April 2, 1935. H. L. T. BUCKLE 1,996,057

APPARATUS FOR THE PRODUCTION OF DISK RECORDS FOR TALKING MACHINES

Filed April 27, 1929 5 Sheets-Sheet 1

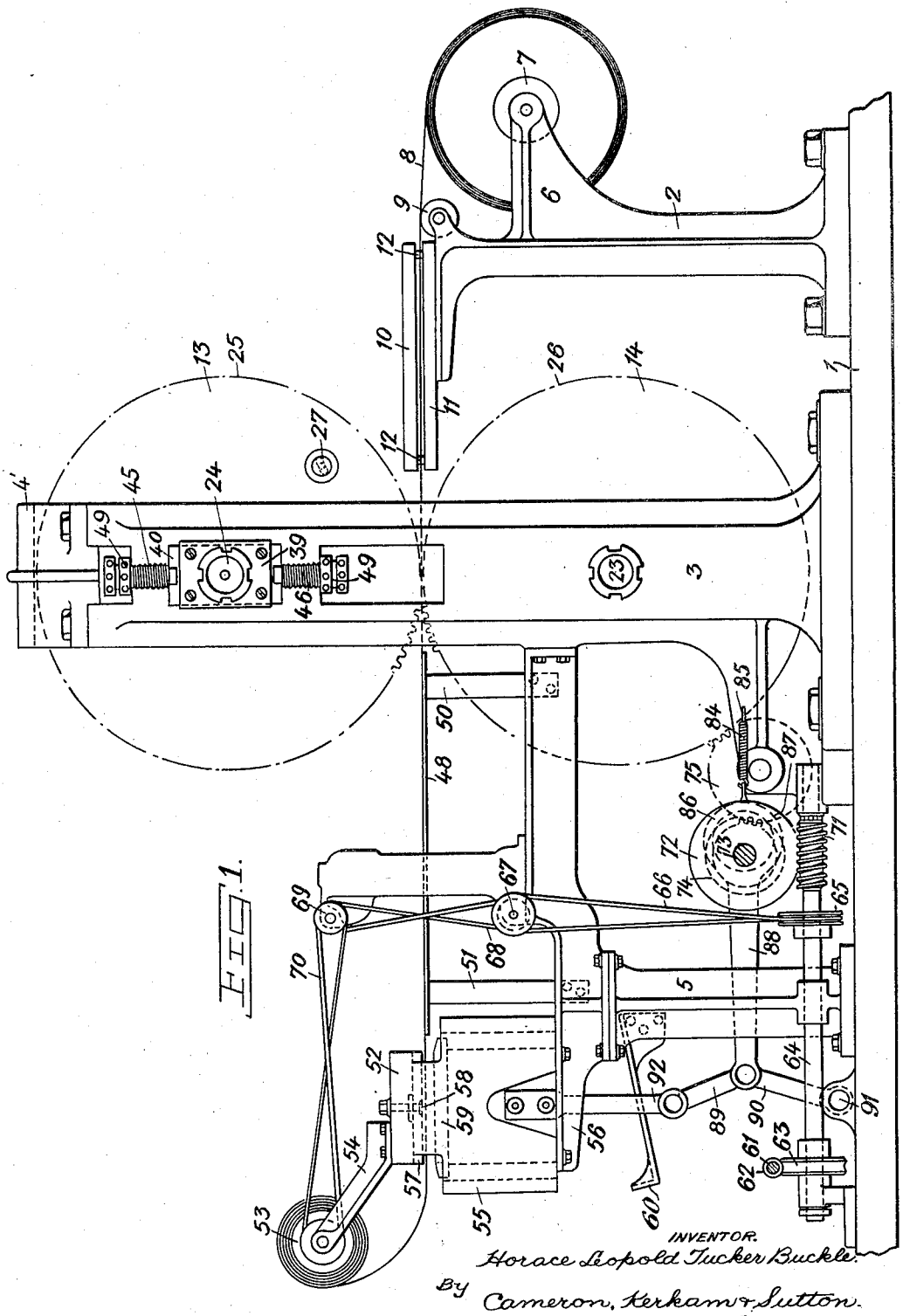


FIG. 1.

