

No. 714,707.

Patented Dec. 2, 1902.

J. W. JONES.
DUPLICATING APPARATUS.

(Application filed Jan. 16, 1902.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

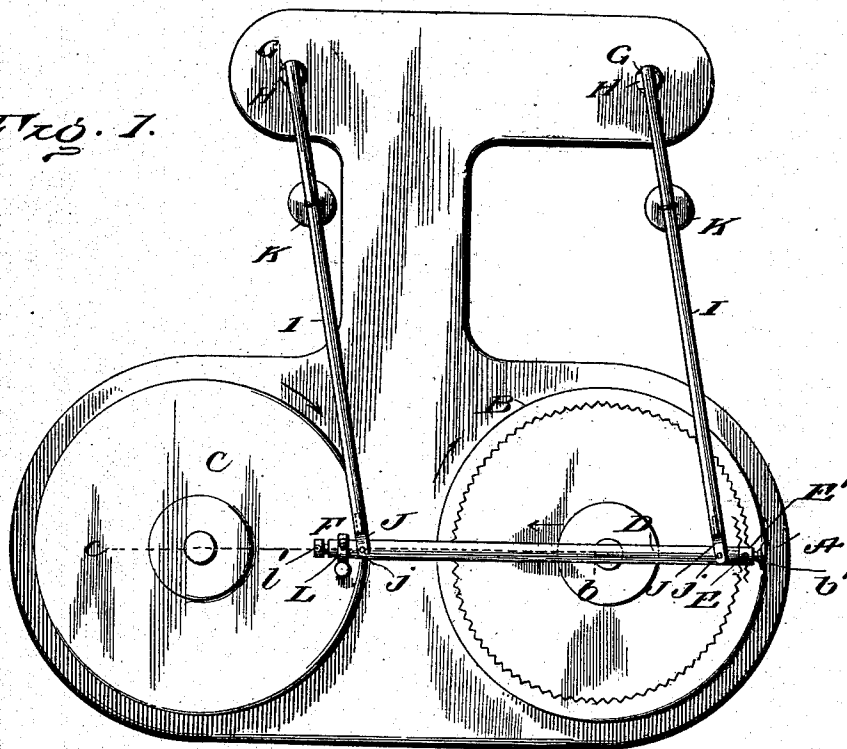
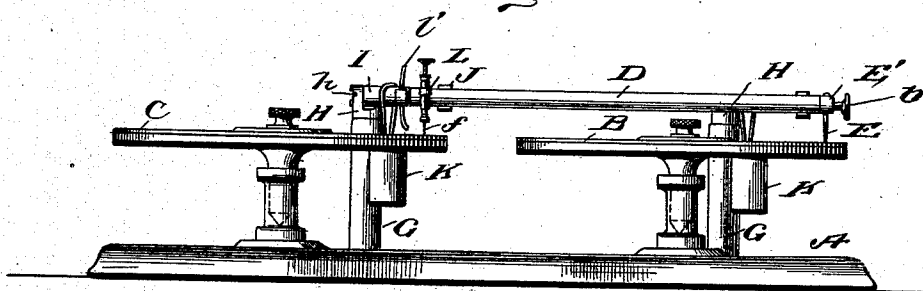


FIG. 2.



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Witnesses

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Fig. 3.

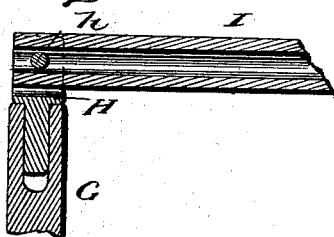


Fig. 4.

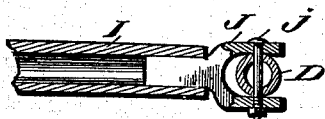


Fig. 5.

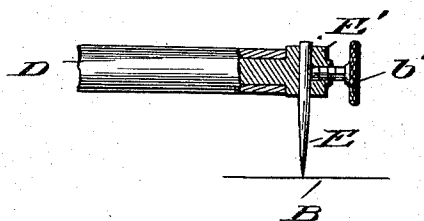


Fig. 6.

