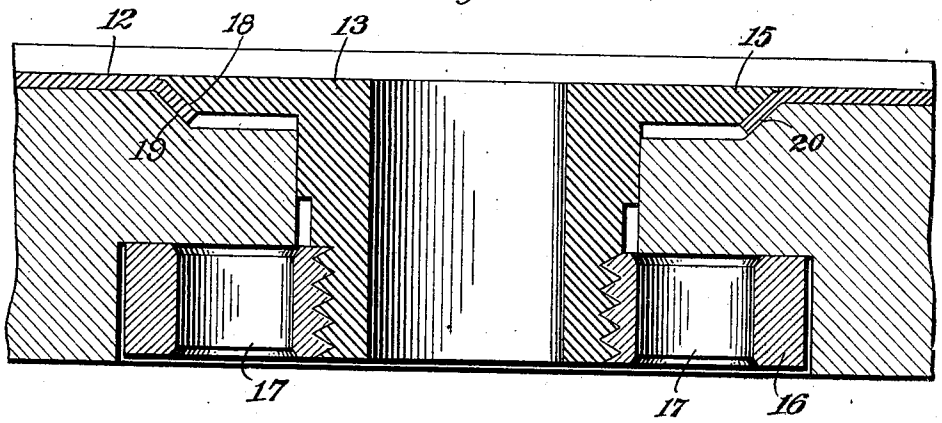
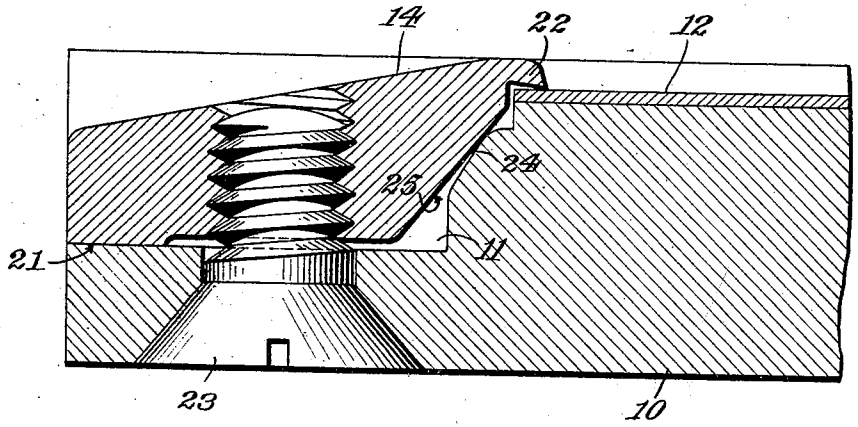


Fig. 4.



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Patented Mar. 6, 1923. 1,447,183

UNITED STATES PATENT OFFICE.

THEODORE C. ROBERTS, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO COLUMBIA GRAPHOPHONE MANUFACTURING COMPANY, OF BRIDGEPORT, CONNECTICUT, A CORPORATION OF DELAWARE.

METHOD OF AND APPARATUS FOR SECURING A MATRIX SHELL TO A SUITABLE BACKING.

Application filed December 27, 1919. Serial No. 347,778.

To all whom it may concern:

Be it known that I, THEODORE C. ROBERTS, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Methods of and Apparatus for Securing a Matrix Shell to a Suitable Backing, of which the following is a full, clear, and exact description.

In the manufacture of commercial phonograph records as now conducted, the records are obtained from an impression made in thermoplastic compositions by a copper-backed matrix shell. The matrix shell is obtained from the master record to be reproduced by electro-deposition of metal, usually of copper, and is relatively thin. As a consequence when it is laid on a heated surface it warps and does not lie flat and smooth thereon. It is therefore customary to solder a relatively thick copper plate to the back of the matrix shell whereupon it is ready for use in any suitable manner.

It is an object of my invention to provide a method and means which will permit the utilization of the thin matrix shell without the copper plate backing heretofore considered essential. In carrying out my invention, I take advantage of the fact that different metals have different coefficients of expansion. As already indicated the matrix shell is usually of copper or copper composition. I, therefore, employ a metal, namely, steel, preferably in the form of a slab, having a coefficient of expansion less than that of copper, for a purpose that will presently appear, and back and mechanically secure the matrix against the steel slab and at the same time insure that the matrix, when the slab is heated, shall lie flat and smooth thereon notwithstanding the fact that the matrix is not integrally united therewith as is the case when it is backed with a copper plate.

In order that the invention may be more fully understood reference should be had to the detailed description of the same in connection with the accompanying drawings in which—

Fig. 1 is a plan view showing the matrix secured to a steel slab, a section of the rim clamping means being broken away;

Fig. 2 is a vertical section on line 2—2 of Fig. 1;

Fig. 3 is a vertical section on an enlarged scale of the central clamping means, and

Fig. 4 is a similar view of the rim clamping means.