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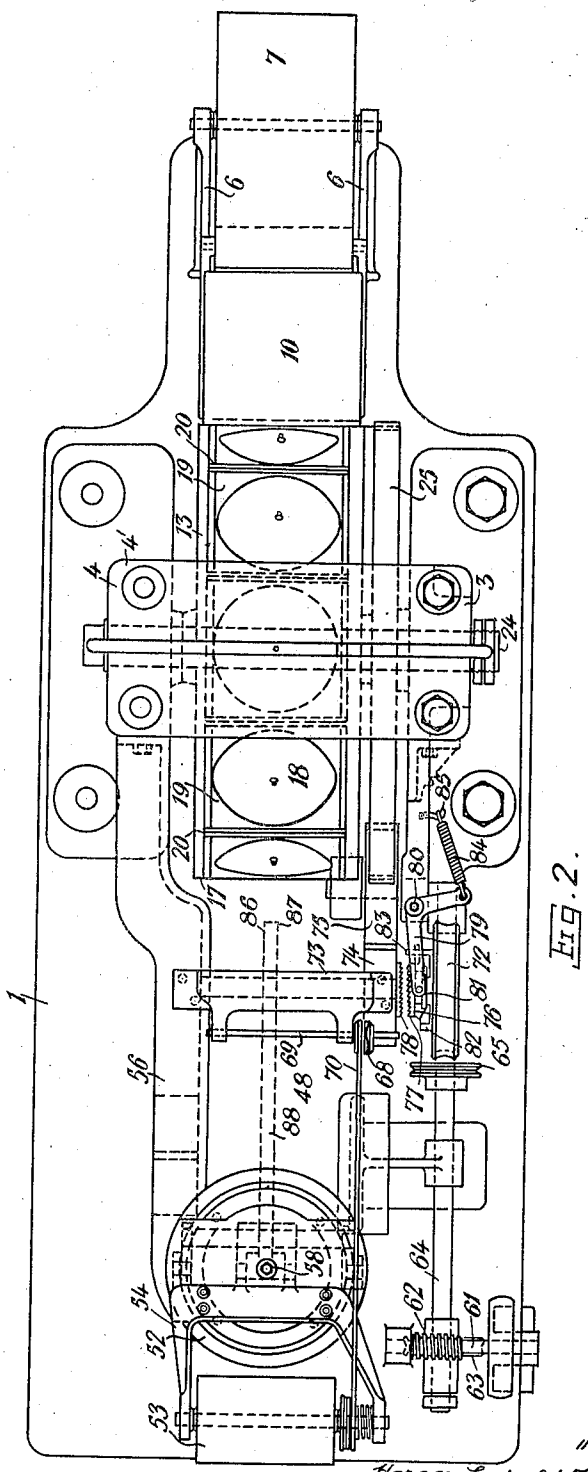


FIG. 2.

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APPARATUS FOR THE PRODUCTION OF DISK RECORDS FOR TALKING MACHINES

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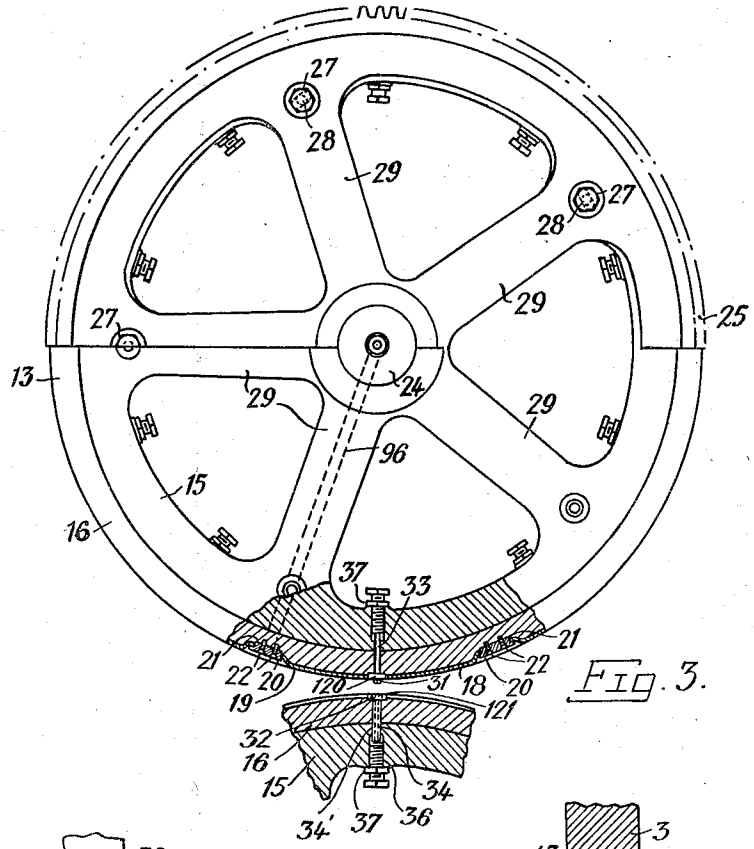



FIG. 3.

