In a machine of the type which projects pictures and synchronized audio information from an audio-visual cartridge of the type having a circular holder with a plurality of picture transparencies spaced along its periphery, said holder containing an audio record which is freely rotatable, and a tone arm for said audio record, the improvement comprising new and improved rotatable drive means for said picture holders including roller clamping assembly means and operating lever means connected to said clamping means, pivotally mounted gear arm assembly means connected to index said picture holder, said operating lever being adapted to synchronize and control the operation of tone arm and the gear drive for the picture holder and having cartridge sensing means adapted to prevent the operation of the device unless a cartridge is properly inserted.
This invention relates to audio-visual means, particularly to apparatus of the type which is adapted to project pictures and transmit audio information from a cartridge containing both the pictures and the audio record.

This application is an improvement of U.S. Pat. No. 3,504,445, dated Apr. 7, 1970.

The audio-visual cartridge is of the type shown in the above patent which is circular in shape and which has a plurality of film transparencies spaced around its periphery, the cartridge holder also holds a freely rotatably audio record of the type of which upon the tone arm rides to pick up the audio information.

In the patent, the picture holder is indexed by a ratchet device. The present invention is directed towards a new and improved means to index the picture holder comprising a rotatable gear arm assembly and associated synchronizing means including an operating lever which is adapted to synchronize and control the operation of the rotatably mounted gear assembly, a roller clamping assembly and the tone arm.

More specifically, in the present invention, the picture holder is indexed by a rotatably mounted gear arm assembly. The gear assembly is actuated by an operating lever which has both horizontal and vertical movements. In order to start the apparatus the operating lever is moved horizontally and then vertically. This actuates a clamping roller assembly which clamps the picture holder in operating position and this actuates the gear drive for the picture holder. At the same time the motor for the audio record turntable is set for actuation.

When it is desired to turn off the apparatus, the operating lever is moved to non-operating position and this stops the gear drive and the turntable, and clamps the tone arm in a non-operating position. The apparatus has a cartridge sensing device which prevents operation until the cartridge is properly inserted. New and improved electrical control means are also provided.

Accordingly, a principal object of the invention is to provide new and improved control means for an audio-visual device which receives a flat circular cartridge of a type having a circular holder with picture transparency spaced around its periphery and a conventional phonograph record rotatably mounted in the holder.

Another object of the invention is to provide new and improved means to clamp the holder in operating position.

Another object of the invention is to provide new and improved means to index the picture holder.

Another object of the invention is to provide new and improved audio-visual apparatus in audio-visual apparatus for projecting spaced visual information segments carried by a holder and for reproducing sound information recorded on a movable storage medium held captive by the holder comprising, a housing, projecting means mounted in the housing for projecting the space visual information segments carried by the holder, means to lock the holder in drivable position comprising a rotatably mounted gear drive member, a roller assembly adapted to clamp said holder on said drive member, a operating lever pivotally mounted on said roller assembly for rotation in vertical and horizontal direction, a drive motor, a gear arm assembly comprising, first, second and third meshing gears, said gear assembly being pivotally mounted on the axis of said first gear, said first gear being connected to said drive motor and said third gear being adapted to mesh with said gear drive member when in drive position, cam means mounted on said operating lever and adapted to rotate said gear arm assembly when said operating lever is rotating horizontally, said operating lever being mounted so that it is first moved vertically to clamp said holder with said roller arm assembly and then rotated horizontally to connect said gear drive.

These and other objects of the invention will be apparent to the following specification and drawings of which:

**FIG. 1** is a perspective view of the outside case of an audio-visual device.

**FIG. 2** is a plan view of a cartridge for the audio-visual device of FIG. 1.

**FIG. 3** is a plan view of a turntable deck of an embodiment of the invention.

**FIG. 3A** is a side view of FIG. 3.

**FIG. 4** is a plan view of the cartridge deck of the embodiment of FIG. 3.

**FIG. 4A** is a detail view of FIG. 4.

**FIG. 5** is a top view of the control arm and roller assembly of an embodiment of FIGS. 3 and 4.

**FIG. 5A** is a side view of FIG. 5.

**FIGS. 6-9** are electrical schematic block diagrams.

**FIGS. 10 and 10A** are an electrical schematic diagram.

Referring to the figures:

**FIG. 1**, shows a view of the outside case 1, of the audio-visual device. The top cover 2, has a viewing screen 3. When the top cover is raised to the vertical position it is in position to receive and display projected picture from a projector in the case. The device has a slot 4, in the front face which is adapted to receive a circular cartridge 10, which contains the picture to be projected as well as a phonograph record. The top of the cartridge device as shown in **FIG. 2**. Also shown in **FIG. 1**, is a plurality of answer switch arms, 6, a loud speaker 7, and an operating control arm 42'. Switch arm 52 is an "Advance" switch. It advances the holder one picture frame in the manual mode of operation. Switch 52 is a mode switch for manual, automatic and answer response modes of operation.

