United States Patent [19]

Winkler

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[54] **TAPE CARTRIDGE EJECTION MECHANISM**

[75] Inventor: **Gustav A. Winkler,** Wheaton, Ill.

[73] Assignee: **Motorola, Inc.,** Franklin Park, Ill.

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[21] Appl. No.: **124,152**

[52] **U.S. Cl.** ..... **274/4 B,** 74/99 R, 179/100.2 R
[51] **Int. Cl.** **G11b 15/24**
[58] **Field of Search** ..... 274/4 B, 4 E, 11 B; 242/55.19 A; 179/100.2 Z

[56] **References Cited**

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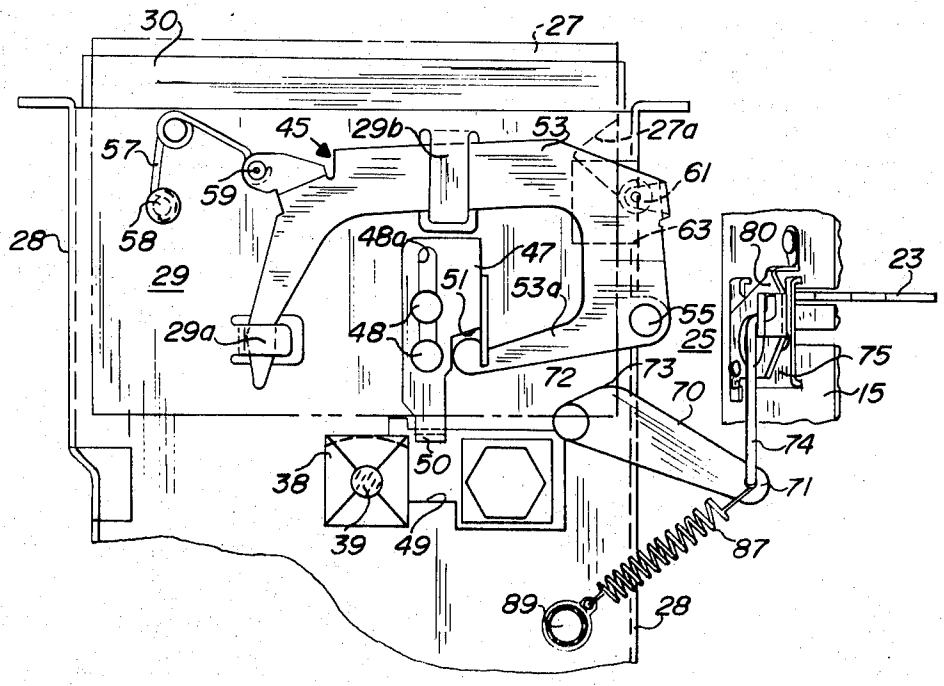
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Primary Examiner—Louis R. Prince
Assistant Examiner—Dennis A. Dearing
Attorney—Vincent Rauner and L. Arnold

[57] **ABSTRACT**

A housing for an electronic-type tape player device has two substantially perpendicular and intersecting outer walls, one of which includes an access opening to an internal cartridge receiving cavity and the other of which contains thereon an actuator member for a tape cartridge ejection mechanism. The actuator member is movable to an actuated position and is linked to an actuated member internal to the housing for correspondingly moving the actuated member. The actuated member is engageable with a bi-stable cartridge lock and release mechanism for moving the same from a first stable cartridge lock position to a second stable cartridge release position with movement of the actuator member to its actuated position thereby to permit an insertable tape cartridge to be removed from the cavity.

