Aug. 8, 1939. S. KONISHI 2,168,529

GRAMOPHONE FOR PLAYING RECORDS OF AN ENDLESS FILM

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Fig. 1

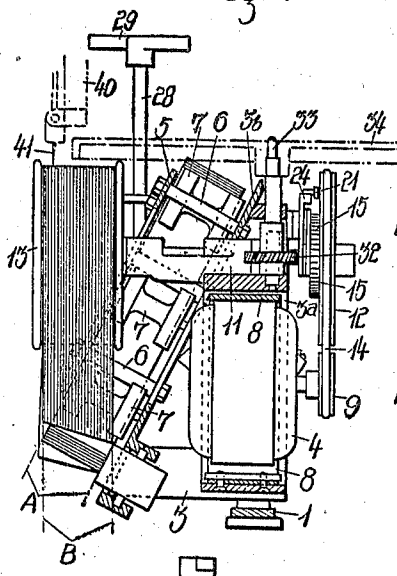

Fig. 2

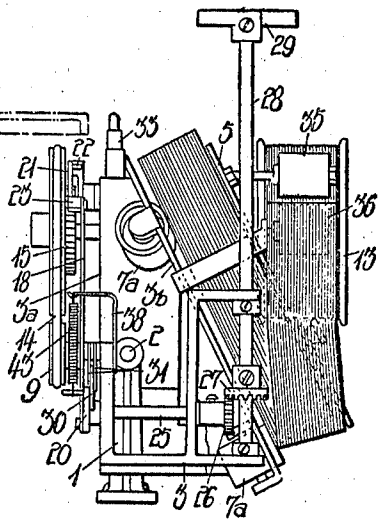

Fig. 4

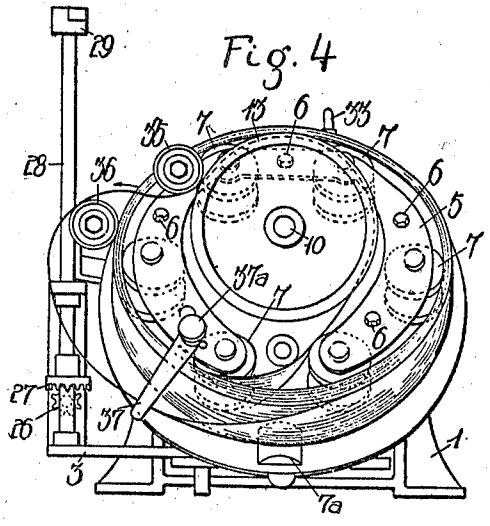

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Fig. 3

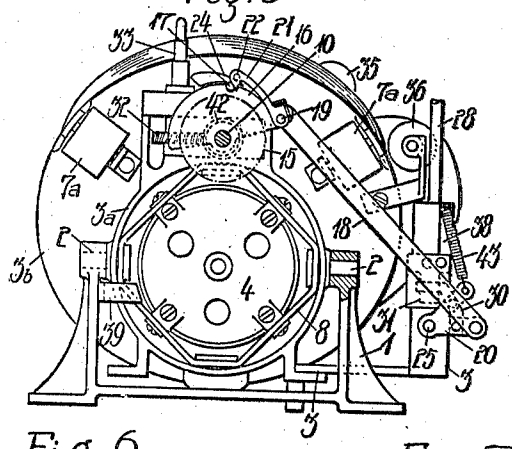


Fig. 6

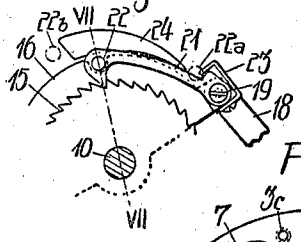


Fig. 7

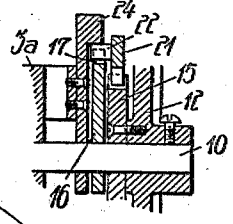
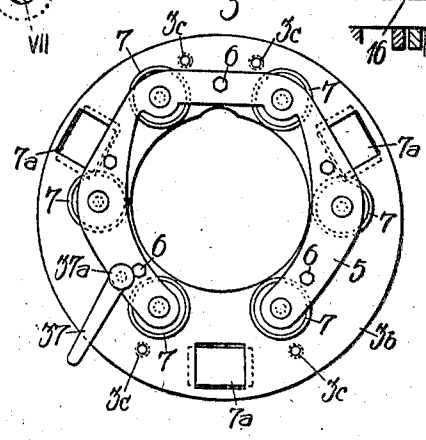


Fig. 5



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UNITED STATES PATENT OFFICE

2,168,529

GRAMOPHONE FOR PLAYING RECORDS OF AN ENDLESS FILM

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Application June 23, 1937, Serial No. 150,006
In Japan May 28, 1934

4 Claims. (Cl. 274—11)

This invention relates to improvements in a gramophone for playing records of an endless-film.