**FIG. 2** shows the cartridge 10, which is circular in shape. It comprises inner and outer rims 10a and 10b. Between the rims and spaced around its periphery of the cartridge are a plurality of picture transparencies 11, 12, 13, etc. Inside the inner rim 10a is mounted a phonograph record 14. It is held captive by the rim 10b but is freely rotatable with respect to the rim 10a, and it is described in U.S. Pat. No. 3,405,445. The rim 10b has notches 10c, 10d, etc., which actuate a switch to index the pictures. The phonograph record is rotated on a turntable in a conventional manner and the picture holder comprising the rims 10a and 10b is adapted to be indexed so that a particular picture is projected in synchronism with an audio accompaniment from the phonograph record 14. The pictures may be indexed manually or automatically as described in the above mentioned patent.
A feature of the present invention comprises new means and methods for clamping and indexing the picture holder and also controlling the tone arm of the record player.

FIGS. 3 and 3A show top and side views of the turntable deck assembly. A turntable 15, is mounted on a shaft 16, which is rotatably mounted on the frame F. The shaft 16 is connected to the flywheel pulley 17, which is adapted to rotate it by means of the belt 18, which is connected to a conventional motor M2. Three support rollers 20, 21 and 22 are mounted on the frame and adapted to support the periphery of the cartridge 10, so that the record 14, will rest upon the turntable 15. The picture holder rests upon the member 24, to which is connected a circular gear 25. The picture holder has an indentation which engages an indexing projection 24' in the member 24. The member 24 is adapted to be indexed to successive pictures by means of the gear train comprising the gears 26, 27, and 28, which are geared to the motor M1 which is turned on by "Advance" switch and turned off by notch operated switch 19. Code sensing switches S10-S13 contact coded indentations in the cartridge to provide an answer response system, as will be discussed.

The gear 25 is spring loaded by a coil spring 56 so that pin 25' is stopped by stop 25a on frame F in zero position. The gear drive turns member 24 on a revolution in steps against spring 56 to index all the picture positions. The gear train 26, 27 and 28 is mounted on a control arm 30 which is pivotally mounted on the shaft 31. The arm 30 is an extension arm 30' which is adapted to be actuated by a cam mounted on a control arm as will be described. The arm 30 is rotated by arm 45' to engage the gear 26 with the gear 25 in order to index the picture holder 24. Also, turntable motor M1 is actuated by switch 19' by movement of arm 30' moving switch arm 19c from a notch on cartridge 10.

FIG. 4 shows a top view of the cartridge deck and actuator arm assembly.

FIG. 4A is a detail view of cam 45. The tone arm 40 is mounted on a post 41 on the frame F. The tone arm contains a conventional phonograph pick-up and is adapted to ride on the phonograph record in a conventional manner. The control actuator arm 42 is mounted on a cross member 43 which is fixedly connected to the frame F. The arm 42 is mounted on a vertically slideable post 44 so that arm 42 rotates in a vertical plane and also horizontally. The arm 42 extends into the control panel area and has a finger hold 42'. On the other end of the arm 42 is mounted a control cam 45, which is also shown in FIG. 4A.

One of the functions of the cam 45 is to cam the end of the tone arm 40, so as to raise the tone arm from the record when the apparatus is turned off. This is for the purpose of inserting and removing the cartridge without interference or damage to the phonograph pick-up on the tone arm 40.

Extension 45' of cam 45 moves post 30a mounted on arm 30' to engage the gear train with gear 25 on member 24, FIG. 3. When arm 42 is lifted, spring 42a moves it clockwise and extension 45b hits post 30a and disengages the gear train. At the same time extension 30b hits switch actuator 19a, FIG. 3, removing 19a from notch 10a, b, c, allowing cartridge to return to stop 25a.

