June 24, 1930. M. HOFFMAN 1,768,200

SOUND REPRODUCING MACHINE

Filed Oct. 11, 1927 3 Sheets-Sheet 1

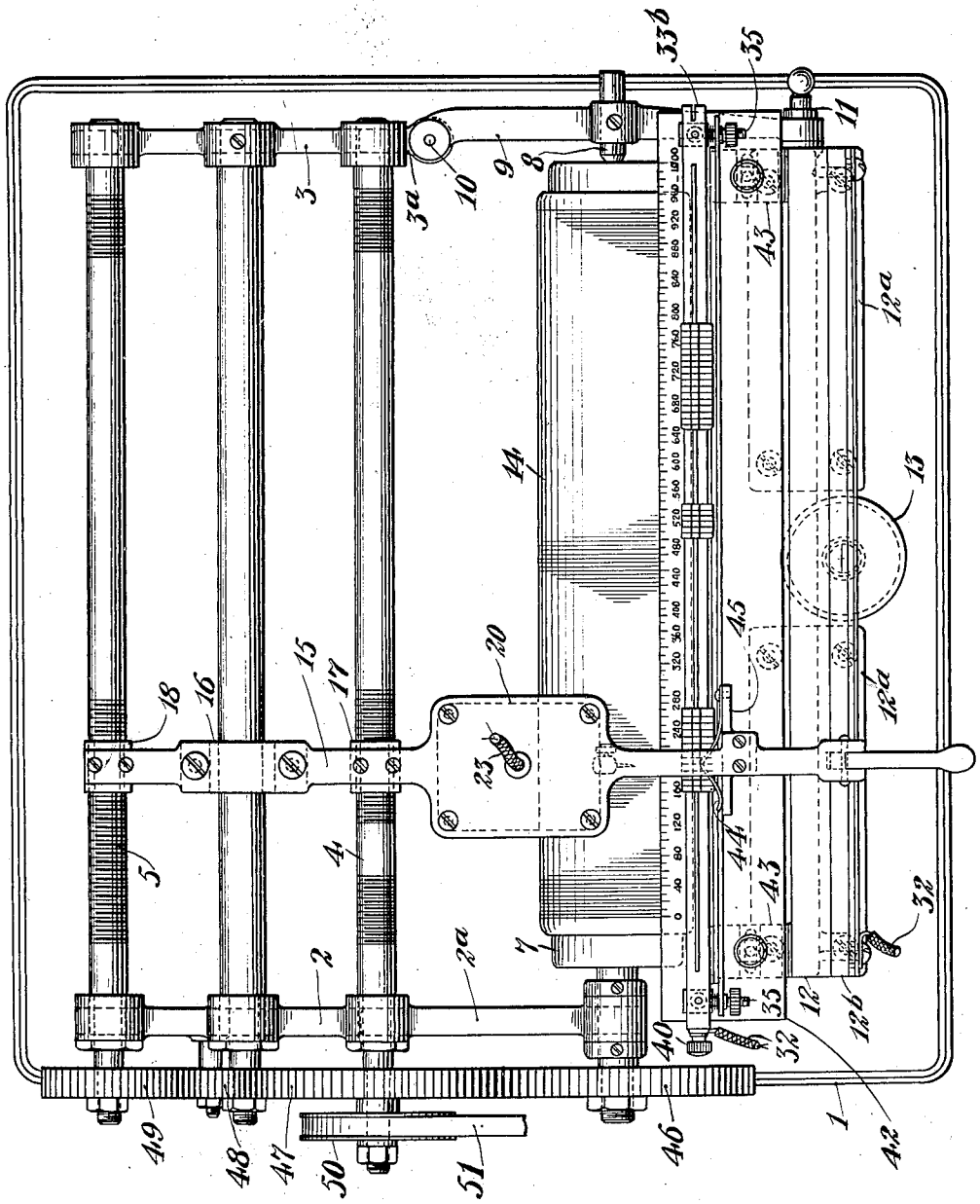


Fig-1

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Fig. 5