8 Claims, 7 Drawing Figures



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SHEET 1 OF 2

Fig. 1

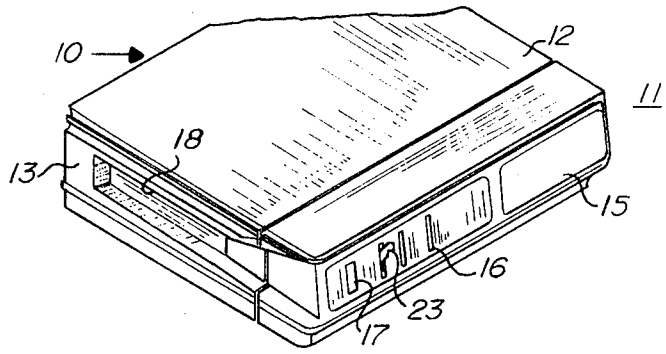


Fig. 2

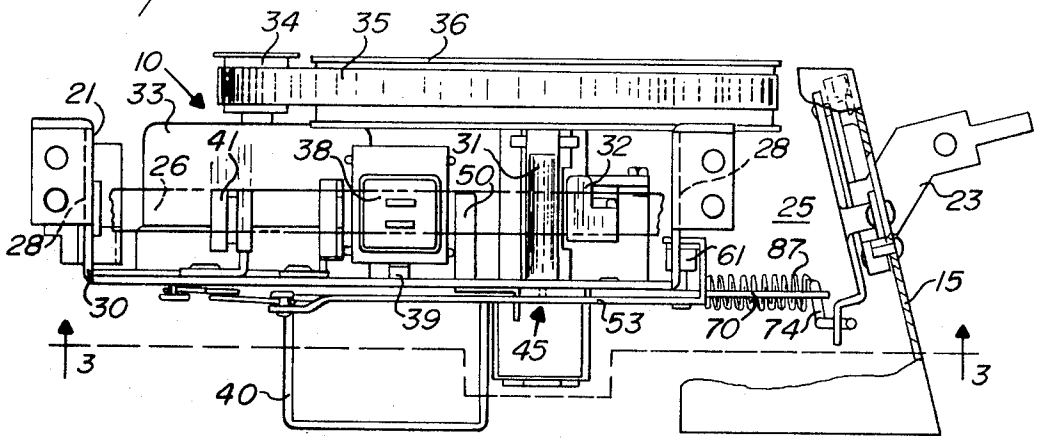
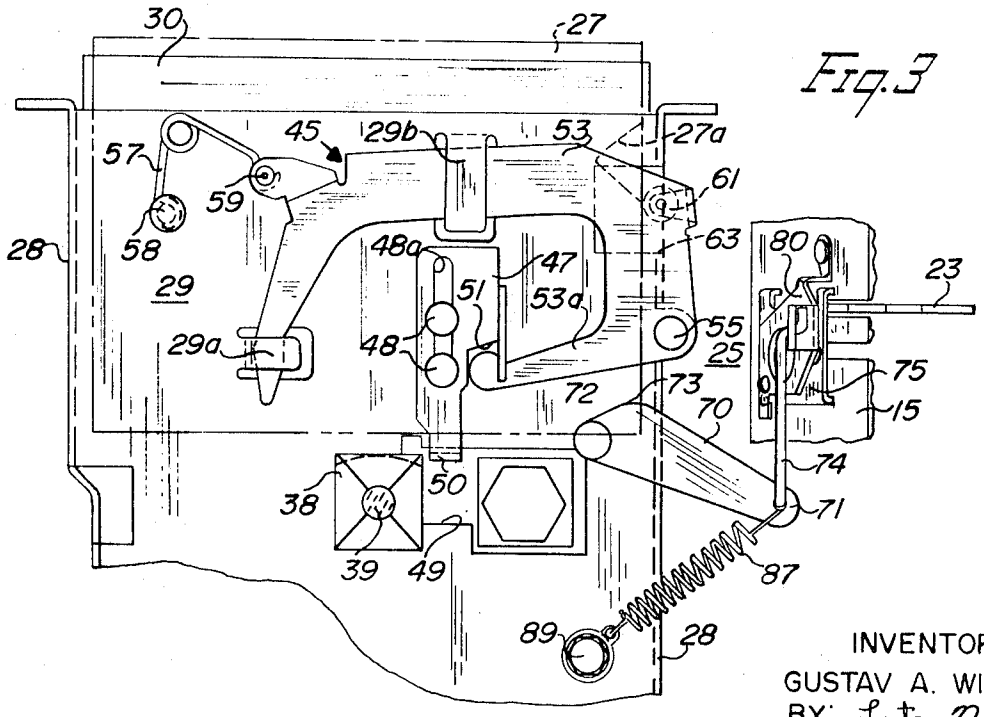


Fig. 3



INVENTOR:
GUSTAV A. WINKLER
BY: Lester N Arnold
ATTY.