Also mounted on the post 44 and shown in FIGS. 5 and 5A is a clamping assembly 50 which is adapted to clamp the inner rim of the picture holder. The clamping assembly has three rollers 51, 52 and 53, which are adapted to be lowered on to the picture holder 10 in order to clamp it in position so that it can be indexed.

FIG. 4 also shows projection lens 60 which passes the light through a picture onto a 45° mirror 9, which reflects it to screen 3. Cartridge detector 57, is pivotally mounted in frame F on pin 57'. It mounts a wheel 57a, which is lifted when cartridge is inserted. This rotates edge 57b down out of interference with arm 42. If no cartridge is inserted the edge 57b, stops movement of arm 42 and prevents operation.

"Advance" switch arm 55, advances the cartridge one picture frame. Switch arms 56--59 are answer insertion means.

Referring more specifically to FIGS. 5 and 5A the frame mounted member 43, contains a bearing 43', which mounts the post 44, so that the post is slidable in the vertical direction. The bracket 50 which mounts the clamping rollers 51, 52 and 53, is spring loaded down by means of the springs 54 and 55, on guide posts 54' and 55', and this assembly is adapted to be lowered and raised by vertical movement of the control arm 42.

In order to start the operation of the device the control arm 42 is raised causing it to rotate about the pin 44' in the post 44 and causing it to depress the post 44, to clamp the cartridge.

FIG. 6 shows a schematic block diagram of the electrical system. A phonograph pick-up cartridge 65, is connected to the audio amplifier IC--1 and then to the speakers. It is also connected to the detector IC--2 which detects low frequency pulses 75Hz, which are rejected by the response of the audio amplifier. The control pulses are fed to the picture advance and turntable logic control means 69, which has several outputs. It controls the picture advance motor M1 and the turntable motor M2 and a ready lamp control means 70, which controls the ready lamp G to operate.

The answer response system includes the answer switches S6--59, which are mounted on the front panel and the cartridge code sensing switches S10--S13, which read the codes on the cartridges. The codes are indentations molded into the cartridge. The output of these switches is connected to the response control circuit 72, the output of which is connected to the error lamp and the error counter driver 9. The output of driver 9, operates the lamp R and the error counter C. The supply voltage clamp O4 controls the voltage to the advance push-button 74 and also controls the voltage to the picture advance circuit, as will be explained.

FIG. 7 shows a more detailed circuit of the audio and detector circuits. The phonograph pick-up 65 is connected to an emitter follower O1, the output of which is connected to a volume control 75 and a sensitivity control 76. The output of the volume control 75 is connected to an internal circuit IC--1, which contains an audio amplifier which is connected to a loud speaker for head phones.

The sensitivity control 76 is connected to an internal circuit IC--2, containing one amplifier 77, which is tuned to 75Hz. The amplifier 77 has a feed back circuit including a filter 77' to tune it to the frequency of the control pulses. The other amplifier 78 acts as a switch
control responsive to the control signal. Its output is fed to a switching circuit Q2–Q3, which is controlled by the pulse to provide a 28 volt control signal output.

FIG. 8, shows a schematic block diagram of the supply voltage clamping circuit. This circuit Q4 controls a 28 volt source so as to provide a sufficient voltage via mode switch S3, in response to a control signal from SCR1, FIG. 9. The 28 volts is supplied to the advance push-button S5 and manual advance circuit S0, or the automatic advance circuit S1, to the response control circuit S2, when in the response mode of operation.

FIG. 9, shows a schematic block diagram of the picture and turntable controls. An input pulse triggers an advance multivibrator Q6, which supplies a large pulse to a triac switch T1, which turns on the picture advance motor M1. The motor M1 is turned off by the cartridge switch 19, which rides on the edge of the cartridge. There are indexing notches on the edge of the cartridge so that when the arm of the switch 19, falls into the next notch the motor M1 is turned off.

The output of Q6, is also supplied to control SCR1 which operates the triac switch T2 to control the turntable motor M2. The output of SCR1 also controls the ready lamp control which operates the ready lamp G. The SCR1 circuit is also controlled by the supply voltage clamp Q4, as will be explained in connection with FIG. 10.

OPERATION

The manual mode of operation allows the student to proceed to the next visual after receiving aural instructions whenever desired by pressing the ADVANCE key.

In the automatic mode, an entire lesson is presented with visuals automatically indexing in proper sequence, synchronized to the aural presentation.