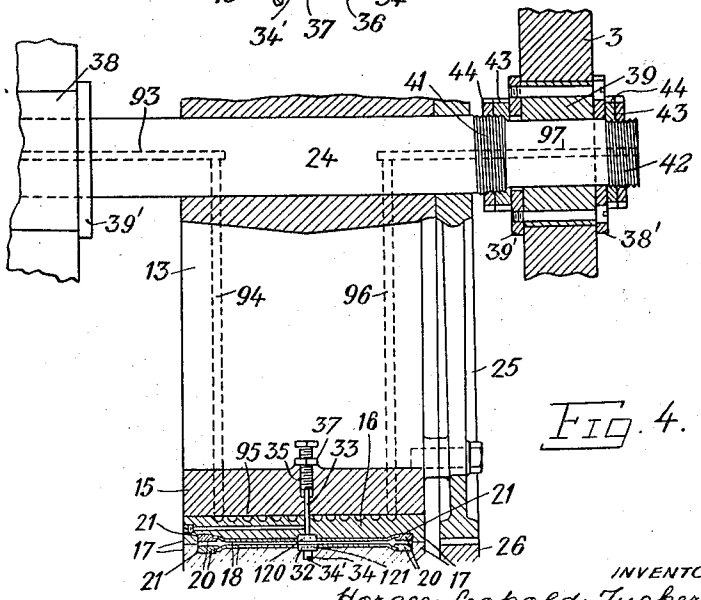



FIG. 4.

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APPARATUS FOR THE PRODUCTION OF DISK RECORDS FOR TALKING MACHINES

Filed April 27, 1929 5 Sheets-Sheet 4

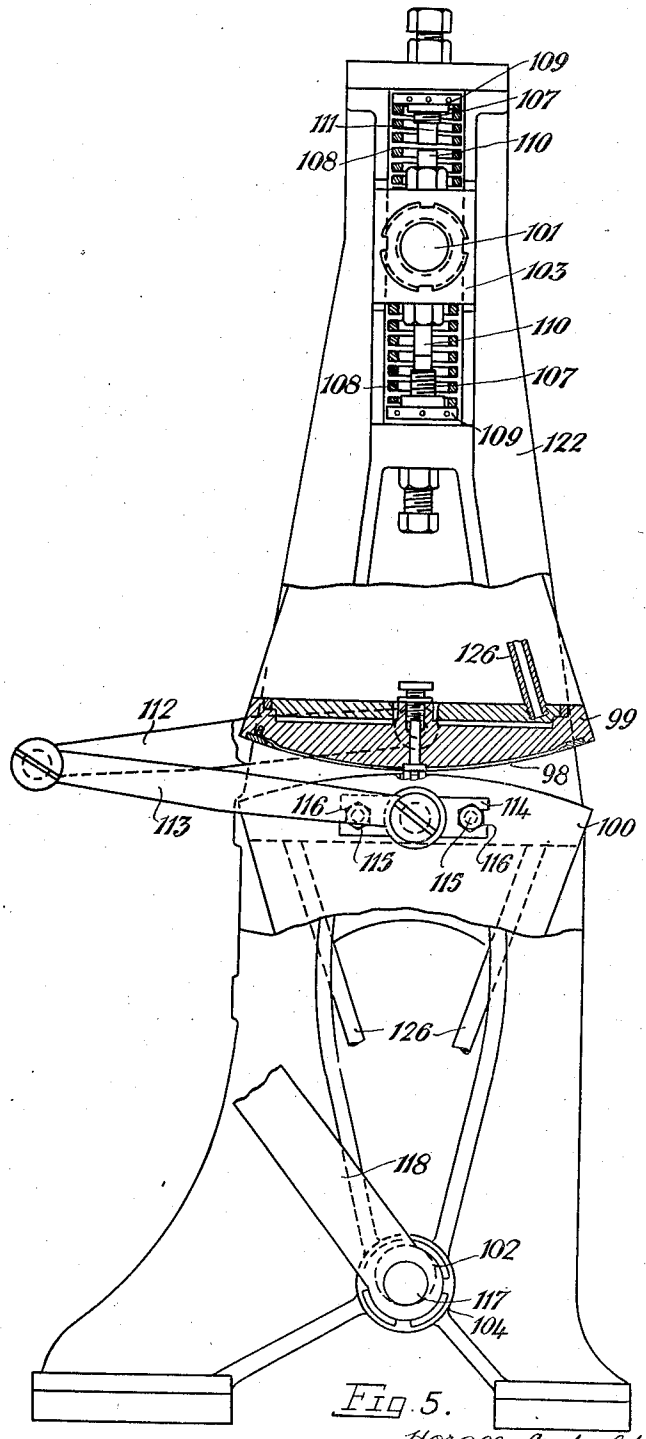



Fig. 5.

