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[54] **TAPE PLAYER**
12 Claims, 13 Drawing Figs.

[52] U.S. Cl. **274/4,**
242/55.19A, 242/181, 242/198; 179/100.2

[51] Int. Cl. **G11b 5/00**

[50] Field of Search. **274/4;**
242/55.13; 179/100.2, CA, MI, Z

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ABSTRACT: The present invention is an improvement in tape recorders, and provides a new mounting mechanism in the tape player onto which a two reel type tape cartridge is mounted including an elevator for moving said two reel-type tape cartridge in its width direction, as well as a sliding table on this elevator, and at the same time permits interchangeability between said two reel-type tape cartridge and either or both of a single reel-type tape cartridge with pinch roller or without pinch roller, thereby enabling the playing of many different types of cartridges with the same tape player for which in the past a plurality of tape players have had to be used.

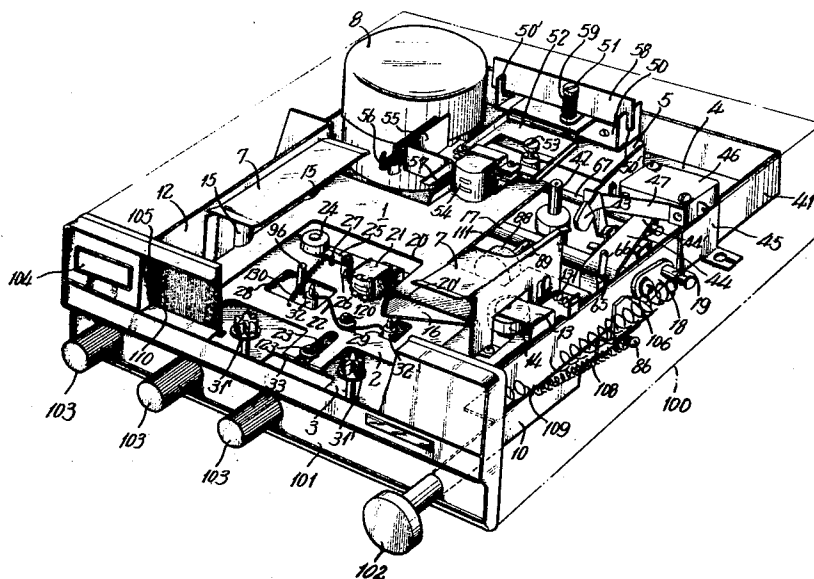
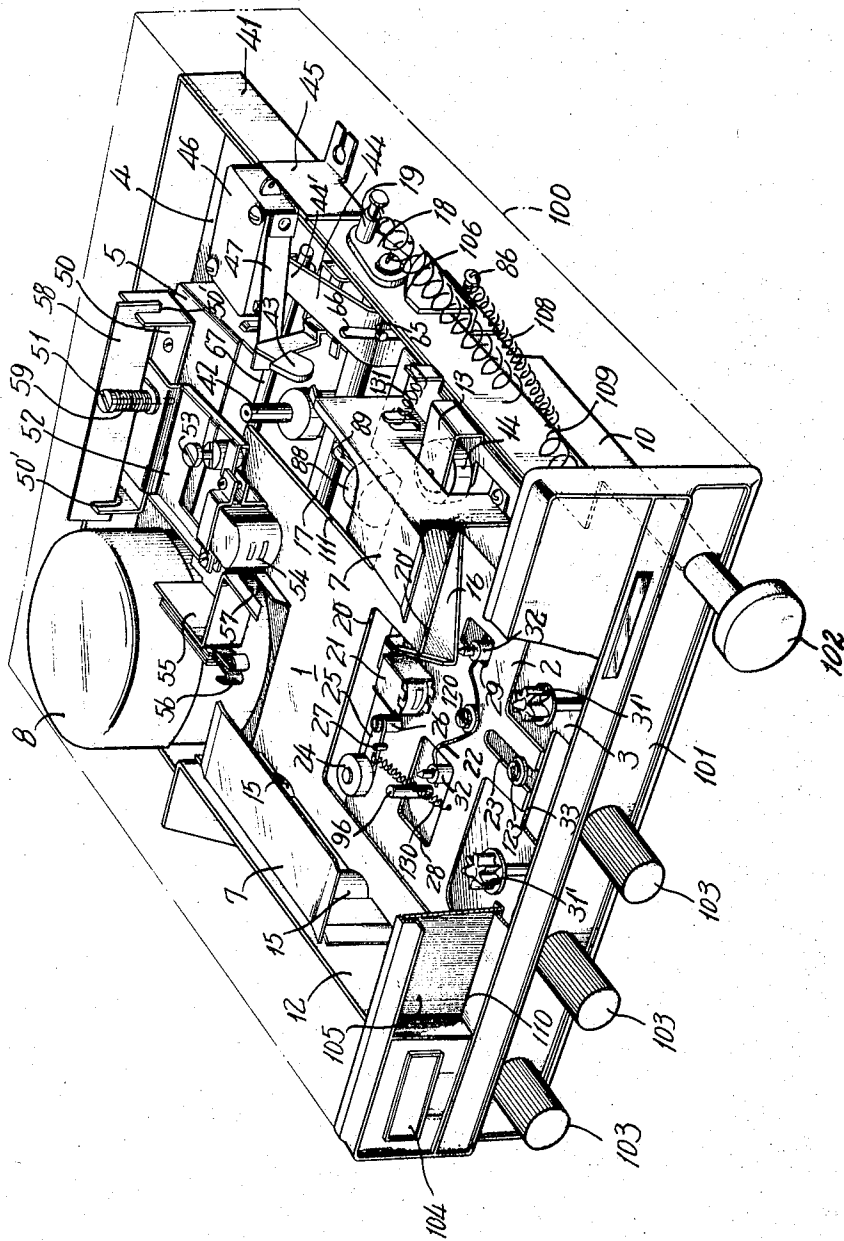
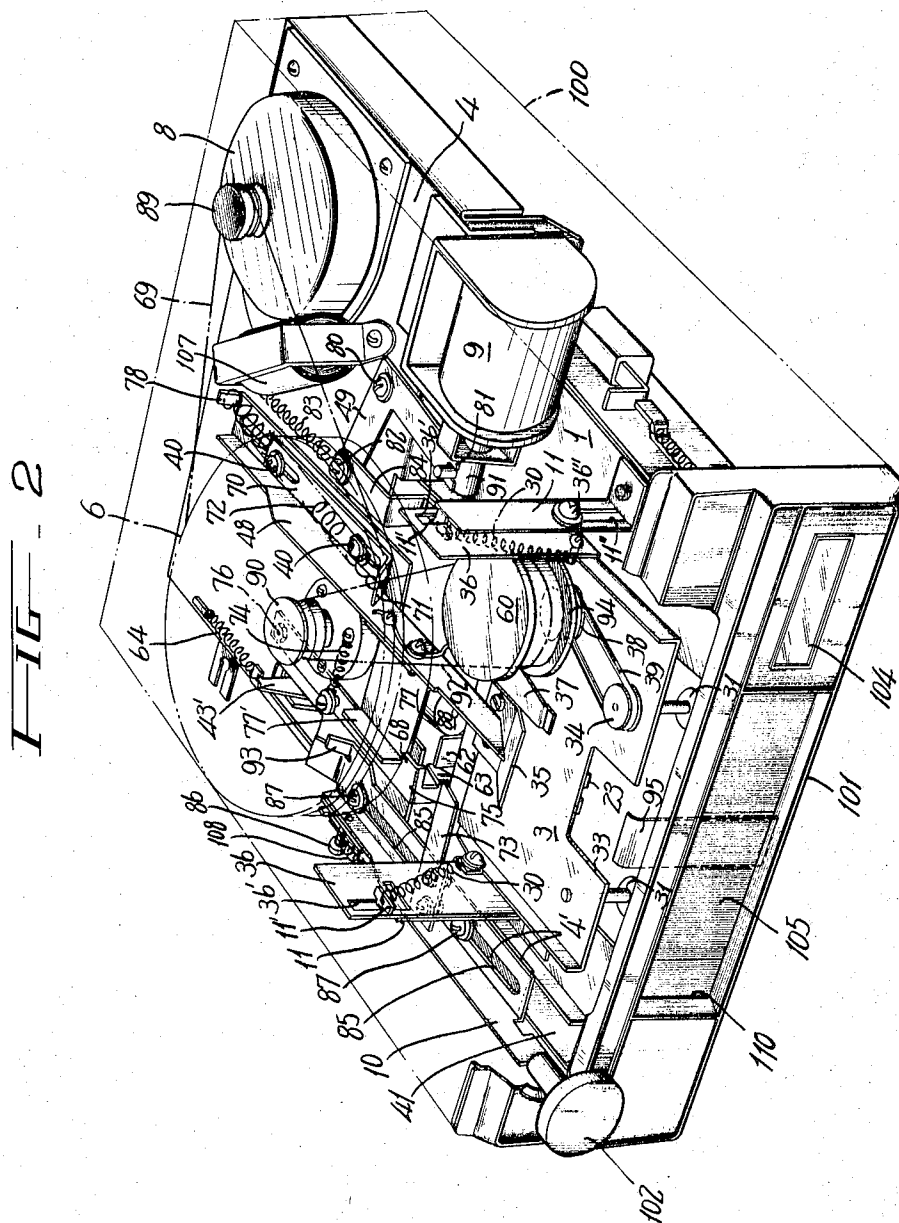