The response mode requires the student to interact with the machine. A correct answer is necessary to cause the machine to advance to the next visual. An incorrect answer results in a visual error indication. The number of incorrect answers is also tabulated on a resettable error counter.

SYSTEM OPERATION

The cartridge is inserted into the cartridge loading slot and properly seated. The loading lever 42, (above loading slot) is then moved to the right and down until the machine turns itself on. At this point, the first frame is projected on the self-contained screen, FIG. 1, and the green ready lamp G, above answer keys illuminates. The record does not rotate so that no audio is heard.

At this point, the desired mode of operation is selected by means of the mode selector switch, S2.

In the manual mode the advance key S5, is depressed to start the record and advance to the next frame. When the instruction or explanation related to this frame is ended, the record stops and the ready lamp G again illuminates. The student depresses the key for the next frame when he has digested the material at his own pace.

In the automatic mode, the advance key S5, is depressed to advance to the second frame and start the record. From this point, the advance key becomes inoperative. The pictures then advance in synchronism with the audio presentation.

Finally, in the response mode, when the record stops, a multiple choice question must be answered. Four answer keys S6, S7, S8 and S9, are available, labelled with a square, cross, triangle and circle. The use of symbols permits the machine to be used with preschool children who may not be familiar with numbers or the alphabet. When the correct answer key is depressed, the record starts and the machine advances to the following picture. When an incorrect answer is selected, a red error lamp R illuminates and the green ready lamp G is extinguished while the incorrect key is depressed. An additional count is recorded on the error counter. Operating mode may be changed at any time during or before operation.

At the end of the presentation, the loading lever 42, is moved up and to the left, turning the machine off and freeing the cartridge simultaneously.

THE CARTRIDGE

One of the most important design features of this system is the fact that all visual, aural and response code information is contained in a plastic cartridge 10, FIG. 2, approximately one-quarter-inch thick and 5 inches in diameter.

Up to 52 visual frames of pictures to be projected on the self-contained screen or wall, can be mounted in the cartridge, FIG. 2. They are sandwiched between clear polycarbonate plastic within an area bordered by the outer periphery and an inner circle, one-half-inch from the periphery.

Answer coding, in the form of depressions, is molded into the underside of the cartridge. The presence of a depression in a particular spot on the cartridge indicates a correct answer corresponding to one of the four symbols (square, cross triangle and circle) on the answer keys. Conversely, absence of a depression indicates an incorrect answer. The coded area is bounded by the previously mentioned inner circle of the visual area and another circle about an inch closer to the center.

The cartridge is indexed by means of notches molded into the outer periphery, one notch corresponding to each visual. This self-indexing feature eliminates the problem of an inaccurate alignment of the cartridge with an indexing system external to itself. The cartridge, in operation, is seated on its turntable to which it is keyed for positive rotation.

ELECTRONIC SYSTEM OPERATION — FIGS. 6–10A

Refer to System Block Diagram, FIG. 6. Mode switching is not shown in this diagram.

The audio amplifier IC–1 and the detector IC–2 blocks are common to all modes of operation. The signal from the ceramic cartridge pick-up 65, is amplified and fed to the speakers, or earphones. The 75hz control pulses, which are not audible due to amplifier and speaker response are detected and produce a positive control voltage when present.

In the manual and automatic modes, when a cartridge has been loaded the ready lamp G lights and a positive voltage is available to the advance key S5. Neither advance nor turntable motor is energized. When the advance key is depressed, the advance logic causes an AC voltage to be applied to the advance motor M1, for a duration long enough to move the car-
tride so that a microswitch 19 actuator 19a (FIG. 7) leaves a notch molded into the periphery of the cartridge.

The switch 19, then allows the motor to continue rotating the cartridge until the switch actuator finds itself in the next notch. At the same time, the advance and turntable logic control 69, has caused energization of the turntable motor M2. The supply voltage clamp Q4, has also been energized so that voltage is not available to the advance push button which is therefore ineffective.

In the manual mode, the record plays and the next 75hz pulse causes de-energization of the turntable motor and the supply voltage clamp Q4.

In the automatic mode, the advance key S5, initiates the cycle as above, but the detector IC-2 output is now connected to the advance logic, the turntable remains on until either the record is removed or the mode changed, and each 75hz pulse causes the cartridge to advance one notch.