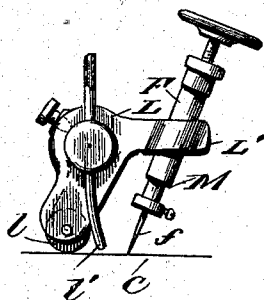
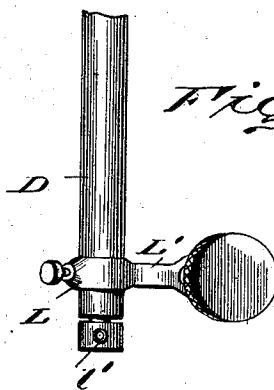


Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF NEW YORK, N. Y.

DUPLICATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 714,707, dated December 2, 1902.

Application filed January 16, 1902. Serial No. 90,057. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. JONES, of the city, county, and State of New York, have invented a new and useful Duplicating Apparatus, which invention is fully set forth in the following specification.

This invention relates to the production of sound-records of the type characterized by spiral grooves of uniform depth having lateral undulations corresponding to sound-waves and produced upon a flat tablet or disk, the type being known as "zigzag" disk sound-records or "zigzag" records. The present invention is a duplicating apparatus for transferring upon a disk of suitable composition a copy or duplicate of a master-record of the type described. Two horizontal turn-tables are arranged side by side, one carrying the master-record and the other the blank tablet or plain disk of suitable composition, and means are provided for rotating the two turn-tables at the same speed.

The invention consists, first, in a thrust-bar parallel to the turn-table and carrying at one end an ordinary reproducing-stylus or "follower" in operative contact with the record-groove of the master and carrying at its other end a recording device in operative contact with the plain disk.

The invention consists, second, in the manner of mounting or supporting this thrust-bar or transferring apparatus; and the invention consists, further, in the details of construction hereinafter described and claimed.

The drawings annexed hereto as part of this specification illustrate a convenient and preferred form of my invention.

Figure 1 is a plan view; Fig. 2, a front elevation, and Figs. 3 to 7 show details.

Upon the base-plate A are two horizontal turn-tables driven in the same direction and at the same speed and carrying a master-record and a plain disk B and C, respectively. The plain disk C may be of any suitable material that may be readily and cleanly cut or engraved by the action of the recording device, provided only that the material have sufficient body to withstand the subsequent handling. Preferably I employ such a composition as pointed out in my patent No. 688,739, granted December 10, 1901.

D is the thrust-bar, lying parallel to the

disks B and C, above them, and preferably in their central line *b c*. At one end of bar D is secured the follower—a reproducing stylus or point E, placed in operative contact with the spiral record-groove on disk B—and at the other end of bar D is the recording device F, having the recording-tool *f* inserted into the surface of plain disk C. The thrust-bar D is supported in any desirable manner, so as to have longitudinal play, but be always substantially parallel with itself. Now when the turn-tables revolve the spiral groove of disk B acts as a feed-screw, moving stylus E (and all of thrust-bar D) longitudinally of bar D, as indicated by the arrow. Thrust-bar D moving always parallel to itself, the recording device F travels the same way radially of the plain disk C, and the recording-tool *f* traces in the surface of disk C a spiral groove corresponding to the spiral groove in the master-record B. Any lateral irregularities constituting the real "record" cause longitudinal vibrations of the thrust-bar D, which are reproduced by the recording-tool *f*, the latter thus producing in the surface of the plain disk C a spiral-groove of uniform depth and having lateral undulations corresponding to the sound-record in the master. The peculiar advantage of having this rigid longitudinal thrust-bar D is that it carries the follower and the recording-tool rigidly and in never-failing positions with regard to each other, so that there is no lost motion, due to pivoting of levers, flexibility of arms, &c. The bar D is preferably an aluminium tube, and a satisfactory method of supporting the same will now be described.