The numeral 10 designates a steel slab of any suitable outline having a groove 11 of a radius greater than that of the matrix 12. The latter at its center is secured to the slab by means of a clamping post or bushing 13 and at its outer rim by means of a clamping ring 14. The bushing has a disk head 15 at one end and at the other is threaded to receive a nut 16 which is set into a counter-bore in the slab and provided with openings 17 adapted to receive a suitable wrench. The disk 15 is beveled as at 18 and extends partly below the face of the slab into a beveled recess 19 in the operation of clamping the inclined edge 20 of the matrix between itself and the slab. The relation of the disk to the beveled recess is such that the face of the matrix and top of the disk are substantially flush.

The clamping ring 14 at its outer edge is suitably seated on the slab as at 21. For bringing the ring into clamping position, I prefer to provide a plurality of screws 23 that pass through the bottom of the slab and into the ring, the heads of the screws being set into the slab, so as to be flush with the surface thereof. The radial clearance between the slab and ring is reduced to a minimum, to prevent relative movement of the two when the matrix is in position on the slab, by providing the slab with a circumferential hump 24 and the ring with an inclined wall 25 adapted for abutment thereagainst, to limit the extent to which the clamping ring may be drawn down as its annular jaw is grippingly engaged with the outer marginal portion of the matrix. Normally, however, the ring is slightly spaced from the hump 24.

In Figs. 1 and 2 I have shown a mandrel 26 centered in the bushing 13 and posts or guides 27 rising from the slab. The mandrel serves to make the center hole in the pressed record and the posts 27 to aline the cooperating slab (not shown) during the pressing operation by entering into corresponding openings therein.

It is essential that the matrix be held against the slab in a smooth and flat con-

dition. To obtain this result the matrix is preferably clamped at its center to the slab and the two then heated to a temperature sufficiently above that of the normal working temperature of the same to cause an appreciable difference in the normal length of the matrix and slab. The outer rim of the matrix is then clamped to the slab after which the two are allowed to cool. The matrix being of copper or copper composition contracts more than the steel slab and as a consequence is drawn taut and smooth across the face of the same and hence is under tension. By reason of the clamping ring being circular the matrix is secured to the slab at an infinite number of diametrically opposite points and the matrix is thus uniformly tensioned over its entire area.

While I have described the matrix securing means in detail, it will be obvious that changes may be made in the form, arrangement and proportion of parts thereof without departing from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent is:—

1. The method of securing a matrix to a slab having a coefficient of expansion less than that of the matrix, which consists in first securing the center of the matrix to the slab, then heating the matrix and slab to a temperature above the normal working temperature of the same, then securing the matrix at spaced points to the slab and finally cooling the two to normal temperature.

2. The method of securing a matrix to a slab having a coefficient of expansion less than that of the matrix, which consists in first securing the center of the matrix to the slab, then heating the matrix and slab to a temperature sufficiently above the normal working temperature of the same to cause an appreciable difference in normal length of the two, then securing the outer rim of the matrix to the slab and finally cooling the two to normal temperature.

3. The method of securing a metal matrix to a metal slab having a coefficient of expansion less than that of the matrix, which consists in first securing the matrix at its center to the slab, then heating the two to a temperature above the normal working temperature of the same, then securing the outer rim of the matrix to the slab and finally cooling the two to normal temperature.

4. The method of securing a matrix to a means having a coefficient of expansion less than that of the matrix which consists in first securing the center of the matrix to said means, then heating the matrix and means above normal working temperature, then securing the matrix to the means at a plurality of diametrically opposite points and finally cooling the two whereby the matrix is put in a condition of tension.

5. A backing means for a matrix comprising a backing plate having a central beveled recess, a clamping means cooperating therewith and adapted to positively clamp a portion of the matrix within the recess against lateral movement, and a clamping ring in substantially fixed radial relation relatively to said clamping means, said ring having a circumferential claw projecting over the face of the backing-plate and adapted to positively secure the outer marginal portion of the matrix against lateral movement.

6. A backing means for a matrix comprising a backing-plate having a dished recess, a clamping post having beveled disk head for clamping cooperation with said recess and providing a space between the dished recess and the beveled disc head for clamping a matrix therein, means for drawing the post into matrix clamping position and adapted to positively clamp the matrix against lateral movement, and matrix clamping means radially spaced from and in non-slidable relation with respect to, the clamping post and adapted to positively secure the matrix against lateral movement.