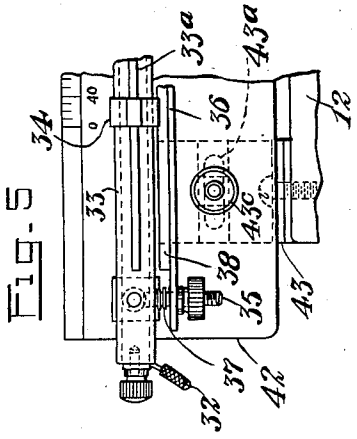


Fig. 2

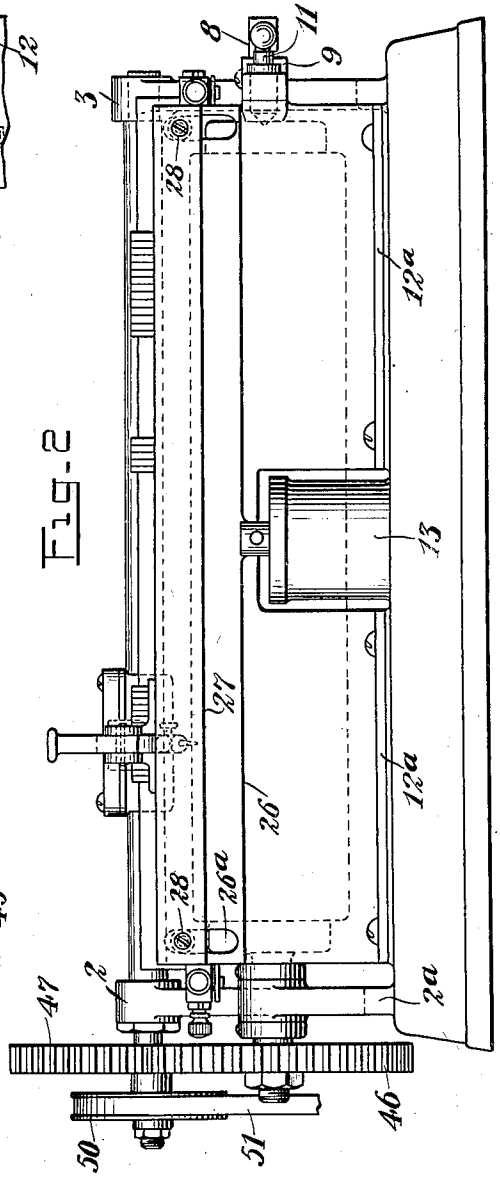
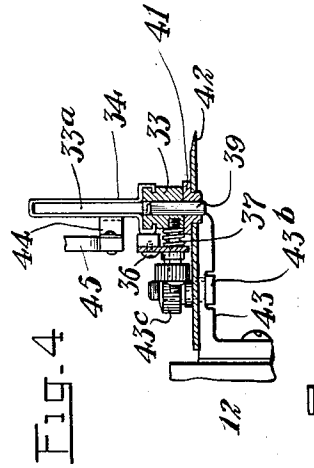


Fig. 4



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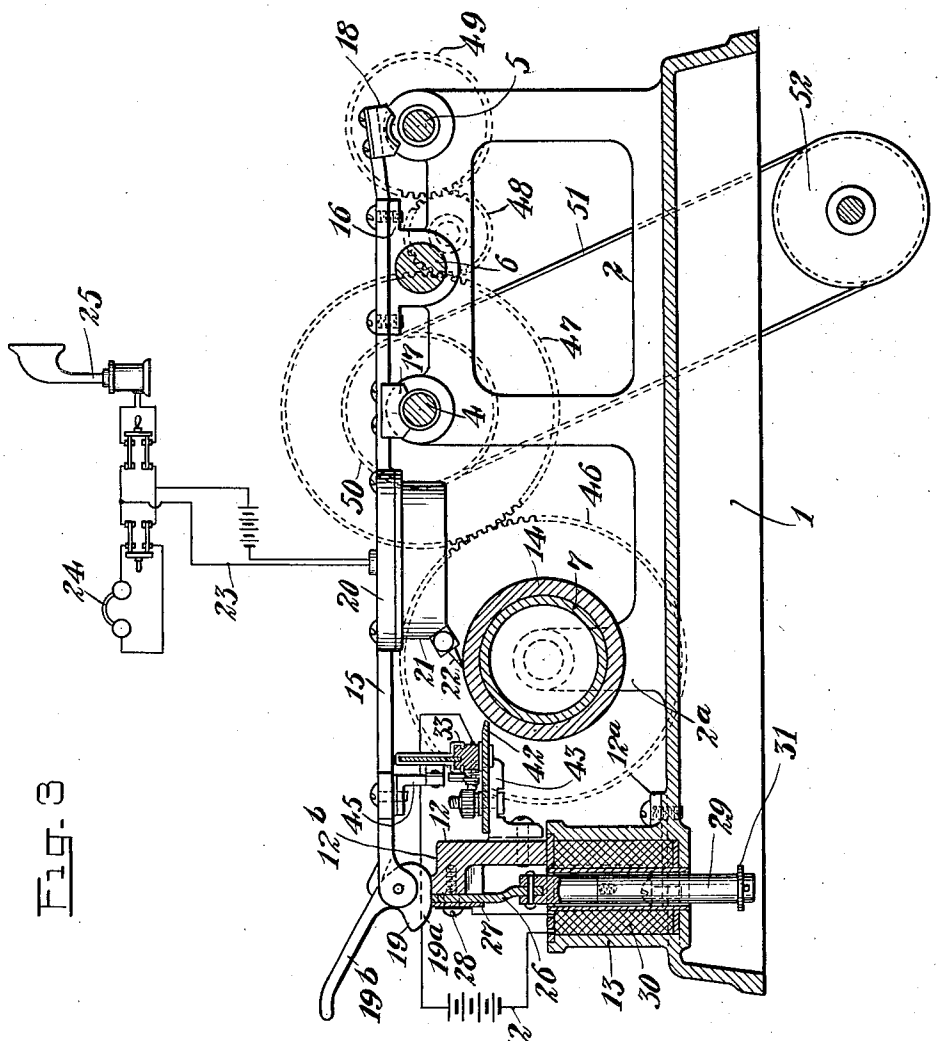