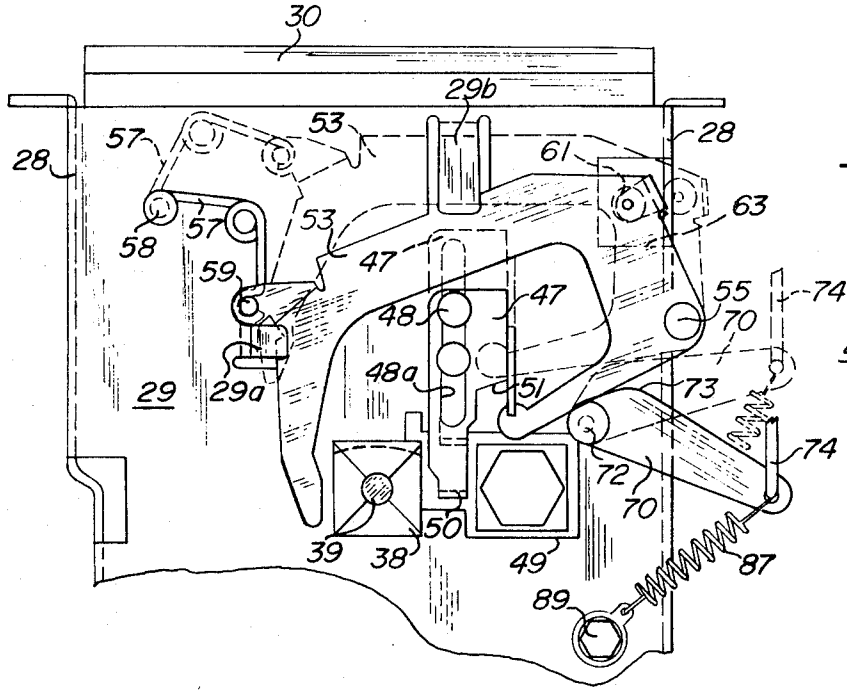


Fig. 4

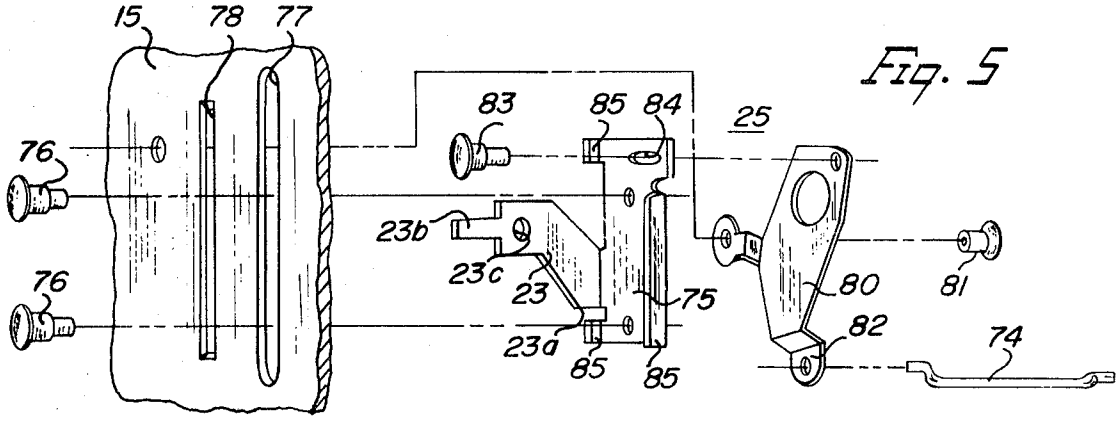


Fig. 5

Fig. 6

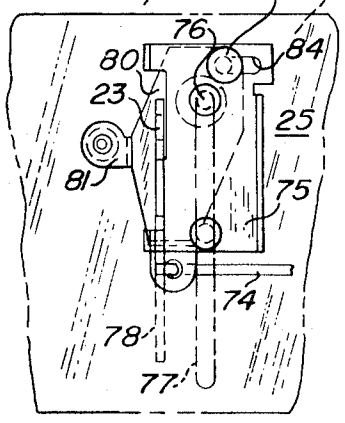
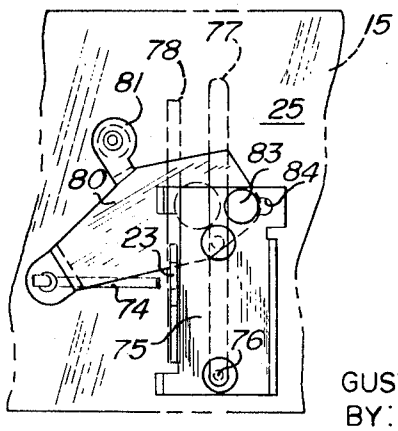


Fig. 7



INVENTOR:
GUSTAV A. WINKLER
BY: Lester N. Arnold
ATTY.

TAPE CARTRIDGE EJECTION MECHANISM

BACKGROUND

This invention relates generally to electronic-type tape player devices of the insertable tape cartridge variety wherein manually operable ejection mechanisms are employed to actuate internal cartridge lock and release mechanisms. More particularly, the invention relates to providing a manually operable ejection mechanism on a different housing wall of such a device from that housing wall providing an access opening to an internal cartridge receiving cavity.

In a popular configuration for under-dash mountable automobile tape players, front-loading electronic-type tape player devices have an internal cartridge receiving cavity for accepting insertable tape catridges for playing the tape thereof. Quite often such tape player devices employ a bi-stable cartridge lock and release mechanism for locking a grooved cartridge case within the cavity in a first stable position whereby the tape is made accessible to instrumentalities for playing the tape, and for releasing the cartridge to facilitate removal of the cartridge from the cavity in a second stable position. A tape player device having a similar cartridge lock and release mechanism and utilizing a grooved tape cartridge case similar to that described herein is set forth in U.S. Pat. No. 3,485,500, assigned to the assignee of the present invention and to which reference can be made for a greater detailed explanation of these features. Front-loading automobile tape players present a front protruding cartridge case with the cartridge in its tape playing position, which protruding portion presents a potentially hazardous obstacle to the body of the driver and/or an occupant of the automobile during emergency driving conditions.