An object of this invention is to obtain a compact mechanism, nevertheless a record can be sent from a reel of the record to a place where a needle of a sound box is located without giving any remarkable twist to the record.

Another object of the invention is to obtain a on the frame, so that any vibration of the motor which is employed in this invention for driving a record.

Another object of this invention is to obtain a means whereby the motor is floatingly supported on the frame, so that any vibration of the motor would not be transmitted to the needle which slides in the sound groove when the gramophone is played.

Another object of this invention is to obtain a means to utilize a machine for playing endless-film records also for playing ordinary disc records so that a single machine can be employed for both types of records.

Further objects will be better understood from the following specification.

In the accompanying drawings,

Figure 1 is a part sectional side elevation of a gramophone according to this invention.

Figure 2 is an elevation of the side opposite to Figure 1.

Figure 3 is an elevation of the gramophone on the motor side, the power transmission pulleys and ropes being removed.

Figure 4 is an elevation of the side opposite to Figure 3.

Figure 5 is a plan of a reel for the record.

Figure 6 is a detailed view of a starting mechanism, and Figure 7 is a sectional view on line 7—7 of Figure 6.

In the drawings, 1 is a bracket to be fixed on the bottom of a cabinet, not shown, and the frame 3 of the machine is rotatably supported on this bracket by means of alined spindles 2. The frame consists of as its main part a cylindrical part 3a and a disc 3b, and the disc is firmly fixed to the cylindrical part and its extensions with set screws 3c.

A C-shaped plate 5 is mounted over and spaced apart from the disc 3b by standards 6. The disc is situated out of the perpendicular, and a series of rollers 7 are rotatably held, disposed on a circle, between the disc and the C-shaped plate. The C-shaped plate is fixed on the disc in such a position that its open side takes the lowest position. This is clearly seen on Figure 5.

7a are rollers rotatably mounted on the disc 3b the peripheries of the rollers appearing a little above the surface of the disc. These rollers are disposed along the periphery of the disc having their axis in radial directions as shown on Figure 5, and layers of a coiled record placed around the rollers 7 are supported at their edges on the peripheral surfaces of the rollers 7a. Since the coiled record is loosely placed around the rollers 7, it passes out from the innermost turn of the coil as it is pulled by a feed mechanism, and passes back to the outside turn of the coil without undue frictional resistance.

Inside the cylindrical part 3a is floatingly held a small synchronous motor 4 by means of flexible bands 8, such as India rubber, leather, or the like, and a rope pulley 9 is fixed on the motor shaft.

There is a spindle 10 above the motor parallel to the motor shaft and extending through the disc 3b, which is mounted on a journal 11 provided in an upper extension of the cylindrical part 3a. A rope pulley 12 and a record-feeding pulley 13 are fixed on the spindle at each end, and a rope 14 passes over the pulleys 9 and 12 so as to transmit power from the pulley 9 to 12.

The pulley 13 serves to feed an endless-film record. It has a small flange on each side so as to prevent the record from getting aside, and an India rubber sheet with numerous lines or small projections thereon is coated over the surface of the pulley so that a record is carried by the pulley without slipping.

The lower part of the pulley 13 extends to the central space of the C-shaped plate 5 as shown in Figures 1 and 4, and imaginary perpendicular lines B drawn along the inner sides of the flanges of the pulley on Figure 1 intersect imaginary lines A drawn along both ends of the rollers 7 nearly at the periphery of a circle touching the outer surface of the rollers 7, so that the record coming from the outer circle of the rollers 7 is transferred to the periphery of the pulley 13 almost at a tangent.

A ratchet wheel 15 is mounted on the spindle 10 adjacent to the rope pulley 12 and is fixed thereto, as shown in Figure 7. A sector 16 is loosely mounted on the same spindle adjacent to the ratchet wheel, and a recess 17 is provided on the peripheral surface thereof.