FIG. 1



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FIG. 3

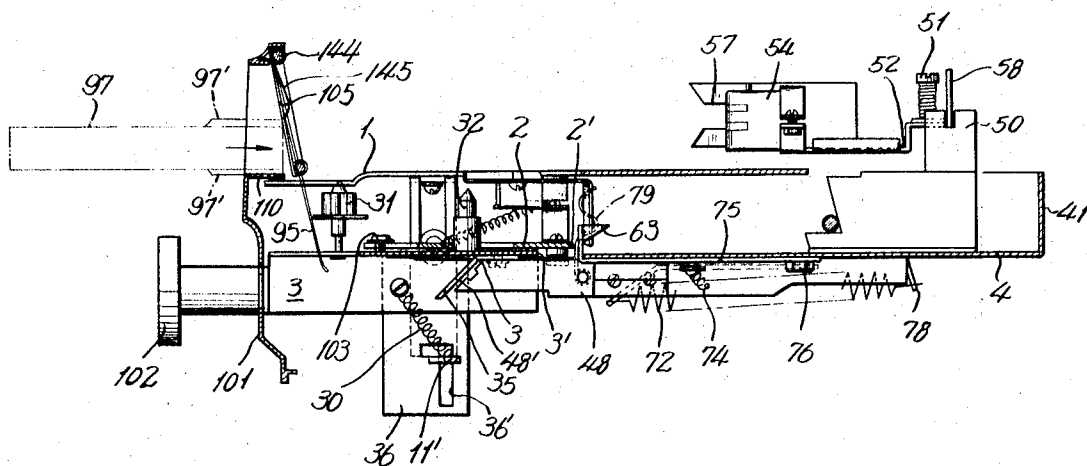


FIG. 4

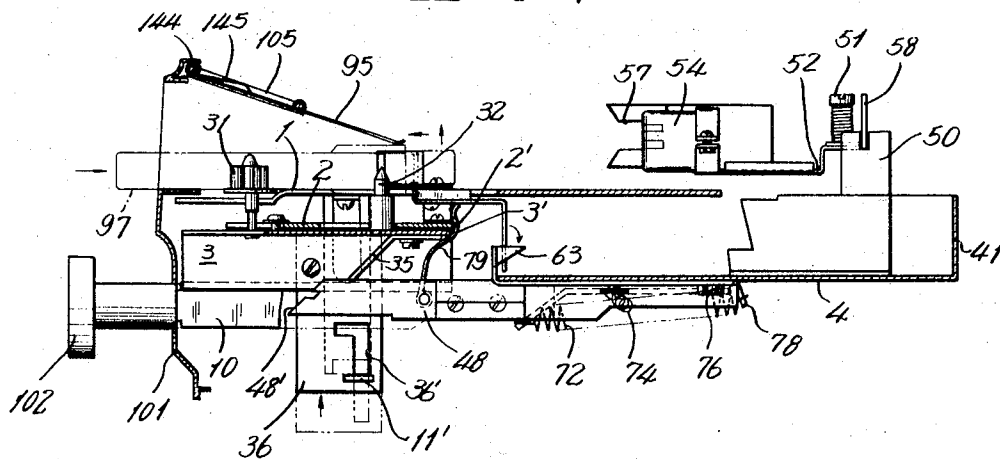
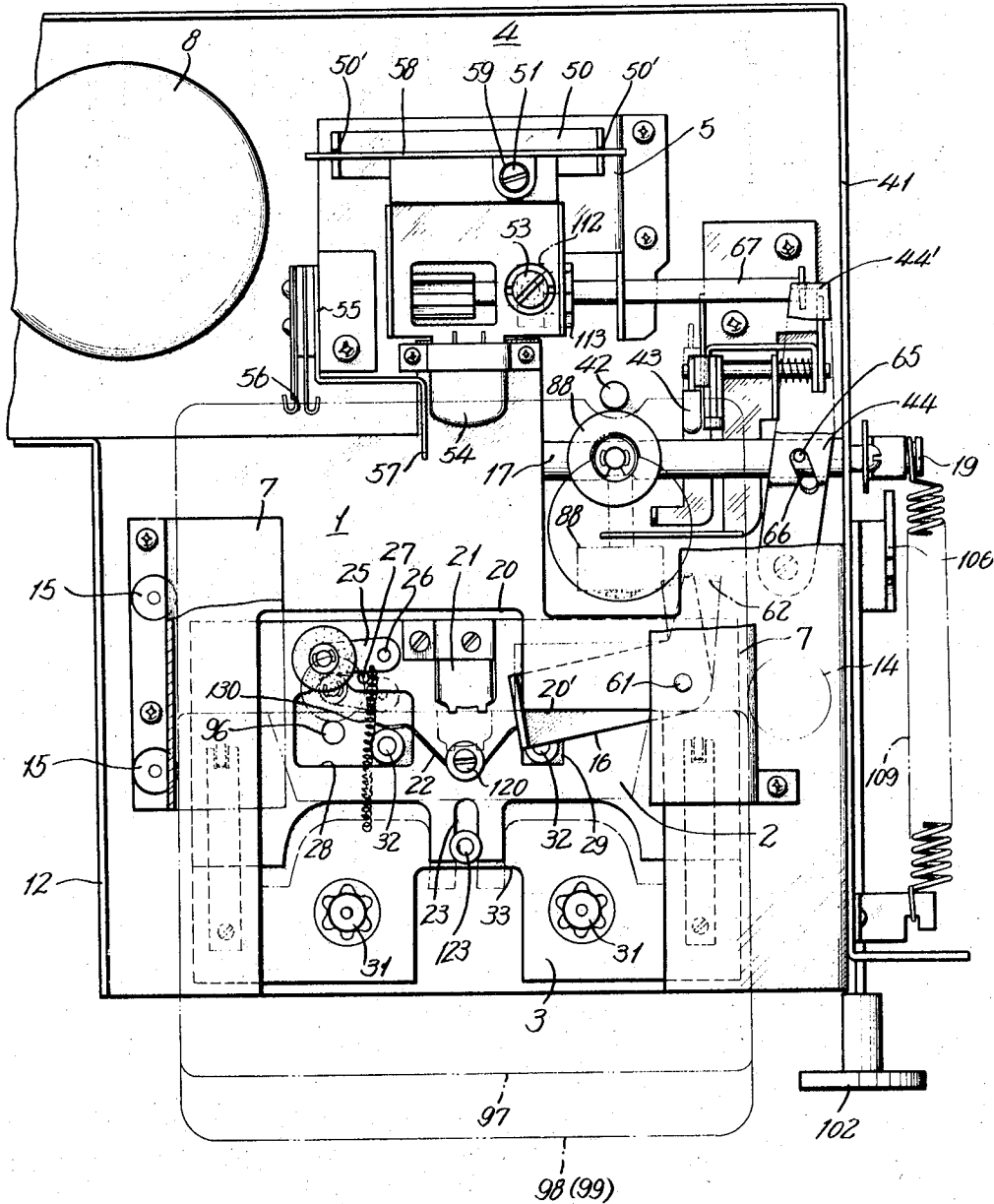