It is accordingly desirable to provide entry of the tape cartridge to the internal cavity through a housing wall other than the front wall, thereby to remove the front protruding cartridge. Also, it is desirable to retain the ejection mechanism for actuating the cartridge lock and release mechanism on the front face of the tape unit along with other control dials where it remains readily accessible for actuation with a minimum of attention.

SUMMARY

It is therefore an object of the present invention to provide an electronic-type tape player device having side-loading access to its internal cartridge receiving cavity.

It is another object of this invention to provide a front actuable ejection mechanism for facilitating the release and removal of the tape cartridge from the internal cavity.

It is still another object to provide a bi-stable cartridge lock and release mechanism actuable by the ejection mechanism for movement in one direction from a cartridge lock position to a cartridge release position with movement of an actuator member of the ejection mechanism in another direction generally perpendicular to the one direction.

In a preferred embodiment, an electronic-type tape player device includes a housing having at least two substantially perpendicular and intersecting outer walls defining a front wall and side wall for the player device. An opening in the side wall provides access to an internal cartridge receiving cavity including instrumentalities for playing the tape of an insertable tape cartridge. A bi-stable cartridge lock and release mechanism is operable between first and second stable positions by a snap-acting overcenter means for locking the cartridge within the cavity in the first stable position and releasing the cartridge for its subsequent removal from the cavity in the second stable position. An ejection mechanism comprises an actuator member, an actuated member and a motion converting means linking these members. The actuator member is accessible from the front wall of the player device and movable to an actuated position to correspondingly move the actuated member. The actuated member is engageable with the lock and release mechanism and moves it from its first stable position to cause the overcenter means to move the same to its second stable position.