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APPARATUS FOR THE PRODUCTION OF DISK RECORDS FOR TALKING MACHINES

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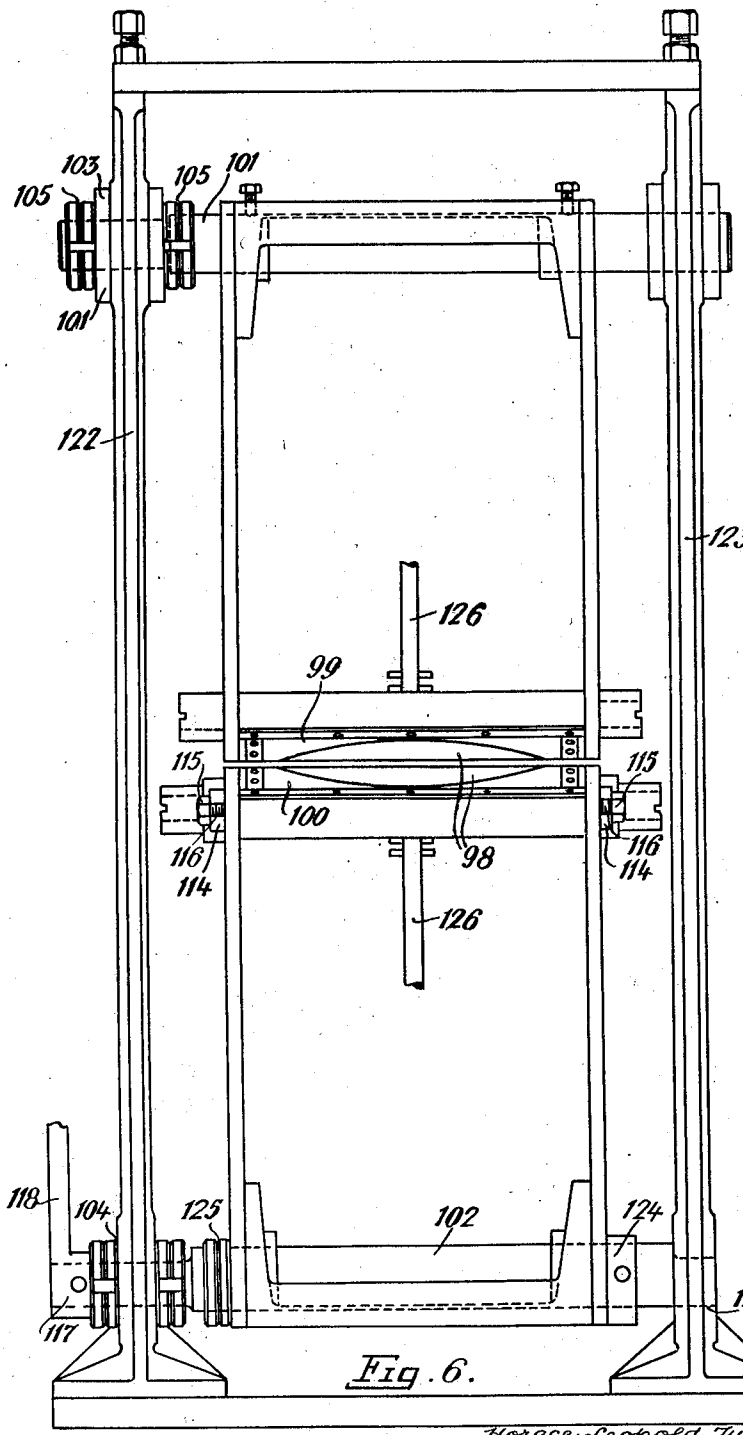



Fig. 6.

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Patented Apr. 2, 1935 1,996,057

# UNITED STATES PATENT OFFICE

1,996,057

## APPARATUS FOR THE PRODUCTION OF DISK RECORDS FOR TALKING MACHINES

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Application April 27, 1929, Serial No. 358,703
In Great Britain May 14, 1928

6 Claims. (Cl. 18—5.3)

This invention relates to a process and apparatus for the production of disk records for talking machines.