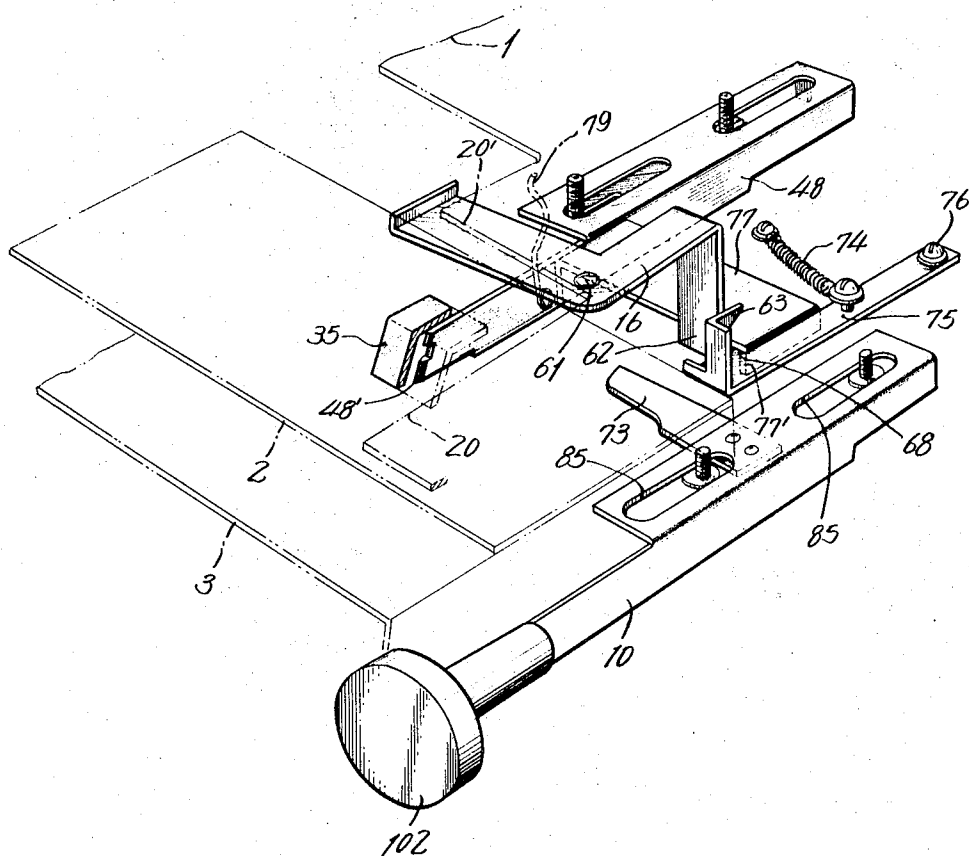
FIG. 5



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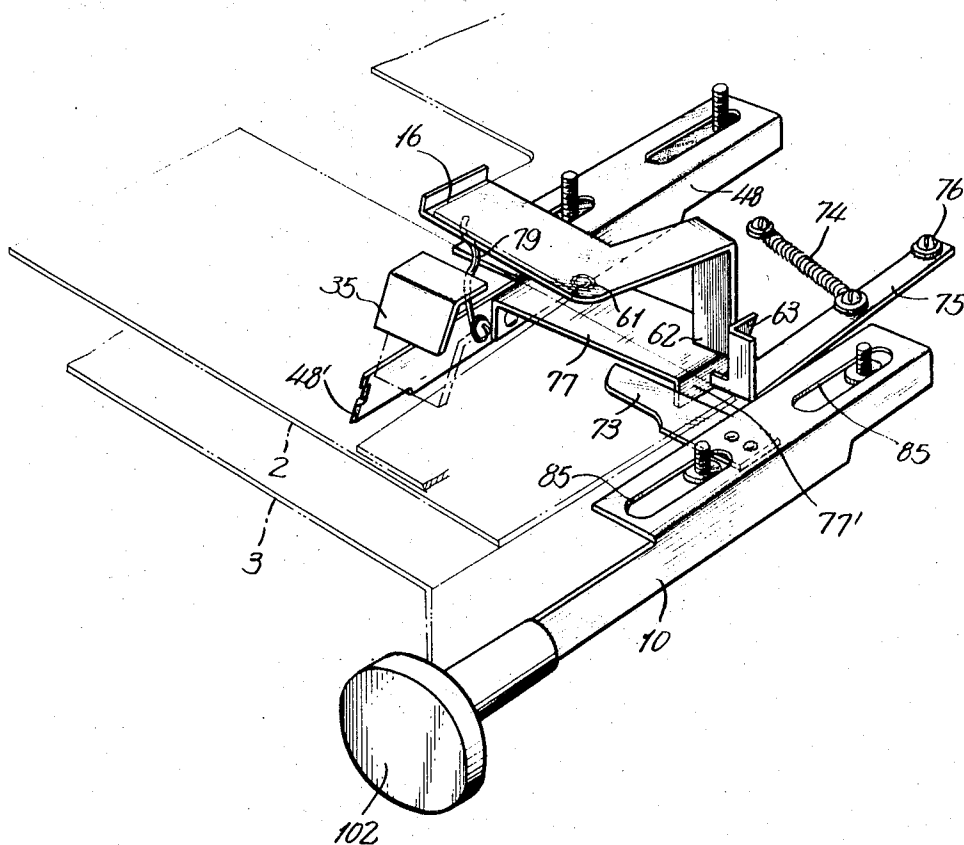
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FIG. 6



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FIG. 7



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FIG. 8

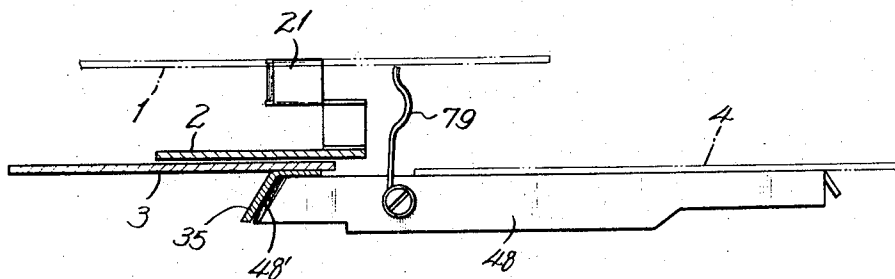


FIG. 9

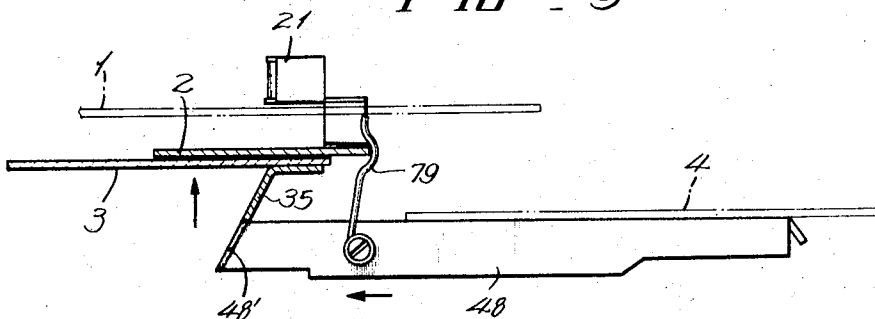


FIG. 10

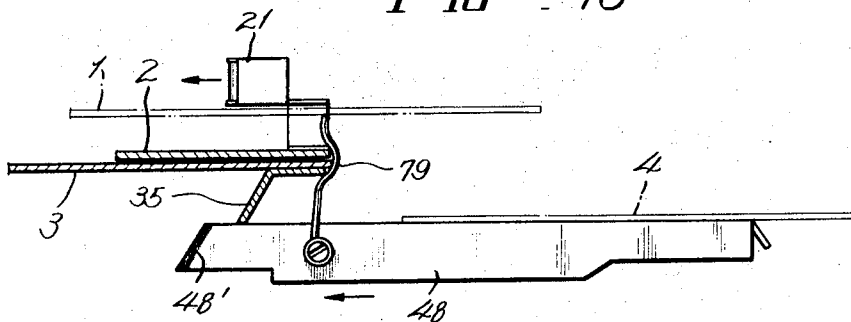
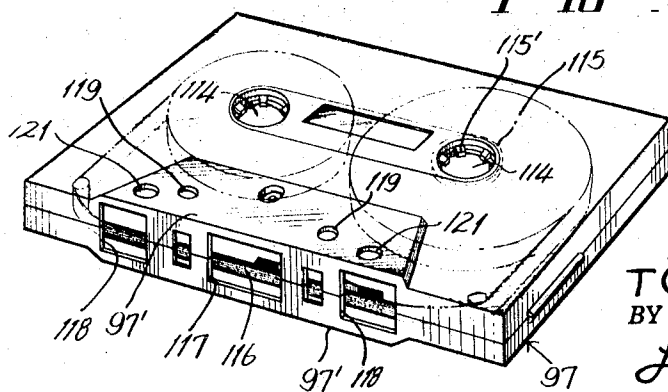