Fig. 3

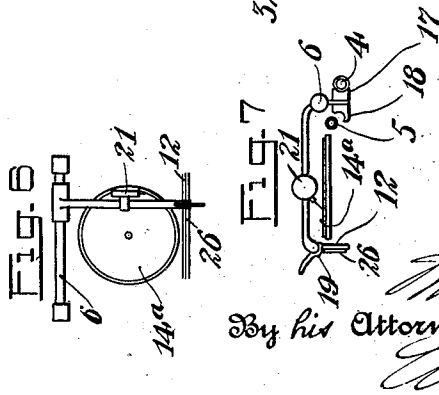


Fig. 7

Fig. 6

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Patented June 24, 1930 1,768,200

UNITED STATES PATENT OFFICE

MICHAEL HOFFMAN, OF BROOKLYN, NEW YORK

SOUND-REPRODUCING MACHINE

Application filed October 11, 1927. Serial No. 225,407.

My invention relates to the type of sound reproducing machine wherein the sound reproducing device or vibration transmitter is carried by an arm which is moved relatively to the sound record by a positive feeding device, such as a screw or rack and pinion.

The main object of my invention is to provide such type of sound reproducing machine with means for automatically discontinuing and resuming sound reproduction at predetermined points without discontinuing or interrupting the forward feed of the sound reproducer, whereby predetermined parts of a sound record may be automatically eliminated from reproduction while the machine continues in operation. In the preferred form of my invention I accomplish this object by raising the traveler arm which carries the reproducer for the purpose of disengaging the reproducer stylus from the sound record without, however, discontinuing or interrupting the forward feed of the reproducer arm; and further I prefer to feed the reproducer arm at such times when sound reproduction is temporarily eliminated, at a higher rate of speed, and for this purpose I prefer to employ an auxiliary feed screw and means whereby when the reproducer arm is raised to discontinue sound reproduction, the feed connection is simultaneously transferred from the normal feed screw to the auxiliary feed screw, and vice versa, when sound reproduction is to be resumed.

A sound reproducing machine embodying my invention may be employed for a variety of uses, but primarily my improved machine is designed for use in conjunction with motion picture projecting machines or other types of picture projectors to facilitate the maintenance of synchronism between the picture projection and sound reproduction; the sound record for such purpose consisting of vocal, instrumental or other sounds arranged for completing the acoustical and optical illusion presented by a picture on a screen.