The response mode operates in the same manner as manual operation except that the advance key S5, is disconnected, the response logic connected, and a correct answer key must be depressed in order to advance the cartridge and start the turntable. This supplies a positive voltage to the advance logic. An incorrect answer causes the response logic to light the error lamp R, increase the error counter C and extinguish the ready lamp G. After releasing the key, the lamps return to normal, ready lamp G on, error lamp R off.

**AUDIO AND DETECTOR STAGE**

The signal produced by the ceramic cartridge 65, is fed to the high impedance input of an emitter follower Q1. The follower feeds two controls: a volume control 75, which feeds the Audio Amplifier and a sensitivity control 76, which feeds the detector.

By proper choice of the external components, the response of the audio amplifier IC-1 portion is approximately 120Hz to 10kHz (3dB limits). The relatively high low frequency cut-off is needed to keep the 75Hz control pulse from becoming audible. The IC-1 amplifier may be a GE PA-234.

The Detector circuit IC-2 comprises two amplifiers, the first as a tuned amplifier 77, amplifying the 75Hz control signal through use of a parallel T filter 77 in the feedback loop. The last stage of the detector, a differential amplifier 78, with external collector load, is directly coupled to the output of the first such that the last stage, is in saturation in the absence of a signal. A 75Hz signal brings the DC collector voltage to approximately 1 volt. Thus, the device produces an output of 1 volt in the presence of 75Hz and remains at approximately zero when 75Hz is absent. The detector IC-2, may be an RCA CA-3035 VI. The Detector IC-2 may be an RCA "CA-3035".

The output of the detector is then fed to a pulse circuit switch Q2, Q3, to produce a large positive voltage with 75Hz signal present and zero with no signal present.

**SUPPLY VOLTAGE CLAMP — Q4**

One of the most important features of this design in this single transistor stage Q4, FIGS. 8 and 10A. When the base of this transistor is at ground potential, full supply voltage is available to the advance key S5 or response logic, permitting cartridge advancement and turntable starting. The same SCR-1 that starts the turntable motor also supplies a positive voltage to the supply voltage clamp base of sufficient magnitude to cause the transistor to saturate, reducing the voltage to a sufficiently low level to prevent cartridge advancement until after the SCR-1 (and hence turntable motor) has been turned off by the action of a recorded 75Hz pulse.

**MODE SELECTOR S2 — FIG. 10A**

This switch selects the various modes of operation.

**MANUAL MODE**

Section A connects advance switch S5 to Q6 multivibrator, advance circuit.

Section C connects the other side of S5 to the Q8 and SCR-1 turntable circuit.

Section D connects the voltage clamp Q4, to the ready lamp circuit Q12–Q10.

**AUTOMATIC MODE**

Section A connects one side of advance switch S5 to the Q6 multivibrator advance circuit.

Section B connects the other side of S5 to the Q6 multivibrator, bypassing the manual advance.

Section C connects the Q8, SCR-1 circuit to the Q5 error signal circuit.

Section D connects the ready lamp circuit A12–Q10 to the voltage clamp Q4.

**RESPONSE MODE**

Section A connects the code switches S10–S13 to the input of the Q6 multivibrator.

Section B connects the input pulse from Q3 to the Q8, SCR-1 turntable control circuit.

Section C connects the Q4 voltage clamp to the Q5 error circuit and answer buttons S6–S9.

Section D connects the Q5 error circuit to the Q12–Q10 ready lamp circuit.

**ADVANCE AND TURNTABLE LOGIC**

This part of the system controls the advancement of the cartridge from visual to visual, and the start and stop of the turntable motor.

In manual mode, FIGS. 9, 10 and 10A, when the advance key S5 is depressed, or in response mode, when the correct answer key is depressed, (and provided the turntable motor is not energized) a positive DC voltage is applied to the advance multivibrator Q6, which is monostable, which delivers a fixed period pulse to the triac T1 gate. The triac T1 is energized until the first zero cross-over (of the 60Hz supply voltage) after the fall of the pulse. The advance motor M1 energized through the triac T1, is on a sufficient length of time to pull the cartridge switch 19, actuator 19a, out of its notch and on the outer periphery of the cartridge. The switch 19 now keeps the advance motor energized until the cartridge switch actuator falls into the next notch. This actuator causes the previous "visual" to be replaced by the following one.