In the production of disk records, it has hitherto been the practice to press a sheet or a mass of record material between flat mould plates secured to the platens of a press, the pressure being applied over the whole surface of the record simultaneously.

According to the present invention, disk records are made by pressing a blank of record material between a curved surface and another surface so co-operating with the first that the pressure is applied to the blank over a line running across the blank so that comparatively little power is required to effect the impression.

The blank record material may be of strip form, the records being formed by passing the strip between revolving cylinders, one or both of which carry on their surfaces matrices for impressing the sound lines constituting the sound records on the strip.

The impressed records may be cut from the strip by passing the latter, after impressing, through a punching die, which serves to punch the impressed disks from the strip.

Instead of employing impressing surfaces on a pair of co-operating cylinders, the record blank or strip may be impressed between one curved and one flat surface, the former rolling on the latter, with the blank in between, during movement which may be imparted to either one or both of the impressing surfaces.

It is to be understood that curved surfaces forming other than arcs of circles may be employed.

The invention is illustrated, by way of example, in the accompanying drawings in which

Fig. 1 is a view in elevation of a complete apparatus for producing records in accordance with the invention.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 illustrates the construction of the cylinders and the method of mounting matrices thereon, the two cylinders being shown spaced apart by a distance greater than the working distance.

Fig. 4 illustrates parts of two co-operating cylinders in section and the means for effecting axial adjustment of one cylinder.

Fig. 5 illustrates an alternative form of apparatus according to the invention in side elevation and partly in section.

Fig. 6 is an end elevation of the apparatus shown in Fig. 5.

Referring to Figs. 1 and 2, upon a base plate 1 are mounted supporting columns 2, 3, 4 and 5, the columns 3 and 4 being coupled together at their upper ends by a plate 4'. From the column 2 extends a pair of brackets 6 which support the bearings for a roller 7 on which is rolled a strip 8 of an impressible material, such as cellulose acetate, of convenient thickness. A strip of cellulose acetate of from 15/1000 to 25/1000 inch in thickness has been found suitable, although it will be understood that other thicknesses and other materials may be employed. The strip 8 is led from the roller 7 over a guide roller 9, also mounted in bearings on the column 2, and between upper and lower heating plates 10, 11 carried on the pillar 2 and heated in any convenient manner, as by the circulation of steam through passages (not shown) provided in the bodies of the heating plates 10, 11.

The plates 10, 11 are spaced apart by spacing members 12 to permit free passage of the strip 8 between them. From the heating plates, the strip 8 passes between a pair of impressing rollers 13, 14, and during its passage between these rollers, it is impressed to form the records.

The impressing rollers 13, 14 (Figs. 3 and 4) which are of heavy construction and large diameter, being for example 6 ft. in diameter, are each built up of a central part 15 and an outer jacket 16, preferably shrunk onto the part 15. The jacket 16 is provided on its edges with radially extending flanges or rims 17 and in the space between these flanges are mounted the matrices 18 carrying the sound records to be impressed in the strip 8. The matrices 18 are formed upon rectangular backing plates 19 (Fig. 2) which are bent in one direction to conform to the curve of the outer surface of jacket 16 and they are secured in position on the outer surface of the jacket 16 by means of flanged clamping strips 20 which seat in recesses 21 in the surface of the jacket 16 and the flanges of which overlie the downwardly bent edges of the backing plate 19, as shown in Fig. 4. A strip 20 is provided for each edge of the backing plate 19; that is to say, two strips for each matrix lie transversely of the surface of the jacket 16 and two lie circumferentially. The strips are held in place by screws 22 Fig. 3.

The matrices 18 are provided with central apertures corresponding in position to the central apertures to be formed in the records, and in apertures 33 in the jacket 16 of the upper roller, for example, (Fig. 3) are located pins 31, the ends of which project through the holes in the matrices 18. In the pressing position, as shown

in Fig. 4, the pin 31 passes through the strip 8 to form the aperture in the impressed record. A corresponding aperture or die 32 is provided in the jacket 16 of the lower roller into which the end of pin 31 projects when in the position shown in Fig. 4.