At the right corner of the sector on Fig. 3 is provided a pin 19, and a link 18 connects the sector at the pin and an arm of a bell crank 20 fixed on a spindle 25. A hook 21 is loosely fitted on the pin 19, and a short pin 22 extends sideways from the hook as best seen on Figure 7. This pin 22

has a smaller diameter than the width of the recess 17, and the distances of the pin and of the recess from the pin 19 are the same, so that if the hook touches at its free end the periphery of the sector, the pin 22 fits into the recess and at the same time the hook engages with a tooth of the ratchet wheel. 23 is a spring provided on the pin 19, and acts to have the hook raise its free end so as to keep the pin 22 a little distance out of the recess 17 and to disengage the hook from the ratchet wheel.

Along the periphery of the sector is provided a guide piece 24 being fixed to the frame. This guide piece has a special form as shown in Figures 3 and 6. Its lower side forms an arc keeping a little clearance against the periphery of the sector, and gradually decreases its thickness at its right end on Figure 6, while the left end makes an obtuse angle. The strength of the spring 23 is so regulated that the pin 22 takes a position shown with dotted lines 22*a* or 22*b* when the pin is at the extreme points of its stroke. In view of this fact, when the pin 22 goes to left from the position 22*a*, it is guided along the upper side of the guide piece, while, when it goes to right from the position 22*b*, it is guided by the obtuse angle at first, and slides along the lower side of the guide piece. This means that when the sector turns to left the ratchet wheel is not affected at all, while when it turns to the right, the pin 22 is at first pressed down by the guide surface so as to get into the recess 17 insuring the engagement of the hook with the ratchet wheel, and turns the latter in the clockwise direction.

The spindle 25 on which is fixed the bell crank 28 at one end, has a bevel gear 26 at the other end, and this bevel gear engages with another one 27 fixed to a vertical spindle 28, which has a handle 29 at its top end.

A knife-edge 30 of an electric switch is fixed to the bell-crank 28. The electric circuit for the motor is opened and closed when this knife-edge gets out and into the space between the terminals 31 of the circuit, which are fixed on the frame as shown in Figure 2.

The bell-crank 28 is always under the action of a helical spring 43 which is tensioned between an arm of the bell-crank and a bracket 38 extended from the frame. The relative position of the spring and the bell-crank is such that when the bell-crank has been turned by the action of the spring to its extreme end anti-clockwise direction on Figure 3, the knife edge is kept in the clearance between two terminals 31, as shown on Figure 3, while when the bell-crank is turned to clockwise direction until its arm connected with the spring 43 goes over the dead point pulling the link 18 downwards, the spring acts to turn quickly the bell-crank further bringing the link upwards until the upper end of the link 18 gets in contact with the right end of the guide piece 24 whereby further rotation of the bellcrank is prevented. In this case, the knife-edge comes out of the terminals opening the circuit of the motor, and the pin 22 has gone over the left end of the guide piece.

On the spindle 10 is firmly fixed a worm 42, which engages with a worm gear 32 on a vertical shaft 33, therefore, when the spindle 10 is rotated by the motor, the vertical shaft is rotated at a reduced speed. There is a shoulder at the top of the vertical shaft, on which a turn table 34 for disc records can be located, if required.

Referring to Figure 4, 35 and 36 are guide rollers for film records, which are held on brackets fixed to the disc plate 3*b*. 37 is an arm frictionally fixed on the C-shaped plate 5, and can be turned with a knob 37*a*. When a record is to be loaded around the rollers 7, the arm is turned in a little angle to clear the way for the record, and after the record has been placed in its position, the arm is returned to its original position as shown in Figure 4, so that the record placed around the rollers 7 does not get aside from its position while the record is turning around the rollers.

The center of gravity of the machine is at the left side of the spindles 2 on Figure 1, therefore the machine has a tendency to incline anticlockwise around the spindles 2, but an extension 39 of the bracket 1 holds the end of the frame 3*a* at its inner surface to prevent further inclination of the machine than the position that the shaft 23 is vertical. If the machine is inclined by hand to the right side on the spindles 2, the extension 39 also holds the frame's end at its upper edge, so that the disc 3*b* takes almost a horizontal position. This inclined position is convenient for loading or unloading the record.

An endless-film record has been manufactured in such a way that a strip of film was coiled several turns in a diameter so as to loosely fit around the rollers 7, and both ends were connected together. The sound grooves were impressed on the film before or after it was made endless.