In carrying my invention into effect I preferably employ the type of phonograph which is designed for reproducing sounds from cylindrical records, and having a feed screw and slide-rest for the traveler arm which carries the sound or vibration reproducer. To this type of phonograph I add a secondary feed screw of much greater pitch than the normal feed screw, and a movable auxiliary slide-rest which is arranged to effect in one movement the raising of the reproducer arm for the purpose of disengaging the reproducer stylus from the sound record and the traveler arm from the normal feed screw, and the engagement of the arm with the high pitch feed screw. The movement of this auxiliary slide-rest is preferably effected by means of an electro-magnetic device, such as a solenoid. In addition I provide means, capable of manual adjustment, for automatically effecting the shift from the normal to the secondary feed screw at predetermined points, and such means preferably consists of a bar carrying adjustable contacts with which a contact blade or brush mounted on a movable arm makes contact to energize the electro-magnetic device for operating the movable auxiliary slide-rest, the circuit to which is made and broken as the contact blade is moved along the contact bar by the movable arm in unison with the reproducer stylus. In practice I prefer to mount this circuit controlling device on the phonograph and to secure the moving contact blade on the reproducer arm.

My invention is illustrated in the accompanying drawings, in which Figure 1 is a plan view of the machine; Figure 2 a front elevation; Figure 3 a central vertical section through Figure 1, with the addition of a diagrammatic illustration of the circuit connections for the electro-magnetic shifting device and for the sound reproducer or loud speaker co-operating with the phonograph reproducer; Figure 4 a detail view, partly in elevation and partly in section, of the automatic controlling device; Figure 5 a partial plan view of the same device; and Figures 6 and 7 are schematic plan and end views of a modification employing a disc sound record.

Referring to the drawings, and more par-

ticularly to Figure 1, the base of the machine is indicated at 1, and from which two bearing plates 2 and 3 project vertically, the former having a forward extension 2^a, and the latter a lug 3^a. In these plates are formed the bearings for the normal feed screw 4 and the high pitch feed screw 5, and also the centers for the reproducer guide-rod 6. In the extension 2^a is formed a bearing for the spindle of record cylinder 7, which at the opposite end is provided with a centering hole to receive a centering pin 8 which is adjustably mounted on end-gate 9. This gate is hinged at 10 to the lug 3^a, and at the underside of the forward end it is slotted to receive the locking bolt 11. The reproducer slide-rest is shown at 12, and is in the form of a vertical plate having rectangular extensions 12^a by means of which it is bolted to base 1, and having also a forwardly projecting flange 12^b at its upper edge, and which flange has a vertical bead planed to a straight-edge to form the slide for the presser-foot of the reproducer arm. At its mid-section plate 12 has a large opening (see Figure 2) which permits the plate to straddle a cylinder 13 projecting from base 1. The locking bolt 11 for the end-gate is hinged at the right-hand end of plate 12 so as to swing downward out of the slotted end of gate 9 to permit the gate to be opened for placing a cylindrical sound record 14 on cylinder 7 or the removal of a record therefrom.

The reproducer arm is shown at 15, Figures 1 and 3, and to the underside of which is bolted a slide collar 16 adapted to slide on rod 6. In front of the slide collar and in alignment with feed screw 4 is bolted a nut-section 17, and at the rear end is bolted a nut-section 18 adapted to engage with feed screw 5. The rear end of the reproducer arm 15 is bent upward sufficiently to permit nut-section 18 to clear feed screw 5 while the arm is fed at the normal operating speed, and also while the arm is held in an intermediate or inoperative position, as will be presently explained. The forward end of the reproducer arm is slotted to receive a pivoted presser-foot 19 (see Figure 3) having a flat face adapted to slide on the straight-edge of rest 12. As shown in Figure 3, the presser-foot, reproducer arm, and nut section 17 are in the position for normal operation with the reproducer stylus in contact with the record. The face of the presser-foot is developed into a cam face at 19^a so that when the operating lever 19^b is pressed downward, the reproducer arm will be caused to rock on the guide-rod and disengage the feed nut 17 from feed screw 4, but not far enough to cause nut section 18 to engage screw 5, and at the same time disengaging the reproducer stylus from the record, thus placing the reproducer arm in its intermediate or inoperative position. In this position of the reproducer arm a sound record may be placed in position or removed from the cylinder 7. If desired cam face 19^a may be extended so that further depression of lever 19^b will rock the arm 15 sufficiently to cause nut section 18 to engage screw 5, thus providing manual control for the high speed non-sound-reproducing feed of the reproducer arm. At a section of the reproducer arm slightly to the rear of the axis of the record cylinder is an enlargement 20 to which is secured the sound or vibration reproducer 21 having a stylus 22, see Figure 3. For the purpose of illustration, this reproducer is shown generically as an electrical reproducer of the sound vibrations formed on the record 14, whereby the vibrations imparted to the stylus by the record undulations will be transformed into electrical undulations, which in turn are transmitted over a circuit 23 of any suitable amplifying character to a telephone headset 24, and reproducer or so-called loud speaker 25. It will be understood, however, that my improved sound reproducing machine may be provided with any type of reproducer such as commonly employed in sound reproducing machines wherein a diaphragm is directly operated by a stylus to produce sound.