THE DRAWING

FIG. 1 is a partial front perspective of a tape player device of the present invention showing a housing having a side-loading access opening and a front actuator arm for an ejection mechanism;

FIG. 2 is a side elevation view of the tape player of FIG. 1 with most of the housing removed and showing the ejection mechanism in its unactuated position;

FIG. 3 is a bottom plan view of the tape player generally taken along the line 3—3 of FIG. 2 and showing a cartridge lock and release mechanism in its cartridge release position;

FIG. 4 is a bottom plan view of the tape player similar to FIG. 3 and showing the movement of the cartridge lock and release mechanism between the cartridge release position and its lock position;

FIG. 5 is an exploded view of a portion of the ejection mechanism showing its assembly with the front wall of the housing;

FIG. 6 is a partial front view of the ejection mechanism of FIG. 5 in assembly and in its unactuated position with the front wall indicated in phantom view for purposes of clarity; and

FIG. 7 is a partial front view of the ejection mechanism similar to FIG. 6 but with the assembly thereof in its actuated position.

DETAILED DESCRIPTION

Referring to the drawing, FIG. 1 shows an electronic-type tape player device **10** of the insertable tape cartridge variety that has a housing enclosure **11** including a top wall **12**, a bottom wall and rear wall which are not shown, and a pair of side walls only one of which is shown at **13**. Additionally, the enclosure **11** has a front wall **15** serving as the front face of the player device **10** and upon which various control and indicating dials can be mounted such as slide controls within grooves **16** and a channel indicator **17**.

The side wall **13** defines a generally central elongated opening **18** therein for providing an access opening to an internal cartridge receiving cavity **21** as shown in FIG. **2**. A suitable groove-like opening is provided in the front wall **15** of the player device **10** for permitting the protrusion therethrough of an actuator arm **23** useful for manually operating a tape cartridge ejection mechanism **25** as will be set forth with particularity hereinafter.

FIGS. **2–4** show the internal instrumentalities of the tape player **10** which enable the player device to receive and play an insertable tape cartridge **27**, FIG. **3**,

having an enclosing case for protecting a multi-track tape (a segment thereof being indicated at **26** in FIG. 2) contained therein. Typically, the case is made of a plastic-like material and has a V-shaped groove or notch **27***a* along one edge thereof by which the tape cartridge **27** is held into a playing position as is commonly done with tape cartridges. The internal cartridge receiving cavity **21** is defined by an interior structure having a pair of side plates **28** and a bottom plate **29** having an outwardly extending guide portion **30.** With the tape cartridge **27** fully inserted within the cavity **21,** the tape is positioned to be engaged by the capstan shaft **31** to drive the tape through the cartridge **27.** An electric motor **33** responsive to a switch **32** drives a pulley **34** which is connected through a belt **35** to the capstan flywheel **36.** The switch **32** is activated by the inserted cartridge **27.**

A magnetic tape reproducing head **38** is positioned by cam follower **39** responsive to a rotatable cam means (not shown) which could be housed within enclosure **40.** When a set of tape tracks is completed, a conductive strip on the tape bridges the contacts **41** to provide a means of electrically signalling the cam means to select another cam setting whereby the magnetic tape head **38** is re-positioned to play a different set of tape tracks or to turn the tape player **10** off. Attached to the bottom plate **29** defining the cartridge receiving cavity **21** is a bi-stable tape cartridge lock and release mechanism **45.** The separate parts and the operation of the lock and release mechanism can best be explained by referring to FIGS. **3** and **4** in conjunction with FIG. **2.**

The cartridge lock and release mechanism **45** comprises a linkage including a first arm or slide **47** which is slidably mounted to the bottom plate **29** of the tape player **10** by rivets **48** movable within a groove or slot **48***a*. Extending from the slide **47** through an opening **49** in the plate **29** and into the cavity area **21** is a projecting tab or tine **50** which serves as an actuating member for the lock and release mechanism **45.** The linkage includes a second arm **53** which is pivotally mounted to the bottom plate **29** by rivet **55.** A snap-acting overcenter means in a form of a spring **57** has one end thereof connected to a fixed spring post **58** and the other end thereof connected to spring post **59** of the arm **53.** Further, the arm **53** has an extension arm **53***a* on its end adjacent the rivet **55** that is engageable with a cam edge **51** on the slide **47.**