The centre pin 31 in the upper roller may be slidably adjustable in the aperture 33 in the jacket 16, and the die 32 in the lower roller may be formed by the end of a sleeve 34 fixed in an aperture 34' in the lower jacket 16, the ends of the sleeves 33 and 34 carrying flanges 120 and 121 which seat in recesses in the surface of the jacket 16 but project slightly from the surface of the jackets to form locating members for the matrices by engagement in the central apertures in the latter.

The pin 31 and the die 32 are adjustable longitudinally in the apertures 33 and 34' in the jacket 16 by means of screws 35 and 36 upon which locking nuts 37 are provided as shown in Fig. 4.

The rollers 13 and 14 are mounted rigidly upon axial shafts 23 and 24 mounted for rotation in bearings in the pillars 3 and 4 on the base plate 1.

At the ends of the rollers are provided gear wheels 25, 26 similar to each other and these gear wheels are connected rigidly with the rollers 13, 14 and mesh with each other so that the rollers 13, 14 are constrained to rotate together with the same angular velocity. The connection between the gear wheels 25, 26 and the rollers is effected by means of bolts 27 which pass through arcuate slots 28 in the gear wheels and into apertures in the spokes 29 of the rollers, the arcuate slots 28 being provided to permit small adjustments of the rollers relatively to the gears in a circumferential direction to be effected.

The bearings for the lower shaft 23 in the pillars 3, 4 may be fixed, but the bearings for the upper shaft 24 are arranged to permit the position of the upper roller 13 to be adjusted both laterally between the pillars 3 and 4 and longitudinally of the pillars, so that the flanges 17 on the upper and lower rollers may be brought into satisfactory register and contact as shown in Fig. 4.

To permit lateral adjustment, one end of the shaft 24 of the upper roller is arranged to move freely longitudinally in a bearing block 38 at one end. The other end of the shaft 24 is reduced and the reduced end rotates in a bearing block 39.

The bearing blocks 38 and 39 are mounted in slots 40 in the columns 3 and 4, being bolted to guide plates 38', 39' which engage the outer surfaces of the columns, as shown in Fig. 4, to prevent lateral movements of the bearing blocks 38 and 39. The end of the shaft 24 is screw threaded externally at the two points indicated at 41 and 42 and adjusting nuts 43, 44 are employed to engage these screw threads to adjust the position of the shaft 24 and consequently of the roller 13 laterally with regard to the bearing blocks 38 and 39 and between the columns 3 and 4.

The bearing blocks 38 and 39 are movable vertically with the guide plates 38', 39', the blocks 38, 39 sliding in the slots 40 in the columns 3, 4, by means of adjusting screws 45, 46 arranged in apertures in the columns, the ends of which screws engage in recesses in the ends of the bearing blocks 38, 39. Lock nuts 49, are provided to retain the screws 45, 46 in the adjusted position.

The position of the upper roller is adjusted so that perfect register between the roller flanges 17 is obtained, in which case the matrices opposite one another in the pressing position are spaced apart a required distance. It is found that satisfactory results are obtained if the space between the opposite matrices, i. e. between the lower or smooth surfaces and not the sound line ridges thereon, is about the same as the thickness of the strip 8.

The centres of the matrices are brought into register by suitably meshing the gears 25 and 26, and making a final adjustment by means of the bolts 27 in the slots 28 referred to above.

The strip 8 is drawn from the roller 7 and between the heating plates 10, 11 as the pressing rollers 13, 14 rotate to impress the strip, and, after being impressed, the strip is moved over a support 48 carried on posts, 50, 51 on the frame of the machine and through a punching die 52 where the impressed portions are punched out from the strip. The scrap is wound upon a driven roller 53 rotating in bearings carried by arms 54 arranged above and beyond the die 52 (see Fig. 1).

The punching die 52 comprises a body portion 55 carried on a frame 56 supported on the columns 3, 4 and 5 and the body portion 55 supports an upper fixed die 57 furnished with a central locating pin 58 which engages in the central apertures in the impressed portions of the strip 8 as the latter is fed beneath said fixed die.

The fixed upper die 57 co-operates with a hollow lower die 59 mounted to reciprocate vertically in a guide aperture in the body portion 55, and the record disks are cut from the strip 8 between the edge of the lower die 59 and the upper die 57 as die 59 is raised.

The aperture in die 59 extends wholly through the die and the punched out disk records pass through this aperture and are received upon a collecting tray 60. It will be clear that the strip 8 must remain stationary while an impressed disk is being punched from it and the rotation of the impressing rollers 13, 14 which feed the strip is therefore caused to take place intermittently.