The automatic shifting means for disengaging the reproducer stylus and normal feed and connecting the reproducer arm with the secondary or high speed feed to eliminate predetermined parts of the sound record from reproduction comprises an auxiliary slide rest, a solenoid for actuating same, a stationary adjustable contact bar and a movable brush or contact blade for controlling the circuit to the solenoid. The auxiliary slide rest 26 is in the form of a plate equal in length to the stationary slide rest 12, and is provided with vertical slots 26^a at its ends which permit vertical sliding movement. Plate 26 is held against the face of flange 12^b of the stationary slide rest by a guard plate 27 and screws 28 which pass through slots 26^a, and which screws are shouldered so as not to bind plate 26. When the auxiliary slide rest is in its lowermost or inactive position the upper edge of the plate is in the same plane with the straight edge of slide 12, see Figure 3. The solenoid for actuating the auxiliary slide rest is shown at 30 and is housed in the cylinder 13 as best seen in Figure 3. The movable core 29 is slotted at its upper end and into this slot projects a lug from the center of the lower edge of plate 26 and is pinned thereto. Core 29 is made in two parts screwed together, as shown in Figure 3, and the upper part which is attached to the plate 26 is made of non-magnetic material. The upward movement of the core when the coil

is energized is limited by a stop 31 which may be adjustable. It will be observed that when the solenoid is energized and the core drawn upward, the auxiliary slide rest 26 will be moved upward, raising the reproducer arm and causing the reproducing stylus 22 and feed nut 17 to be disengaged, and nut 18 to engage feed screw 5 and thereby cause the reproducer arm to be fed forward at a high rate of speed, without, however, reproducing any vibrations from the sound record. This forward feed without sound reproduction will continue so long as the solenoid remains energized. The winding of the solenoid is connected to a circuit 32, one terminal of which is connected to one of the screws 28, or other part of the machine frame, and the other terminal is connected to the contact bar 33 which forms part of the third element of the automatic shifting means. Bar 33, which is preferably square in cross section, extends the full length of the machine, as seen in Figure 1, and is longitudinally slotted on its upper surface to receive a plate of insulating material 33^a which is secured in position in any suitable manner. Near the upper edges of the sides of the bar 33 are cut narrow slots (see Figure 4) adapted to receive the hooked ends of contact clips 34 which straddle the insulating plate 33^a and are adjustable on the bar 33 by sliding them along the bar to any predetermined position. The faces of these clips in practice will be quite narrow, about one-twentieth of an inch in width, and these clips may be set individually or in groups as shown in Figures 1 and 2, to form a contact of any desired length from the minimum width represented by one clip. On the front face of the bar 33, at both ends, are screws 35 provided with thumb-nuts (see Figure 5) and upon these screws a locking plate 36 is loosely mounted against spiral springs 37, and this plate is provided on the inner side with a facing of soft or compressible material 38, such as rubber. The purpose of this plate is to lock the contact clips 34 in position on the bar 33 by tightening the nuts on screws 35 and thereby squeezing the soft facing against the clips. To shift the clips on bar 33, the nuts on screws 35 are screwed back, allowing springs 37 to move plate 36 outward and its facing out of contact with the clips. The clips may now be adjusted to any desired point or into any desired grouping and then locked in position again by tightening screws 35. Bar 33 is also provided with pin-holes at each end which register with pins 39, Figure 4, and at the left hand end is a binding-post 40, Figure 1, to which one terminal of circuit 32 is attached. Pins 39 are rigidly mounted in insulating disks 41 which are rigidly mounted on a gauge plate 42. Bar 33 with its contact clips 34 and locking bar 36 is removable and interchangeable with contact bars having the contact clips arranged for any given sound record as will be hereinafter more fully explained. Gauge plate 42 is provided with a scale of any desired graduations, as for instance, a scale indicating the number of record threads or grooves on the sound record 14. This gauge is adjustably carried on two brackets 43 which are bolted to the inner side of slide plate 12. Each bracket 43 is provided with a slot 43^a, see Figure 5, through which project screws having square heads 43^b seated in squared recesses in the underside of the brackets 43, and these screws pass upward through holes in the gauge plate and are provided with thumb-nuts 43^c by means of which the gauge plate is clamped to the brackets; the slots in the brackets permitting slight longitudinal adjustment of the gauge relative to the record cylinder. It is well known that in sound reproducing machines operating with cylindrical records, that the records vary slightly in internal diameter and that therefore the longitudinal position of the record on cylinder 7 will vary slightly. The adjustability of gauge 42 is to meet this variation and permit the zero graduation to be adjusted to the first thread or groove of the record. As indicated in Figure 1, and assuming the record grooves on cylinder 14 run 100 to the inch, each graduation on the scale will represent 10 threads, and if it be desired, for instance, to eliminate from reproduction, the sound vibrations recorded in threads indicated on the scale as from 160 to 270, 490 to 550, and 650 to 790, three groups of contact clips 34 will be arranged on the bar 33 as indicated in Figure 1. When the clips are so arranged and clamped in position by bar 36, the contact bar may be removed and replaced at will for the same record and the same eliminations, and if there is any variation in the position of the record cylinder 14 when replacing it on cylinder 7, all that is necessary to obtain a proper positioning of the contact bar relative to the sound record is to loosen thumb-nuts 43^c and reset the scale so that its zero graduation will register with the first thread on the record and then clamp it in position on the brackets. When the contact bar 33 with its groups of contact clips is now replaced on the scale 42 the registration of the contacts relative to the record will again be as indicated in Figure 1, since the contact clips are clamped in position on the bar and the holes in the underside of the bar 33 registering with pins 39 will place the bar in its proper and original position on the scale plate 42. For the purpose of identifying a record contact bar 33 having contact clips 34 arranged for sound eliminations for a certain record, I will employ identifying