7. In combination, a backing-plate having a beveled recess, a matrix backed against the slab and having its central portion bent into said recess, a clamping post positively securing said portion in the recess against lateral movement, and a clamping ring mounted on the slab in spaced and substantially fixed radial relation to the recess, the ring having a claw projecting over the rim of the matrix and adapted to positively secure the outer marginal portion of the matrix against lateral movement.

8. A backing means for a matrix, comprising a backing-plate having a central recess, clamping means co-operating therewith and adapted to positively secure a portion of the matrix within the recess against lateral movement, and means adapted to positively secure the matrix to the plate against lateral movement and in concentric and outwardly spaced relation to the first-mentioned clamping means.

9. In combination, a backing-plate, a matrix backed against it, means adapted to secure the central portion of the matrix against lateral movement, and other means adapted to secure the outer marginal portion of the matrix against lateral movement, both of said securing means being dependent upon both friction and resistance to deformation.

10. A backing means for a centrally apertured matrix, comprising a centrally apertured backing-plate having a recess surrounding the aperture, clamping means disposed in the recess and adjustable longi-

tudinally of the axis of the aperture, and adapted to positively clamp the matrix against lateral movement at its inner marginal portion within the recess, the relative dimensions of the clamping means and the recess being such, that the clamping means lies substantially flush with the matrix, and means adapted to positively clamp the outer marginal portion of the matrix to the plate against lateral movement.

11. A backing means for a centrally apertured matrix, comprising a backing-plate having a central recess, clamping means disposed in the recess and adapted to positively secure the matrix at its inner marginal portion within the recess against lateral movement, the relative dimensions of the clamping means and the recess being such, that the clamping means lies substantially flush with the matrix, and means adapted to positively secure the outer marginal portion of the matrix to the plate against lateral movement.

12. A backing means for a centrally apertured matrix, comprising a centrally apertured backing-plate having a recess surrounding the aperture, clamping means disposed in the recess and adjustable longitudinally of the axis of the aperture, and adapted to positively secure the matrix at its inner marginal portion within the recess against lateral movement, and means adapted to positively secure the outer marginal portion of the matrix to the plate against lateral movement.

13. A backing means for a centrally apertured matrix, comprising a centrally apertured backing-plate having a recess surrounding the aperture, the recess having beveled side walls, clamping means having a beveled head for clamping co-operation with the walls of the recess, and adapted to positively clamp the matrix at its inner marginal portion within the recess against lateral movement, and means adapted to positively clamp the outer marginal portion of the matrix to the plate against lateral movement.

14. In combination, a backing-plate having a central recess, a matrix backed against it, clamping means co-operating with the recess and adapted to positively clamp a portion of the matrix within the recess against lateral movement, the portion being bent transversely to the lateral surface of the plate, and means adapted to positively clamp the matrix to the plate at its outer marginal portion and against lateral movement.

15. In combination, a backing-plate, a matrix backed against it, a central clamping means secured to the backing-plate and adapted to secure the matrix plate to the backing-plate substantially centrally, a clamping ring secured to the backing-plate and having an annular jaw adapted to grippingly engage the matrix along its outer marginal portion with substantially line contact, and in inwardly spaced relation to the periphery.

16. In combination, a backing-plate, a matrix backed against it, a central clamping means secured to the backing-plate and adapted to secure the matrix plate to the backing-plate substantially centrally, a clamping ring mounted upon the backing-plate having an annular portion adapted to engage the backing-plate, an annular portion engaging and adapted to grip the matrix along its outer marginal portion, an intermediate annular portion spaced from the backing-plate, and adjustable attachment means adapted to secure the backing-plate to the matrix, and to engage the ring with the matrix with variable pressure as the intermediate annular portion is drawn into greater or less proximity to the backing-plate.

17. The method of securing a matrix to a support, which consists in first securing the matrix at spaced points, when in a heated condition, and then allowing the matrix to cool.

18. The method of securing a matrix to a support, which consists in first securing the matrix along a circumferential line, and then causing it to flatten within said circumferential line through thermal contraction of the matrix relative to the support.

In testimony whereof, I affix my signature.

THEODORE C. ROBERTS.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,447,183, granted March 6, 1923, upon the application of Theodore C. Roberts, of Bridgeport, Connecticut, for an improvement in "Methods of and Apparatus for Securing a Matrix Shell to a Suitable Backing," errors appear in the printed specification requiring correction as follows: Page 3, line 74, claim 16, after the word "to" insert the word *positively;* same page and claim, line 75, after the word "centrally", and line 80, after the word "portion", insert the words *and against lateral movement;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of April, A. D., 1923.

[SEAL.]

KARL FENNING,
Acting Commissioner of Patents.