The above pulse also triggers the gate of an SCR-1 which supplies a DC voltage to the triac T2 controlling
the turntable motor M2. The motor M2 remains on until the SCR–1 turntable transistor clamp Q4 is energized by the positive voltage from the detector. When energized, this clamp reduces the current through the SCR–1 below the minimum holding current, thus turning it and the turntable motor M2 off.

The absence of SCR–1 voltage unclamps the supply voltage clamp Q4 and causes the ready lamp G to light. Thus, the machine is ready for its next manual advance or correct answer, depending on the mode in use.

In the automatic mode, the output of the detector IC–2 via Q2 and Q3, is connected to the multivibrator Q6 and causes the cartridge to advance when 75hz pulses occur while the turntable is revolving. In this mode, action is started by depressing the advance key S5, which then becomes ineffective. The record cannot be stopped in this mode except by interrupting the supply voltage.

**RESPONSE LOGIC**

The response logic FIG. 10A is controlled by eight switches. Four of these switches S10–S13, sense the coding on the rear of the cartridge. A closed switch is a wrong answer. When closed, and its corresponding answer key, S6–S9, depressed, the base of PNP transistor Q5 is grounded. This transistor sends a positive voltage to the error switch Q9 and lamp R and to the counter C. Thus, the error lamp R is caused to light and another digit added to the error counter C. Also, through the ready lamp circuit Q12, Q10, the ready lamp goes out while a wrong answer key is depressed.

An open code switch corresponds to a correct answer. When the answer key is depressed, a positive voltage is now applied to the PNP transistor switch Q5 base, having no effect. The same positive voltage applied to the advance multivibrator Q6 causes the cartridge to advance and initiates the cycle.

One of the major design problems of a machine of this type is to make it “child-proof.” The machine is intended for use by young pre-school children (among a wide range of users of all ages and educational backgrounds) with little or no supervision. The machine will not operate unless a cartridge has been properly loaded and the load lever operated. The tone arm is inaccessible from the cartridge loading slot, even with a pencil. The loading lever itself cannot be pulled down until a cartridge is inserted. The loading lever and answer keys are ruggedly designed and are not easily damaged.

The design of the turntable drive system is another interesting problem. The record is required to start and stop many times during a program, with the weight of the tone arm and stylus on the record. Coastling and startup lag has to be minimized. A belt drive system was chosen using a 600 rpm hysteresis synchronous motor. The motor M2 selected uses a shaded pole to assure initial rotation in the desired direction. Mechanical “no-back” systems provided because of the time lag involved in finding the correct direction. Permanent magnet synchronous motors were ruled out because of their cogging tendency which caused unacceptable wow and flutter.

A specially formulated, to prevent transmission of motor vibration, synthetic rubber O ring was used to drive the 5 inch turntable pulley. It was necessary to use a long drive pulley to allow vertical movement of the drive belt. Wow and flutter was reduced to less than 0.5 percent.

We claim:

1. In audio-visual apparatus for projecting spaced visual information segments carried by a holder and for reproducing sound information recorded on a movable storage medium held captive by the holder comprising,
   a housing,
   projecting means mounted in the housing for projecting the space visual information segments carried by the holder,
   means to lock the holder in a drivable position comprising a rotatably mounted gear drive member,
   a roller assembly adapted to clamp said holder on said drive member,
   an operating lever pivotally mounted on said roller assembly for rotation in vertical and horizontal direction,
   a drive motor,
   a gear arm assembly comprising, first, second and third meshing gears, said gear assembly being pivotally mounted on the axis of said first gear, said first gear being connected to said drive motor and said third gear being adapted to mesh with said gear drive member when in drive position,
   cam means mounted on said operating lever and adapted to rotate said gear arm assembly when said operating lever is rotating horizontally,
   said operating lever being mounted so that it is first moved vertically to clamp said holder with said roller arm assembly and then rotated horizontally to connect said gear drive.
2. Apparatus as in claim 1 having a micro switch adapted to be actuated by said gear arm assembly, said switch being connected to control said drive motor.
3. Apparatus as in claim 2, having a pivotally mounted tone arm,
   a second cam mounted on said operating lever to cam said tone arm into non-operating position when said operating arm is in non-operating position.
4. Apparatus as in claim 1 having a holder sensing lever arm and roller assembly comprising,
   a sensing lever pivotally mounted on the frame so as to block movement of said operating lever until a holder is inserted to move said sensing lever.