The overcenter spring **57** is used to bias with a snap-acting movement the arm **53** between first and second stable positions. The first stable position is shown in solid lines in FIG. **4** and the second stable position is shown in FIG. **3.** When the tape cartridge **27** is inserted into the cavity **21,** an innermost or front piece of the cartridge case engages the tab **50** to force the slide **47** to move rearwardly (inwardly) of the cavity **21** as the rivets **48** guide movement of the slide **47** by means of the slot **48***a*. The cam edge **51** engages the extension arm **53***a* to pivot the arm **53** about **55.** With this arrangement, an inward movement of the cartridge **27** against the tab **50** serves to actuate the arm **53** to move to its first stable position.

It is apparent that as arm **53** pivots about **55,** the end of the spring **57** on post **59** reaches a position where the spring tension on each end of the spring will become unbalanced and it will snap to the first stable position as shown in FIG. **4.** The bottom plate **29** may be provided with raised portions **29***a* and **29***b* for providing stop means for the arm **53** in moving to its first and second stable positions, respectively. In addition, as the arm **53** pivots, a roller **61** which is rotatably mounted to the arm **53** engages the groove **27***a* of the cartridge **27** and moves the cartridge to a cartridge lock position where the tape is made accessible to the various tape playing instrumentalities described above. A cut-away in the plate **29** at **63** permits the roller **61** to move inwardly of the cavity **21** in a generally arcuate path. In this position, a pinch or pressure roller (not shown) within the cartridge **27** will press against the capstan shaft **31** to capture the tape therebetween. Therefore, as the capstan shaft turns, it will rotate the pressure roller and drive the multi-track tape past the magnetic tape head **38** to reproduce the sound information thereon.

When the arm **53** is moved from its first stable cartridge lock position toward its second stable position as shown in FIGS. **2** and **3,** the movement of the end of the spring **57** on post **59** will reach an unbalanced position again whereupon the spring will be actuated to bias the arm **53** to the second stable position with a snap-acting movement. Motion of arm **53** to the second stable position causes the extension arm **53***a* to move the slide **47** forwardly (outwardly) causing the tab **50** to move against the cartridge case while simultaneously the roller **61** is being removed from the groove **27***a* in the cartridge along its arcuate path. The combined effect of the removal of the roller **61** and the movement of the slide **47** results in a positive movement of the cartridge **27** to its second stable position. Thereupon, the cartridge **27** is fully released from any engagement within the cavity **21** but complete removal therefrom requires that the cartridge be simply grasped and removed by the operator.

Alternatively, the operator may also remove the cartridge **27** while the lock and release mechanism **45** is in its first stable position with firm outwardly pull on the cartridge **27,** causing the force thereof to be translated through the groove **27***a* to the roller **61.** Movement of roller **61** causes the arm **53** to pivot about **55** thereby actuating the overcenter spring **57** and biasing the linkage to its second stable position whereby the cartridge **27** is released for subsequent removal from the cavity **21.**

The tape cartridge **27** is also expeditiously moved from its first stable cartridge lock position to its second stable cartridge release position by the tape cartridge ejection mechanism **25** in accordance with the present invention. In some mounting positions for the tape player **10** as under the dashboards of automobiles, it may not be desirable nor possible to apply the force required to remove the cartridge **27** unless the lock and release mechanism **45** is already in its second position. As previously explained, the tab **50** serves as the actuating member for the lock and release mechanism **45** upon cartridge insertion, and now it will be explained how the ejection mechanism **25** serves as the actuating means for releasing the cartridge **27** from the cartridge lock position.