tags which may be attached to the contact bar 33 in any suitable manner, as for instance by the provision of a slot 33[b] at the right hand end of the bar, Figure 1, into which a tag may be inserted and pinned in place, or a hole may be provided for receiving a split ring bearing a tag.

The circuit to the solenoid is completed by a brush or contact blade 44 secured to a bracket 45 which is bolted to the underside of reproducer arm 15 in front of the contact bar 33. This contact brush is shown in the form of an inverted V strip of spring metal with one end secured to the bracket and the other end bearing against the bracket, the point of contact with the insulating plate and contact clips being at the apex of the V. It will be observed in Figures 3 and 4 that the insulating plate 33[a] and clips 34 are relatively high compared to the width of the brush 44. The purpose of this is to insure the brush remaining in contact with plate 33[a] or clips 34 when the reproducer arm is held in elevated position by the movable slide rest.

The phonograph cylinder and feed screws are rotated by a train of gears 46, 47, 48 and 49 which may be driven in any suitable manner, but for the purpose of the present illustration, a flanged pulley 50, belt 51 and flanged pulley 52 are shown. Pulley 52 may be driven from any source of constant speed, such as a spring or electric motor provided with a speed governor as commonly employed in phonographs, or when the machine is intended for use in conjunction with a picture projector and to run in unison therewith, pulley 52 may represent a wheel on a shaft of the picture projector so that the rotation of the record cylinder will start and stop with the picture projection. When the machine is intended for general use other than with picture projection, the base 1 will be properly proportioned and provided with the proper bearings for mounting the motor. These details are omitted from the drawings for simplicity in illustration and for the further reason that the base and motor mounting in practice would vary to meet special requirements or cabinet design and which features have no bearing on the present invention.

In Figures 6 and 7 I have shown a schematic illustration of the application of my invention to a disk type of sound reproducing machine. In these views 4 and 5 indicate the normal and secondary feed screws, respectively, and 17 and 18 the feed nuts carried by the reproducer arm; 6 the guide rod for the reproducer arm; 12 and 26 the fixed and movable slide-rests, respectively, and 19 the cam presser foot for the reproducer arm; 14[a] indicates the disk record carried by the usual rotating table and 21 represents the reproducer. In this type of machine the movable slide-rest 26 would be operated in the same manner as illustrated in Figure 3 in connection with the cylinder type of machine, and a similar contact bar 33 and brush 44 would be employed, but in this case the scale 42 could be dispensed with, and pins 39 for locating and fixing the contact bar would project from the base plate of the machine. These details as well as the driving connection for the spindle of the rotary table are obvious and hence are omitted from the drawings to avoid unnecessary duplication.