In the construction of apparatus illustrated in Figs. 1 and 2, the drive of the impressing rollers 13, 14, the hollow die 59 and scrap collecting roller 53 are derived from a single source.

The driving means comprises a driving shaft 61 driven from any convenient source of power and carrying a worm 62 which engages and drives a worm wheel 63 fast on a shaft 64 mounted to rotate in bearings on the base plate 1. The shaft 64 carries and rotates a belt pulley 65 and drive is transmitted from said pulley 65 to the roller 53 by way of belt 66, pulleys on a shaft 67, belt 68, pulleys on a shaft 69 and a belt 70 which runs over a pulley coupled to the shaft of roller 53. Shaft 64 also carries a worm 71 which meshes with and drives a worm wheel 72 on a transverse shaft 73 which is itself mounted to rotate in bearings in the frame of the machine.

On the shaft 73 is mounted a gear wheel 74 which is freely rotatable thereon and this gear wheel 74 is adapted to be coupled to the shaft 73 to drive the rollers 13, 14 through an intermediate gear wheel 75.

The means for coupling the gear wheel 74 to the shaft 73 comprises a sliding clutch member 76 mounted for rotation with and longitudinal movement on the shaft 73 and carrying teeth 77 which are adapted to engage teeth 78 on the gear wheel 74 when the clutch is put in.

The clutch is put in and out, to couple the gear 74 intermittently to the shaft 73, by means of a bell crank lever 79 mounted to move about a fixed pivot 80 on the frame of the machine, one arm of the lever 79 carrying a pin 81 which engages in a groove in the member 76 to move said member

longitudinally of the shaft 73 as the lever 79 is rocked. Rocking of the lever 79 is effected automatically, to put in the clutch, by means of a face cam 82 which is rigid with the worm wheel 72 and which engages a roller 83 on the lever 79 to rock said lever against a spring 84 connected between one arm of the lever 79 and a pin 85 on the frame of the machine. This spring 84 serves to effect return movements of lever 79 to put out the clutch when permitted by the cam 82.

There is also mounted rigidly, at a point in the region of the centre of shaft 73, an eccentric 86 which co-operates with a strap 87 and a rod 88 connected therewith to operate a toggle joint comprising levers 89 and 90, pivoted together to the end of rod 88 and respectively to a pivot 91 on the base plate 1 and the lower end of a rod 92. The latter is yoke shaped at its upper end and is secured to the two sides of the lower movable die 59, whereby the die 59 is raised and lowered.

It will be understood that die 59 moves continuously while the rollers 13, 14 rotate intermittently and the timing is such that the rollers 13, 14 come to a standstill when the die 59 approaches the raised position where cutting takes place.

The impressing rollers 13, 14 may be heated to maintain the strip in a suitable state for receiving the impressions, and this is effected, in the case illustrated, by passing steam through suitable passages in the rollers.

The steam is introduced through passage 93 arranged axially of the shaft 24 and is led from passage 93, through a radial connecting passage 94 formed in one of the spokes 29 of the roller, to one of a series of interconnected circumferential grooves 95 formed in the inner surface of the jacket 16. The steam, after passing through the grooves 95 and heating the jacket, is led off by way of a second radial passage 96 to an outlet passage 97, also arranged axially of the shaft 24. It will, of course, be understood that steam passages may be provided in both impressing rollers.

In the construction shown in Figs. 5 and 6, the impressing matrices 98 are carried upon the cylindrical surfaces of a pair of sector-shaped members 99 and 100 pivoted respectively, to rock about axes formed by shafts 101 and 102 carried in bearings 103 and 104 in columns 122 and 123.

One matrix 98 may be carried on each sector or, if a single sided record is to be produced, a matrix is provided on one sector only, the other sector carrying a plain surface. The matrices are secured to the sectors in the same manner as is described with reference to Figs. 1 to 4, and similar means to that already described are employed to form the central hole in the impressed record.

The sector 99 is mounted rigidly on the shaft 101 which is adapted for lateral adjustment between the columns 122 and 123 by means of the nuts 105 as previously described, while the blocks forming the upper bearings 103 are arranged for adjustment vertically as before, according to the thickness of the record to be produced, by means of the adjusting screws 107 which engage the ends of pins 110 on the bearing blocks 103 and serve to raise or lower the blocks 103 in guide slots in the columns. Means may be provided to vary the pressure of the sectors upon the record material, and to this end, strong springs 108 are provided between the upper and lower surfaces of the bearing blocks 103 and nuts 109 which are movable on the screws 107 to permit the compression of the springs 108 to be varied.