FIG. 11



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FIG. 13

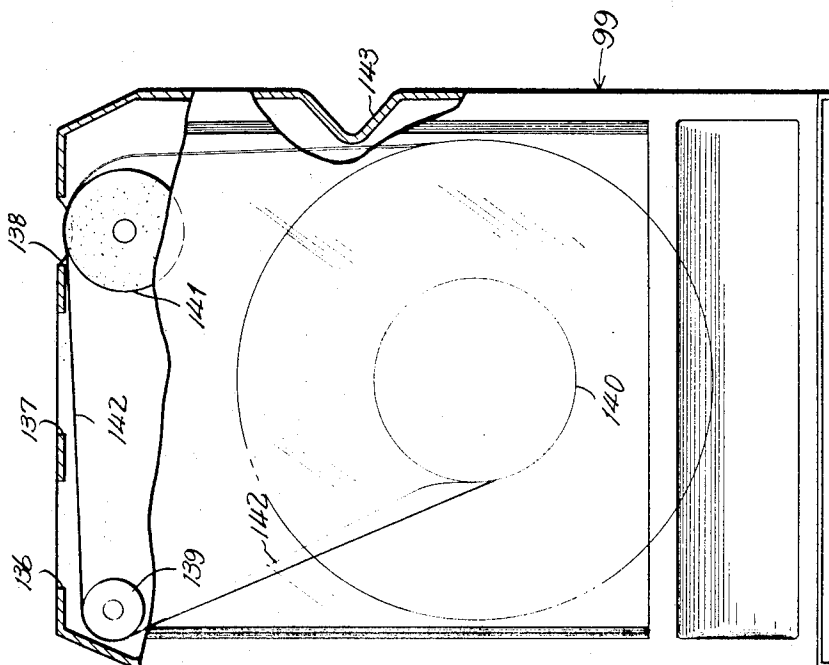
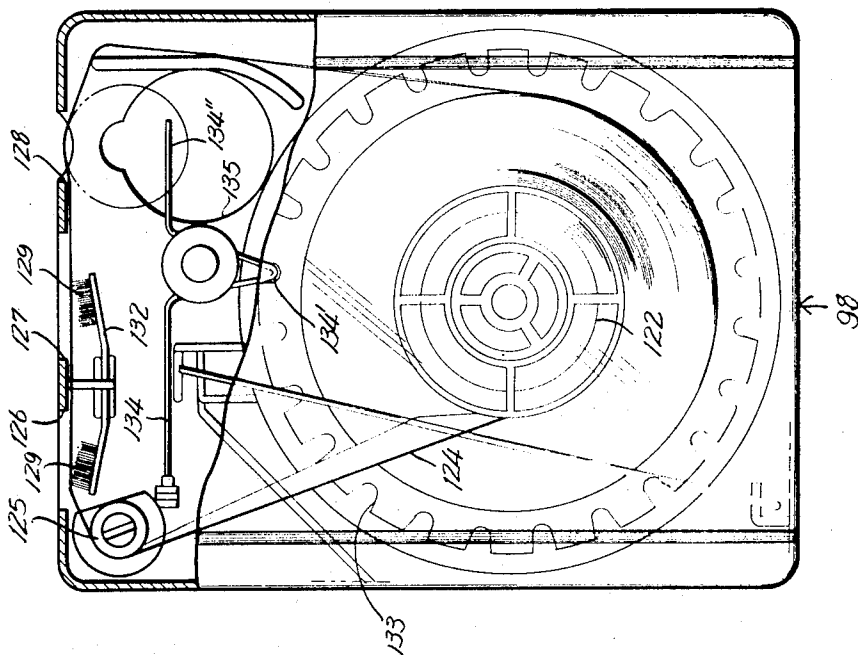


FIG. 12



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TAPE PLAYER

DETAILED EXPLANATION OF INVENTION

The present invention relates to an improvement in tape players, which offers a new mechanism of engaging and disengaging a two reel type tape cartridge and which is also available for either one or both of a two reel type tape cartridge and a one reel type tape cartridge with a built-in pinch roller or one reel type cartridge without a built-in pinch roller.

It is the conventional practice to mount a tape player with a cartridge-type tape for recording or playing back. It is also well known that for the purpose of transmitting the driving force in said cartridge type tape there is a cassette type using two reels or the so-called Phillips type (represented by Phillips of Holland). This two reel-type tape cartridge is compact and light weight with various advantages owing to its being a two reel type, but in engaging said cartridge with a disengaging it from the tape player, two reels must be fitted to respective drive shafts. This would be possible in tape players for indoors whose top is open, but in the case of tape player whose top must be closed as when mounted in a dashboard in the cab of a car it is impossible to engage with and disengage the cartridge from the tape player, namely, as the cartridge can be only inserted in the direction of its length or width, such push operation will not fit the shaft into the reel hole the cartridge which is provided in the direction of thickness. There is a vast difference in the tape feed mechanism as well as in the shape and size of cartridges between said two reel-type tape cartridge and a one reel type tape cartridge with an endless tape would round the reel fed by the pinch roller attached to the tape player, or a one reel-type cartridge with an endless tape wound around the reel fed by the pinch roller built in the cartridge. Besides, since the tape itself differs in width, being 3.125 mm. for one and 6.25 mm. for the other cartridge, it is impossible to use the same tape player for both types of cartridges, and it is uneconomical to provide separate tape players for these two different types of cartridges. Even greater inconvenience and difficulty will arise, if in said narrow cab a plurality of tape players is installed on the part of the dashboard or a spare tape player is always kept in the cab to be ready to be substituted for the other player. Accordingly in a common passenger car, only a single tape player suiting either for the two reel type, the one reel type without a pinch roller, and the one reel type with a built-in pinch roller is provided; and the cartridge of the adopted type is exclusively employed. Particularly the two reel type is not interchangeable with other types.

The present invention successfully solves the above-mentioned difficulties of the conventional types of cartridges. That is to say, the fundamental object of this invention is to offer a two reel-type tape cartridge which is mountable to be ready for tape feeding with the reel shafts fitting into the two reel holes (one of which is driven at least), merely by inserting the cartridge in the direction of its width. For this purpose, in this invention the reel shaft fitted in the reel is vertically lifted at the instant when the inserted two reel-type cartridge reaches the specified position; thereby, the insertion of said cartridge along the table surface is not hindered by the reel shaft, and when the cartridge is inserted up to the specified position, the two reel shafts perfectly fit into the reel holes, assuring accurate tape feeding. Also in this invention, a sliding table with a head moves together with said elevation of the reel shafts; and said head fits into the open end of the two reel type cartridge thus inserted and comes into close contact with the tape in said cartridge. In this manner, the head can be kept effectively in contact with the tape housed in and fed out of the reel type cartridge, enabling proper play back, erasing or recording. Since the reel shaft is provided on an appropriate elevator and can vertically rise through the opening in the main table, the fitting of the two reel-type cartridge into the reel hole is extremely precise, and similarly the head, etc. can very smoothly go into the insertion hole of the cartridge thus fitted to the reel shaft, ensuring exact action all the time.