The ejection mechanism **25** also comprises a linkage including a first or actuated member **70** serving as an elongated pivotable cam means pivotally mounted to the bottom plate **29** by rivet **72** and having a free end **71** connected by linkage rod **74** to other linkage members of the ejection mechanism. The linkage includes

a linearly actuable second or actuator member **75** best shown in FIG. **5** which is slidably mounted to the front wall **15** of the housing enclosure **11** by the rivets **76** being received within an aligned one of a pair of elongated slots **77** and **78** in the wall **15.** When considering the orientation of the tape player **10** shown in FIG. **1,** the slots **77** and **78** are generally vertical slots, and the rivets are conveniently oriented to pass through the vertical slot **77.** The length of the slot **77** may be provided slightly longer than that of the slot **78** so that the slot **78** determines the extent of movement of the actuator **75.** The actuator **75** includes the arm **23** thereon aligned to project through the slot **78** in the front wall **15** as explained in connection with FIG. **1** for moving the actuator **75** from an unactuated position as shown in FIG. **6** to an actuated position as shown in FIG. **7.**

The linkage further includes a third or bell crank member **80** serving as a motion converting means whereby motion of the actuator **75** to its actuated position is transmitted through the rod **74** into a pivotal movement of the actuated member **70** about **72** to the position indicated by the dashed lines of FIG. **4.** The bell crank member **80** is pivotally mounted to the front wall **15** by a rivet **81,** has an offset end portion **82** suitably connected to the free end of the rod **74,** and is mechanically coupled to the actuator **75** by rivet **83.** Rivet **83** is received within an elongated slot **84** of actuator **75** so as to allow generally horizontal movement of the mechanical coupling between the members **75** and **80** as the actuator **75** has generally vertical movement within the slots **77** and **78.** It is to be noted that the pivot axis at **81** is offset (to provide a lever arm) from the mechanical coupling between the members **75** and **80** at **83** so that the bell crank **80** pivots about **81** with a generally vertical movement of the actuator **75.** This pivotal movement of the crank **80** is then converted into a generally horizontal movement of the rod **74** and transmitted directly to the actuated member **70.** Also, it is apparent that with suitable positioning of the members **75** and **80** on the front wall **15** with respect to the member **70,** the linkage rod **74** could be eliminated.

The actuator arm **23** has a stop surface **23***a* engageable with the bottom of the slot **78** to limit the downward movement of the actuator **75,** and is provided with a protrusion **23***b* and an adjacent aperture **23***c* to permit a suitable exterior button (not shown) to be attached thereto. Further, the actuator **75** has opposite guide rails **85** thereon for engaging the rear of the front wall **15** to stabilize any irregular movement thereof as it is moved to its actuated position.

To facilitate the movement of the arm **53** of the lock and release mechanism **45** by the actuated member **70,** the member **70** is provided with a cam edge **73** along one edge portion thereof adjacent the rivet **72** and positioned to be engaged by the extension arm **53***a* of the arm **53.** With the lock and release mechanism in its first stable cartridge lock position, the extension arm **53***a* is in contact with the cam edge **73** as shown in FIG. **4** whereby the cam edge works against the extension arm **53***a* with a mechanical advantage to move the arm **53** from its first stable position a sufficient distance for the spring **57** to become unbalanced.

The spring **57** snaps the arm **53** to its second stable position, and in accordance with the cartridge movement described previously, the tab **50** and roller **61** of the lock and release mechanism **45** combine to move the cartridge **27** to the cartridge release position. The actuated member **70** is returned to its unactuated position by a return bias spring **87** connected between the movable free end **71** of the member **70** and a fixed connection **89** on the bottom plate **29.** The return movement of the member **70** is effective to return the actuator member **75** and the bell crank member **80** to their initial or unactuated positions.

It should be apparent that although the actuated member **70** is preferably provided as pivoted cam means, the forward movement necessary to react against the arm **53** to provide the movement thereof from its first position the predetermined distance to activate the spring **57,** could as well be provided by a slide mechanism similar to the slide **47** which could be pulled forward against the return bias spring **87** by a direct connection with linkage means similar to the linkage rod **74.** While the present invention has been shown and described with reference to the preferred embodiments thereof, the invention is not limited to the precise forms set forth, and various modifications and changes may be made therein without departing from the spirit and scope thereof.