In order to afford the necessary small degree of freedom of movement to the shaft 101 to permit the pressure regulating screws to operate, the upper screw 107 is fixed in a position such that its end is spaced from the pin 110, as shown at 111.

On each sector is pivotally mounted a pair of links 112 and 113 (Fig. 5), one at each side, and the ends of these links away from the sectors are connected to a slide (not shown) so that when the slide is moved the sectors 99 and 100 are oscillated in unison about their axes.

The links 113 are connected to the lower sector 100 through plates 114 which carry the pivots for the links 113 and are connected to the sector 100 by bolts 115 which pass through elongated slots 116 in the plates 114, so that circumferential adjustment of the lower sector 100 with regard to sector 99 is permitted.

The lower sector 100 is mounted to rotate freely on the shaft 102, but in such a manner as to be held against movements longitudinally thereof, and a fixed collar 124 and nuts 125 are provided on the ends of the shaft to maintain the sector 100 in position. The shaft 102 is provided with reduced ends 117 arranged eccentrically of the shaft 102 and these ends rotate in bearings in the columns 122, 123. One end of the shaft 102 projects beyond the column 122 and on this projecting end is rigidly fixed a hand lever 118 whereby the shaft 102 can be rotated eccentrically in its bearings. By this means, the sector 100 can be raised and lowered towards and away from sector 99.

In use, movement commences with the slide, links 112 and 113 and the sectors 99 and 100 in a position to the right of that shown in Fig. 5, and the strip or blank of record material is fed between the adjacent edges of the sectors. Thereupon, the slide and links 112, 113 are moved to the left in that figure and the impressing of the strip and the formation of the central hole is effected. On completion of this movement, the hand lever 118 is moved to rotate shaft 102 eccentrically in its bearings whereby the sector 100 is lowered away from sector 99. The parts can thereupon be returned to the initial position without the strip being impressed between the sectors. The hand lever 118 is again operated to raise the sector 100 and the next impressing operation is performed.

Means for heating the impressing surfaces may be provided, as before, in the form of steam passages 126.

While in the embodiments of the invention described above the impressing of the blank or strip is effected by two co-operating surfaces both of which are curved, it will be understood that the invention may also be carried out by means of a curved surface co-operating with a plane or flat surface, the former being caused to roll upon the latter with the record material in between by moving either one or both of the members carrying the impressing surfaces. Furthermore, curved surfaces of a shape other than that of an arc of a circle may be employed.

The usual labels provided on disk records may be applied, after the pressing operation, in a separate operation, or during the blanking operation, in which the records are cut out from the sheet. In some cases, the title and other lettering that is to be applied to a disk may be embossed thereon during the pressing operation, the centre of the matrix being provided with suitable means for effecting this.

I claim:

1. Apparatus of the class described comprising a pair of pivoted sector-shaped members having cylindrical surfaces, record matrices secured to said cylindrical surfaces, and means for oscillating said members about their pivots and for causing a strip of record material to be fed between said surfaces.

2. Apparatus of the class described comprising a pair of pivoted sector-shaped members having cylindrical surfaces, record matrices secured to said cylindrical surfaces, means for moving one of said members bodily away from the other member, and means for oscillating said members about their pivots and for causing a strip of record material to be fed between said surfaces.

3. Apparatus of the class described comprising a pair of sectors having cylindrical surfaces, record matrices secured to said surfaces, shafts on which said sectors are pivoted, one of said shafts being mounted in eccentric bearings, means for oscillating said sectors about their pivots and for causing a strip of record material to be fed between said surfaces, and means for rotating said one shaft in its eccentric bearings.

4. Apparatus of the class described comprising a pair of rotatable members having cylindrical surfaces, cooperative record matrices secured to said surfaces, record centering means associated with said matrices, and means for rotating said members and simultaneously causing a strip of record material to be fed between said surfaces.

5. Apparatus of the class described comprising a pair of rotatable members having cylindrical surfaces, record matrices secured to said surfaces, record centering pins passing through the matrices in one of said members, means associated with the matrices on said second member for cooperatively receiving said record centering pins, and means for rotating said members and simultaneously causing a strip of record material to be fed between said surfaces.

6. Apparatus of the class described comprising a pair of pivoted sector-shaped members having cooperating cylindrical surfaces and being movable relatively to each other, a record matrix on the surface of one of said members, a matrix cooperating member on the surface of the other of said members, and means whereby one of said members may be adjusted relatively to the other to bring said matrix and matrix cooperating member into registration.

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