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Another important object of this invention is to establish interchangeability between said two reel-type tape cartridge and either of the one reel-type tape cartridge without built-in pinch roller and the one reel-type tape cartridge with a built-in pinch roller; and to enable joint use of a single tape player for said two reel-type tape cartridge and any of the above-mentioned one reel-type cartridges. As above described, there is a wide difference between the two reel-type tape cartridge and either of the above-mentioned one reel-type cartridges.

10 Namely, the basic difference is the number of reels, one or two; not only the shape of cartridge differs very much in itself, but also the type would in it greatly differs in width. Of course, there is too a considerable difference between one reel-type cartridges, depending on the presence or absence of pinch roller or the number of recording tracks, but the size and shape of the cartridge are approximately the same, and the type is equally one reel, with the same tape width of 6.25 mm. and nearly the same speed of tape feeding, i.e., 9.5 cm/sec. Therefore, it will be easily understood how more difficult it is to make interchangeable one reel-type and two reel-type cartridge than to make interchangeable one reel-type without built-in pinch roller and one reel-type with a built-in pinch roller. The present invention aims at solving this difficulty and attaining the interchangeability between two reel-type tape cartridge and one reel-type tape cartridge. For this purpose, the subtable having a reel shaft to fit into the reel hole of said two reel-type tape cartridge is lowered when a one reel-type tape cartridge is inserted; and at the same time, the head or the detector for said two reel-type tape cartridge is similarly lowered. Particularly, the head and the detector, which must be rightly inserted into the opening of cartridge and thereby must come into close contact with the surface of the tape fed into the cartridge, are withdrawn from the two reel-type cartridge before being lowered, and afterwards then are lowered together with the subtable having a reel shaft, etc. Thus, in a tape player for recording and play back with two reel-type tape cartridge, the components for two reel-type cartridge such as the head and the reel shafts, can be held in the lowered condition when said cartridge is not used; and accordingly either of the one reel-type cartridge can be engaged and disengaged without hindrance.

Still another object of this invention is to offer a tape player which can be commonly used for of the three kinds of the above-mentioned two reel-type tape cartridge, one reel-type tape cartridge with a built-in pinch roller and one reel-type tape cartridge without a built-in pinch roller. As described above, the common use of the same tape player between two reel-type cartridge and either of one reel-type with a pinch roller and one without a pinch roller is attained in this invention by the vertical moving up and down of the head, etc. together with the reel shaft. Further, the common use of the same tape player between one reel-type cartridges with a pinch roller and one reel-type cartridges without a pinch roller is attained in this invention by the switching up or down of the pinch roller of either type of one reel-type cartridge provided in the tape recorder. The same effect may be attained for recording and playing back by adjusting the height of the head to the height of the track provided on the tape and inserting either a 4-track (two channels) one reel-type cartridge without built-in pinch roller or an 8-track (four channels) one reel-type cartridge with built-in pinch roller, with a cam for changing the track.

Another object of this invention is to permit the engaging and disengaging of the above-mentioned different cartridges in the same manner. Namely, the same fitting hole is employed to make any of these cartridges ready for use, and the same pushbutton is pressed to bring any of these cartridges into the condition ready to be disengaged. In this manner, all the different cartridges can be operated in the same way, and can be utilized very easily and smoothly.

Another object of this invention is to stabilize the fitted condition of the inserted two reel-type tape cartridge. As already described, the two reel-type tape cartridge is shorter and con-

siderably thinner than any of the above-mentioned one reel-type cartridges. If inserted at the same hole as intended for the one reel-type cartridge and moved by the same guide as intended for the one reel-type cartridge, such a two reel-type tape cartridge will not be stabilized in its fitted condition because there is too large a clearance between the guide and the hole, and even if fully inserted the two reel-type cartridge will be able to move up and down freely. In this invention in order to stabilize such two reel-type cartridge, the vertically moving elevator is added with another pair of fitting shafts to engage the inserted end of the cartridge inserted together with the reel shafts, so that said inserted end of the cartridge may be fixed to the head, etc., thereby the pushing force of the pressed head, etc. will be prevented from withdrawing the inserted end of the cartridge. When in this condition, the head, etc. go into the opening of the inserted end of cartridge, the inserted end of this two reel-type cartridge will not be moved either in a longitudinal or in vertical direction, is thus stabilized in the very much fitted condition.

Still another object of this invention is to make the inserted two reel-type cartridge exactly perform the function of lifting the elevator equipped with the reel shafts, etc. for said cartridge. As explained above, when a two reel-type cartridge with less thickness is inserted at the same hole as intended for the one reel-type, the inserting operation will not reliably cause a lifting of the elevator, because of uncertainty as to what part of the large hole the two reel-type cartridge is introduced into. In this invention, for the purpose of making fixed the inserting position of the two reel-type cartridge, there is at the inserting hole provided an opening and shutting door, which is equipped with an appropriate spring pressing the inserted cartridge all the time so that the inserted end of the two reel-type cartridge which is considerably thinner than the cross-sectional area of the hole may be always pressed against the main table which is equipped with a working piece which causes the rising movement of said elevator. Thus the inserted cassette-type cartridge will always exactly cause the rising movement of the elevator.

Many other features, concrete composition and functional effect of this invention will be more precisely understood by referring to the embodiment of this invention illustrated in the attached drawings, of which:

FIG. 1 shows a tape player of this invention with its casing removed as viewed obliquely from above;

FIG. 2 shows the same tape player with its casing removed as viewed obliquely from below;

FIG. 3 shows the tape player just before a cassette-type cartridge is being inserted and explains the relation of its components;

FIG. 4 shows the tape player just after the cassette-type cartridge has been inserted and explains similarly the relation of its components;

FIG. 5 shows a plan view of the tape player according to this invention, the solid line indicating its condition with no cassette cartridge inserted and the dotted line indicating its condition with a cassette-type cartridge inserted;

FIGS. 6 and 7 are respectively oblique views of the pushup bar, the working member and the sliding bar with a pushbutton, FIG. 6 showing the conditions with no cassette-type cartridge inserted in FIG. 7 showing the conditions with a cassette-type cartridge inserted;