In order to load this endless-film record on the gramophone, the machine is inclined by the handle 29, which will be supported by the stopper 39 keeping the disc plate 36 in a nearly horizontal position. The coiled record is placed around the rollers 7, the innermost turn of the coil being led through the space between two rollers 7 provided at the open end of the C-shaped plate 5, passing over the feed roller 13, under the guide roller 35 and over the roller 36 successively, and returning to the outerside turn of the coil as shown on Figure 4. The arm 37 is then turned outwards, and the machine is removed to its vertical position.

To stop rotation of the gramophone, the operator should turn the handle 29 to rotate the bellcrank in the clockwise direction in Fig. 3 so that the hook 21 is brought to its extreme leftward position on Figure 3, whereby the switch for the motor's circuit is open. Thus, the hook is always at the left end of its stroke when the switch is open.

To begin play of the gramophone, one should quickly turn the handle to the opposite direction so that the ratchet wheel 15 is rotated. This rotation of the ratchet wheel gives a synchronous speed to the motor, and when the bell-crank passes over its dead center, the spring 43 strongly pulls the bell-crank, and the switch quickly closes the circuit for the motor, so that the latter starts.

A sound box 40 is then placed on the driving pulley 13, so as to have its needle 41 locate in the starting groove of the record which is passing over the pulley, and the play is continued until the needle travels all the grooves. The rotation of the motor can be stopped by hand or by an automatic stopping attachment which opens a switch in the circuit.

In case a disc record is to be played with this machine, a spare turn table 34 should be put on the vertical shaft, and the machine can be operated in the same manner as above described.

What I claim is:

1. A gramophone for playing coiled endless records comprising a sound box, a needle carried by said sound box, a reel having an inner space for rotatively supporting a coiled record thereon, a feed pulley for withdrawing the inner turn of the coiled record and sending it back to its outer turn, said reel and pulley being positioned so that their planes make an acute angle with each other and the lowermost part of the pulley's periphery being located in said inner space of the reel so that lines drawn along the ends of the record on the reel intersect other lines drawn along the edges of the record on the feed pulley at points near the outer circumference of the coiled record on the reel, and said needle cooperating with that portion of the record on said pulley.

2. A gramophone for playing coiled endless records comprising a sound box, a needle carried by said sound box, a reel having an inner space for rotatively supporting a coiled record thereon, said reel comprising a disc, a C-shaped plate spaced from said disc and a series of rollers disposed in a circle between said disc and said plate, said C-shaped plate having its open side directed downwardly, and a feed pulley for withdrawing the inner turn of the coiled record and returning it to its outer turn, said reel and pulley being positioned so that their planes make an acute angle with each other and the lowermost part of the pulley's periphery being located in the inner space of said reel so that lines drawn along the ends of the record on the reel intersect other lines drawn along the edges of the record on said feed pulley at points near the outer circumference of the coiled record on said reel, and said needle cooperating with that portion of the record on said pulley.

3. A gramophone for playing coiled endless records comprising a sound box, a needle carried by said sound box, a reel having an inner space for rotatively supporting a coiled record thereon, a feed pulley for withdrawing the inner turn of the coiled record and returning it to its outer turn, said reel and pulley being positioned so that their planes make an acute angle with each other and the lowermost part of the pulley's periphery being located in said inner space of said reel so that lines drawn along the ends of the record on the reel intersect other lines drawn along the edges of the record on said feed pulley at points near the outer circumference of the coiled record on the reel, a shaft for said feed pulley, a vertical shaft upon which a turn table can be mounted operatively connected to said shaft of said feed pulley, and said needle cooperating with that portion of the record on said pulley.

4. A gramophone for playing coiled endless records comprising a sound box, a needle carried by said sound box, a reel having an inner space for rotatively supporting a coiled record thereon, a feed pulley for withdrawing the inner turn of the coiled record and returning it to its outer turn, said reel and pulley being positioned so that their planes make an acute angle with each other and the lowermost part of the pulley's periphery being located in said inner space of said reel so that lines drawn along the ends of the record on said reel intersect other lines drawn along the edges of the record on said feed pulley at points near the outer circumference of said coiled record, a frame rockingly mounted, driving means for said reel and pulley located on said frame, and said needle cooperating with that portion of the record on said pulley.

SHOZO KONISHI.