From the foregoing description, it will be observed that my improved sound reproducing machine may be employed for the reproduction of sound records arranged for any class of work, and that a record may be reproduced in its entirety or any predetermined sections eliminated from reproduction without injury to the record, and that such elimination is made practically instantaneous by the secondary high speed feed connection for the reproducer arm.

The high speed secondary feed for the reproducer arm may be as rapid as desired within practical limits. For instance, the normal surface speed of the sound record may be arranged for twelve inches per second, which is the normal speed of motion picture film feed, and the high pitch feed screw may have four threads to the inch as compared, for instance, to a normal feed for the reproducer arm equivalent to 100 threads per inch, and the high pitch screw may be driven at, say 240 R. P. M., and the normal feed screw at 60 R. P. M. Under such conditions the normal forward feed of the reproducer arm would be one thread or 1/100 of an inch per second; whereas, the forward high speed feed would be at the rate due to four revolutions of the screw having four threads per inch, or one inch per second, which would be equivalent to 100 record threads. Such rapid non-sound-reproducing feed movement would be practically instantaneous, since the elimination or skipping of that number of record threads would occur in one one-hundredth of the time it would take to reproduce that length of sound record at normal running speed.

My machine is especially useful in reproducing sound records arranged as accompaniments for motion pictures. In such case if the motion picture is complete the record or records bearing the accompaniment may be reproduced entirely, that is without eliminations or skipping, or in case the motion picture film is shortened by the omission of certain parts of scenes for any reason, the corresponding parts of the sound record may be eliminated from reproduction by arranging the contact bar for effecting the automatic non-sound-reproducing feeds of the reproducer arm, whereby the reproducer

will be caused to cease sound reproduction at the desired point and then be fed forward at high speed to the point where sound reproduction is to be resumed. For this class of use, the contact clips on the circuit controlling bar will preferably be arranged so that each sound record elimination will be slightly in excess of its respective picture film deletion, so that the slight picture film feed taking place during the time that the phonograph is operating at the high speed non-sound-reproducing feed will be compensated for and absolute synchronism maintained.

The sound records bearing accompaniments to motion pictures may be prepared for distribution with motion picture reels, and where the picture has been "cut" for any reason, prepared contact bars for effecting the automatic record eliminations may be shipped with the picture reels, and in such case as above pointed out, each bar will be tagged to indicate the subject and reel number of the picture for which it is prepared.

I do not claim herein the combination of the sound reproducing machine, picture projector and automatic controlling means for maintaining or restoring synchronism between sound reproduction and picture projection, since that feature of my invention forms the subject matter of my application for Letters Patent, Serial No. 213,730, filed August 18th, 1927.

What I claim is:

1. In a sound reproducing machine, the combination with the reproducer arm and feed mechanism therefor, of means for automatically discontinuing and resuming sound reproduction at predetermined points while continuing the forward feed of the reproducer arm, and thereby automatically eliminating from reproduction certain parts of a sound record.

2. In a sound reproducing machine, the combination with the reproducer arm and a two speed forward feeding mechanism therefor, of means for automatically changing the feed from one speed to the other at predetermined points and simultaneously eliminating sound reproduction during the high speed feed, and thereby automatically eliminating from reproduction certain parts of a sound record.

3. In a sound reproducing machine, the combination with the reproducer arm, slide-rest and feed mechanism for said arm, of an auxiliary movable slide-rest for the reproducer arm, and means for automatically operating the movable slide-rest to raise or lower the reproducer arm at predetermined points relative to a sound record for discontinuing and resuming sound reproduction, and means for feeding said arm forward between such points, and thereby automatically eliminating from reproduction certain parts of a sound record.

4. In a sound reproducing machine, the combination with the reproducer arm, slide-rest and a two speed feeding mechanism for said arm, of an auxiliary movable slide-rest for the reproducer arm, and means for automatically operating the movable slide-rest to raise or lower the reproducer arm at predetermined points relative to a sound record for discontinuing and resuming sound reproduction and simultaneously changing the forward feeding drive from the normal to the high speed drive, or vice versa, and thereby automatically eliminating from reproduction certain parts of a sound record.

5. In a sound reproducing machine, the combination with the reproducer arm and feed mechanism therefor, of manually adjustable means for automatically discontinuing and resuming sound reproduction at predetermined points while continuing the forward feed of the reproducer arm, and thereby automatically eliminating from reproduction certain parts of a sound record.