FIGS. 8 to 10 illustrate the actions of the elevator and the sliding table as caused by the pushup bar, FIG. 8 showing the condition of the pushup when not acting at all, FIG. 9 showing the condition of the pushup after having pushed up the inclined plate, and FIG. 10 showing the condition of the elastic rod of the pushup bar when further acting on the sliding table and causing the latter to slide;

FIG. 11 shows an oblique view of a typical two reel-type tape cartridge to be employed in this invention;

FIG. 12 shows a partially exploded view of a one reel-type tape cartridge with no built-in pinch roller; and

FIG. 13 shows a partially exploded view of a one reel-type tape cartridge with built-in pinch

Referring to these FIGS., a decorative frame 101 is furnished in the front of the casing 100; in said frame 101 are arranged a pushbutton 102 for operation to take out the cartridge and control unit 103 respectively controlling the sound volume, tone quality and making a selection; in the upper of these members are arranged a channel indicator 104 and a cartridge insertion hole 110, said cartridge insertion hole 110 providing with an opening-shutting door 105 whose top edge is set to said decorative frame 101 and said door 105 closes all the time said insertion hole 110 by means of the elasticity of the material which constitutes said edge. Said decorative frame 101 is connected by a connector 12 whose one side is fitted to one side of the main table 1, and the other side of which is fitted to the sidewall 41 formed by turning up the edge of the fitting table 4 connected at the inner place of the main table, said sidewall 41 extending to be fixed to the decorative frame 101. In the opening 20 formed in front of the main table 1 are located an elevator 3 and a sliding table 2 provided slidably on said elevator 3. Said elevator 3 is installed to move freely up or down between the guide frames 11, 11 which are opposite each other on both lower sides of said main table 1, as shown in FIG. 2; namely, on both sides of the elevator 3 are arranged the perpendicular pieces 36, 36 oppositely to each other. In the L-type guide hole 36' provided in the perpendicular piece 36 is inserted an engaging piece 11' formed by bending the tip of the guide frame 11, and in the guide hole 11'' formed on the base of the guide frame 11 is inserted an engaging piece 36 hole 11'' formed on the base of the guide frame 11 is inserted an engaging piece 36'' fixed to said perpendicular piece 36, thereby enabling the rising and falling motion. Moreover, a spring 30 is stretched between the engaging piece 11' and the elevator 3. Meanwhile on the top of said main table 1, guides 7, 7 for cartridges are provided opposite to each other in the inner end of said insertion hole 110, said guides 7, 7 constituting a cartridge guide together with said main table 1. One of these guides 7, 7 is, in on the inside of the said guide 7, provided rotatably with rollers 15, 15 mounting appropriately, and another shows the roller 14 of the roller bracket 13 equipped with a spring 131, thereby guiding the cartridge as it goes into or out of the insertion hole 110. The thickness of a guiding portion of the cartridge guide formed by the guides 7, 7 and the main table 1, is made, as described later, to control the thickness of one reel-type cartridges 98, 99. Further, a step 20' is formed in the opening 20 provided to expose the elevator 3 or the sliding table 2 of this side from the center in the main table 1, and at the bottom of this step 20' is provided, as seen from FIG. 5, a working member 16 whose center is pivoted to the main table 1 by pin 61, and as described later in detail, said working member 16 is to be operated by the catch of its projection 97' at the moment of the insertion of a two reel-type cartridge 97. Moreover, another opening 111 is provided at the inner portion of the main table 1. Across this opening 111 lies a rotating shaft 17 fitted with a pinch roller 88 and on its outward portion, projecting through said sidewall 41, said rotating shaft 17 is fixed with crank plate 18, at the end of which is fixed a connector 19; and there is a spring 109 stretched between said connector 19 and the edge of said decorative frame 101 or said sidewall 41.

The sliding table 2 is slidably provided on the elevator 3 and there is a head 21 corresponding to the two reel-type cartridge at the farther end of this table 2; and further, both ends of the elastic rod 22 attached to the fixed post 120, at its center, engages the bases of two fitting shafts 32 installed on the elevator 3, thereby always pushing the sliding table 2 forward. For the purpose of guiding this sliding action, a guide slot 23 is formed on one side of the center of said sliding table 2, and a guiding pin 123 fixed to the elevator 3 is engaged in said guide 23. Also at the farther end of said table 2, there is, adjoining to said head 21, and supported on a pivot pin 26, the base of an arm 25 having at its tip a pinch roller 24 for the two RT cartridge. A spring 130 is stretched between the center of said arm 25 and the sliding table 2, and the movement of said arm 25 due to this spring 130 is halted at a fixed position by the

stopper 27 provided on the sliding table 2. Moreover, on said table 2 there are oppositely arranged the openings 28, 29 on both sides of the fixed post 120 for exposing the fitting shaft 32 of the elevator 3.

As described above, the elevator 3 is equipped with opposite fitting shafts 32 on both sides at the inner portion thereof, and moreover it is equipped with opposite reel shafts 31, 31 on both sides of the opening 33. One of these shafts 31, 31 is fixed with a small pulley 34, as shown in FIG. 2, on the back side of the elevator 3; and a drivebelt 39 is wound between said pulley 34 and the intermediate pulley 38 which is driven through the flywheel 6 and the intermediate wheel 60 from the drive pulley 89 of the motor 8. Said belt 39 may be so wound as to make the drive pulley 89 directly drive the middle wheel 60 by appropriately determining the dimension of the drive pulley 89 and the intermediate wheel 60 without the flywheel 6 and the small roller 90. Meanwhile, an inclined plate 35 is fixed nearly at the center of the bottom of such elevator 3, with this plate 35 facing the inclined edge 48' of the tip of the pushup bar 48 slidably arranged at the bottom of the fitting table 4. On one side this inclined plate 35 there is fitted a guiding member 37 which precisely guides the sliding movement of the sliding table 2 relative to the elevator 3. The pushup angle bar 48 slidably fitted at the bottom of the fitting table 4 and is made slidable by means of the fixing seat 70 fixed by the bolts 40, 40 at the bottom of the fitting table 4. There is stretched a tension spring 72 between the stop 78 formed by bending the tip, of bar 48 and the stop 71 formed in the fixing seat 70 as shown in FIG. 2; accordingly, said inclined edge 48' is all the time being pulled in the direction of the incline plate 35. At the midpoint of this pushup piece 48 there is fitted an engaging metal piece 77 formed by bending an engaging piece 77' at the tip. To said member piece 77 there is fitted another member 75 whose base is pivoted by the fitting pin 76 on the bottom of the fitting table 4 and the tip of said engaging member 75 is made to always face to the engaging piece 77' by the tension spring 74 stretched between said metal 75 and the fitting table 4. Moreover, the engaging piece 73 of the sliding bar 10 connected to said pushbutton 102 is to be engaged with and disengaged from said engaging piece 77'. Further an elastic rod 79 is fixed on the other side of midpoint of the said pushup bar 48, thereby the tip of said rod 79 acts on the edge of the sliding table 2. Further, at the bottom of the fitting table 4 there is an L-type working arm 49 pivoted at its midpoint by the pivot pin 80, the slot 81 provided at one end of said L-type working arm 49 being engaged with the working rod 91 of the plunger 9 and the connector 82 provided at the other end of said working arm 49 being linked to the interlocking piece 84 and having a spring 83 stretched from it to the fitting table 4.