G and G are pillars rising from base-plate A at the rear of the turn-tables, the line G G being parallel to the central line *b c*. In the top of each of the pillars G is inserted the swivel H, having a fork in which is secured by a horizontal pin *h* one of the two parallel arms I. (See Fig. 3.) These parallel arms I are likewise aluminium tubes, and in the front end of each is inserted the fork J, in which the thrust-bar D is pivoted by the pin *j*. (See Fig. 4.) Thus the points G G *j j* define a parallelogram, and thrust-bar D is free to swing around radially on the disks B and C, but always parallel to itself and to the central line *b c* on the turn-tables.

K and K represent weights supported from one of the parallel arms by flexible connection. These weights serve to hold the follower in intimate contact with the recording-groove of the master-disk and the recording-tool in proper relation to the surface of the plain disk. These weights are adjustable longitudinally on the parallel arms to regulate the pressure on the points E and *f*, and by having the connections flexible—i. e., a cord—longitudinal vibrations of the thrust-bar D (and the swinging of the parallel arms) are not checked or in any manner interfered with.

Fig. 5 shows the follower or reproducing-stylus E secured in a metal casting E' by the thumb-nut *b*, the casting E' having a shank forced into the open end of the tubular thrust-bar D.

Figs. 6 and 7 illustrate the recording device F. A casting L is fitted snugly upon the end of thrust-bar D. Extending forwardly from this casting L is a member L', through which passes recording device F. Extending downwardly from the piece L is a flange carrying the antifriction device *l*, the latter running over the surface of the plain disk C, and preferably a small pipe *l'*, leading from a fan, discharges a blast of air immediately between the antifriction device *l* and the recording-tool *f*. The recording device F contains an ordinary "tailpiece" M, (common in lathes,) at the lower end of which is the recording-tool *f*, the tailpiece regulating the depth of groove cut or engraved by the tool *f*.

While I have described one particular mounting of the thrust-bar D, it is obvious that others may be employed. It is further obvious that whereas I have described the turn-tables as horizontal and the thrust-bar as resting upon top of them by gravity assisted by the weights K, yet this position may be changed, a spring or other device serving to hold the thrust-bar, with its following and recording points, in operative contact with the two disks. Of course the best results are obtained by having the thrust-bar lie in the vertical plane upon the central line *b c*, and the points E and *f* travel in that plane radially of the disks; yet this is not absolutely necessary. The position and adjustment may be varied considerably without any material difference in results.

I have described the parallel arms H H and the thrust-bar D as constituting a parallelogram, yet if they do not constitute an exact geometric parallelogram it is not material. So,

also, if for any reason the exact geometric outline is distorted it is likewise immaterial. The operation of the apparatus is the same. The rotation of the feed-screw of disk B will propel the recording-tool *f* across the surface of the rotating disk C and the lateral undulations of the master-disk B will produce corresponding lateral undulations in the groove being engraved in the surface of disk C—that is, will produce lateral undulations corresponding to the sound-waves.

Changes may be made in the construction and arrangement of this apparatus and certain parts of it may be used to the exclusion of others without in any case departing from the spirit of my invention.

Having thus described my invention, I claim—

1. An apparatus for making duplicates of zigzag disk sound-records, consisting of the combination with two horizontal turn-tables, arranged side by side and carrying a master-record of the kind described and a suitable blank-disk respectively, of two parallel arms swinging across said turn-tables from fixed pivots, and a rigid thrust-bar pivoted at the ends of said arms to reciprocate always parallel to itself, said bar carrying at its ends a follower and a recording-tool in operative contact with said master and blank respectively, whereby upon the rotation of said turn-tables an exact counterpart of the master is produced automatically in the blank by means of the longitudinal thrust of said thrust-bar.

2. An apparatus for making duplicates of zigzag disk sound-records, consisting of the combination of two turn-tables for a master-record and blank-disk respectively, and a rigid thrust-bar parallel with said tables and carrying a follower and a recording-tool for engagement with the master and blank respectively, said thrust-bar being located within the perpendicular plane of the centers of said tables, and being supported in such manner as to have longitudinal play always parallel to itself and practically entirely within said plane of said centers, as and for the purpose described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOSEPH W. JONES.

Witnesses:

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WILLIAM E. HILLS.