I claim:

1. An ejection mechanism for use with an electronic-type tape player device including a housing having two substantially perpendicular and intersecting outer walls, a cartridge receiving cavity accessible through an opening in a first one of said walls, for holding an insertable tape cartridge, and an operable bi-stable cartridge lock and release mechanism movable in one direction to a first stable position for releasing said tape cartridge from said cavity, said ejection mechanism including in combination: a first, cam member mounted for movement in a first plane and engageable with said cartridge lock and release mechanism for moving the same to its first stable position whereby said cartridge is moved toward said access opening in said first wall of said housing for removal from said cavity, a second, actuator member extending outwardly from said second housing wall and movable linearly in a second plane generally perpendicular to said first plane, and a motion converting means coupled to said first and second members and being mounted for movement therebetween to translate the linear movement of said second member in said second plane into a corresponding movement of said first member in said first plane, said motion converting means including a member mounted for pivotal movement and coupled at one end to said second, actuator member and link means coupled to and interposed between said pivotal member and said first member.

2. The ejection mechanism of claim **1** wherein said lock and release mechanism has a second stable position for locking said tape cartridge in said cavity, and said first member of said ejection mechanism comprises an elongated pivotable cam means including a free end thereof connected to said motion converting means and a pivoted end mounted adjacent said lock and release mechanism and having a first cam edge engageable therewith to move the same from said second stable position with movement of the free end of said cam means by said motion converting means.

3. The ejection mechanism of claim **1** wherein said pivotal member comprises a pivotal bell crank mechanically coupled to said second member and having a pivot axis removed from said mechanical coupling to provide movement of said first member in said one di-

rection with movement of said second member in said other direction.

4. In an electronic-type tape player device including a housing having two substantially perpendicular and intersecting outer walls, an opening in one of said outer walls providing access to an internal cartridge receiving cavity, a bi-stable cartridge lock and release mechanism operable in a first plane between first and second stable positions by a snap-acting overcenter means for locking a tape cartridge within said cavity in said first position and for releasing said cartridge for removal from said cavity in said second position, an ejection mechanism including in combination: a linearly actuable slide member having an actuator arm extending outwardly of said player device from the other of said two outer walls, said actuator arm being movable in a second plane generally perpendicular to the plane of movement of said lock and release mechanism for providing movement of said slide member to an actuated position, a cam means internal to said housing and movable in said first plane, said cam means being engageable with said lock and release mechanism for moving the same from said first stable position to cause said overcenter means to move said lock and release mechanism to said second stable position with a snap-acting movement whereby said tape cartridge is released, and a motion converting means including a member mounted on said housing for pivotal movement and coupled pivotally to said slide member and link means coupled to and interposed between said pivotally mounted member and said cam means for converting movement of said slide member in said second plane to a corresponding movement of said cam means in said first plane.

5. The ejection mechanism of claim 4 wherein said one wall containing said access opening is a side wall of said housing and said other wall providing access to said actuator arm is a front wall of said housing.

6. The ejection mechanism of claim 5 wherein said front wall includes an opening therein, and said slide member is slidably mounted on said front wall and has said actuator arm extending through said opening and movable therealong.

7. In an electronic-type tape player device including a housing having two substantially perpendicular and intersecting outer walls, an opening in one of said outer walls providing access to an internal cartridge receiving cavity extending horizontally within said housing, a bi-stable cartridge lock and release mechanism movable between first and second stable positions by a snap-acting overcenter means, said lock and release mechanism locking an insertable tape cartridge within said cavity in said first position and releasing said cartridge for removal from said cavity in said second position, an ejection mechanism including in combination: an actuator member extending outwardly from the other of said two walls and movable vertically along said wall to an actuated position, an actuated member internal to said housing movable horizontally and engageable with said lock and release mechanism for moving the same from said first stable position in response to the movement of said actuator member to said actuated position whereby said tape cartridge is released, and motion converting means coupled between said actuator and actuated members to convert the vertical movement of said actuator member to horizontal movement of said actuated member, said motion converting means including a member mounted for pivotal movement on said housing and coupled pivotally to said actuator member and a link member interposed between and coupled to said pivotally mounted member and said actuated member, said pivotally mounted member being pivoted in response to the movement of said actuator member vertically to move said link member to drive said actuated member into engagement with said lock and release mechanism.

8. The ejection mechanism of claim 7 wherein said one wall containing said access opening is a side wall of said housing and said other wall providing access to said actuator member is a front wall of said housing.

* * * * *