6. In a sound reproducing machine, the combination with the reproducer arm and a two speed forward feeding mechanism therefor, of manually adjustable means for automatically changing the feed from one speed to the other at predetermined points and simultaneously eliminating sound reproduction during the high speed feed, and thereby automatically eliminating from reproduction certain parts of a sound record.

7. In a sound reproducing machine, the combination with the reproducer arm, slide rest and a two speed feeding mechanism for said arm, of an auxiliary movable slide rest for the reproducer arm, and manually adjustable means for automatically operating the movable slide rest to raise or lower the reproducer arm at predetermined points relative to a sound record for discontinuing and resuming sound reproduction and simultaneously changing the forward feeding drive from the normal to the high speed drive, or vice versa, and thereby automatically eliminating from reproduction certain parts of a sound record.

8. In a sound reproducing machine, the combination with the reproducer arm and feed mechanism therefor, of electrically controlled means for automatically discontinuing and resuming sound reproduction at predetermined points, and means for feeding the reproducer arm forward while sound reproduction is discontinued, and thereby automatically eliminating from reproduction certain parts of a sound record.

9. In a sound reproducing machine, the combination with the reproducer arm and a two speed forward feeding mechanism therefor, of electrically controlled means for

automatically changing the feed from one speed to the other at predetermined points and simultaneously eliminating sound reproduction during the high speed feed, and thereby automatically eliminating from reproduction certain parts of a sound record.

10. In a sound reproducing machine, the combination with the reproducer arm, slide rest and a two speed feeding mechanism for said arm, of an auxiliary movable slide rest for the reproducer arm, and electrically controlled means for automatically operating the movable slide rest to raise or lower the reproducer arm at predetermined points relative to a sound record for discontinuing and resuming sound reproduction and simultaneously changing the forward feeding drive from the normal to the high speed drive, or vice versa, and thereby automatically eliminating from reproduction certain parts of a sound record.

11. In a sound reproducing machine, the combination with the reproducer arm, slide rest and a two speed forward feeding mechanism for said arm, of an auxiliary movable slide rest for the reproducer arm, electromagnetic means for operating the movable slide rest to raise or lower the reproducer arm and simultaneously change the feeding drive, a stationary contact bar having adjustable contacts and a movable contact member carried by the reproducer arm whereby the circuit to said electro-magnetic means will be automatically closed and opened at predetermined points relative to a sound record, and thereby automatically at predetermined points discontinuing sound reproduction and simultaneously feeding the reproducer forward at higher speed and resuming reproduction at lower speed.

12. In a sound reproducing machine of the character herein described, a removable contact bar having adjustable contacts thereon for controlling the discontinuance and resumption of sound reproduction without stopping the forward feed of the sound reproducer.

13. In a sound reproducing machine of the character herein described, a removable contact bar for controlling the discontinuance and resumption of sound reproduction without stopping the forward feed of the sound reproducer, said bar comprising a metal rod, a plate of insulating material mounted thereon and adjustable contact clips engaging said rod and straddling the insulating plate.

14. In a sound reproducing machine of the character herein described, a contact bar for controlling the discontinuance and resumption of sound reproduction without stopping the forward feed of the sound reproducer, said bar comprising a metal rod, a plate of insulating material mounted thereon, adjustable contact clips engaging said rod and straddling the insulating plate, and a locking device on said bar for securing the contact clips in position on said rod.

15. In a sound reproducing machine of the character herein described, the combination of the removable contact bar for controlling the discontinuance and resumption of sound reproduction without stopping the forward feed of the sound reproducer, adjustable contacts on said bar, an adjustable gauge upon which said bar is removably mounted, said gauge having one or more graduations thereon for determining its adjustment relative to a sound record, and means for locking said gauge in adjusted position.

16. In a sound reproducing machine of the character herein described, the combination of a contact bar, comprising a metal rod, a plate of insulating material mounted thereon, adjustable contact clips engaging said rod and straddling said insulating plate, a pair of holes in said rod adapted to register with a pair of pins, and a locking device on said bar for securing the contact clips in position on said rod, and an adjustable gauge plate having a pair of pins with which the holes in said rod register to fix said rod in position on said plate, said gauge having one or more graduations thereon for determining its adjustment relative to a sound record, and means for locking said gauge in adjusted position.

This specification signed at New York city, in the county and State of New York, this 10th day of October, 1927.

MICHAEL HOFFMAN.