The head seat 5 is fixed on the fitting table 4 and this seat 5 is fitted with a U-type support 50 having slotted arms 50' on both sides thereof. A bent support 58 is provided between these arms 50', 50' at the base of the head mount 52, in proximity to which passes an upright supporting shaft 51 on the head seat 5; the head mount 52 with a spring 59 on said supporting shaft 51 is so attached as to move said support 58 as the centers of the supporting arms 50', 50'. At the forward end of said head mount 52 is mounted a head 54 directly suiting either of the one reel-type cartridges 98, 99, mentioned earlier and to be described hereinafter more in detail. Moreover, at midpoint of the head mount 52 there is provided an adjusting shaft 53, the end of which is to come over either of the head position change cams 112, 113 provided on the camshaft 67 fitted parallel to and before said rotating shaft 17. A lateral movement of the tip 44' changes the direction of the shaft 67 by means of the rotation of pin 65, projected on the rotating shaft 17, in the inclined groove 66 formed in the bent portion of midpoint of the switching piece 44. In this manner, either the cam 112 or 113 is positioned just below the adjusting shaft 53, corresponding to the number of tracks (four) on the tape for a one reel-type cartridge without a pinch roller or to the number of tracks (eight) on the tape for a one reel-type

cartridge with a built-in pinch roller. At the side of the head 54 is attached a tape-guiding member 55 having a guide 57 at its tip together with a detector 56. Said detector 56 detects the channel end of the tape which is passed exactly before the head 54.

Further, a knock piece 43 is pivoted at one end of said rotating shaft 17, the lower end 43' of this knock piece 43 being projected through the back of the fitting table 4, as shown in FIG. 2, and this projecting portion 43' has a tension spring connected to the fitting table 4, whereby the upper end always projects into the insertion area of the cartridge 98 or 99 which is inserted between the guides 7, 7. When this knock piece 43 is, against the tension of said spring 64, pushed by the inserted cartridge 98 or 99, the spring 47 provided at the start switch 46 on the fitting table 4 is pressed, thereby closing the switch 46. Although not shown, because it is not essential to this invention, this knock piece 43 is fitted with an interlocking piece to effect the roller shaft 89 installed at right angles to the rotating shaft 17 so as to raise the pinch roller 88 for inserting a one reel-type cartridge 98 without pinch roller; and this interlocking piece is so arranged that the interlocking relation with the knock piece 43 may be released and the roller shaft 89 may not be raised on inserting a one reel-type cartridge 99 with a built-in pinch roller.

Each example of the cartridges to be employed in this invention is illustrated in FIGS. 11 to 13. FIG. 11 illustrates a two reel-type cartridge 97 which offers an important contrast in this invention. Said cartridge 97 uses a narrow tape of 3.125 mm. width as described; and there are two reel holes 114 provided at the center of a comparatively thin cartridge 97 with no special winding frame but the case itself is a frame. In these holes 114 rotatable fits a reel 115 whose projection 115' engages the projection 31' of the reel shaft 31. The tape 116 wound on the reels 115, 115 is guided by an appropriate guide member to the forward part of the cartridge 97 and brought to the head insertion hole 117 on the front of the cartridge or to the insertion holes 118, 118, for the pinch roller or the detector. Said forward part is formed with upper and lower steps 77', 77' so that the insertion holes 117, 118 may be amply constituted in the thin cartridge 97. Moreover, on this cartridge 97 there are the insertion holes 121 for two capstans 96 and the insertion hole 119 for the fitting shaft 32. The insertion of the cartridge, either side being the upper surface, enables the tape 116 to be played back and the selection (change) of other tracks accomplishes the purposes.

FIG. 12 illustrates an example of a one reel-type cartridge 98 without built-in pinch roller. The tape 124, being drawn from the center of the reel 122 rotatably provided in the center of the cartridge, is guided by the guiding piece 125 on one front side, passes through the insertion hole 126 of the detector 56, the insertion hole 127 of the head 54 and the insertion hole 128 of the capstan 42; and is again wound on the outside of the tape wound around the reel 122. The brushes 129, 129 attached on both sides of the elastic member 132 face toward to the said insertion holes 126, 127, thereby adequately pressing the tape 124 to the detector 56 or the head 54. A stop recess 133 is formed on the outer circumference of the reel 122 and in the position near to the guiding piece 125 is fixed the end of the elastic rod 134 having an engaging portion 134' to engage with and disengage from said recess 133; and the tip 134'' of the elastic rod 134 faces to the pinch roller hole 135 provided in the bottom of the cartridge 98. When the pinch roller 88 is raised in this hole 135, the engaging piece 134' is disengaged out of said recess 133, and when said pinch roller 88 is lowered, said engaging piece 134' engages with any of said recesses 133.

FIG. 13 illustrates an example of a one reel type cartridge 99 with a built-in pinch roller. Similarly to the case of the above-mentioned cartridge 98, in the front part of said cartridge 99 are arranged the respective holes 136, 137, 138 for the detector 56, the head 54 and the capstan 42; and a guiding piece 139 is provided on one front side of said cartridge 99. In the same way as described above as to the cartridge 98, the

tape 142, being drawn out from the center of the reel 140, goes from the guiding piece 139 through said insertion holes 136, 137, 138 to the pinch roller 141 provided on the other side, and then is wound on the outside of the reel 140. In this connection, a stop recess 143 is formed on the other side of such cartridge 99; when the roller 14 pressed by the spring 131 at the time of being inserted between said guide metals 7, 7 is pushed into said stop recess 143, said cartridge 99 can be inserted to the desired position.

To explain further details of the construction, the sliding bar 10 providing the cam 106 and the pushbutton 102 at both ends is equipped with a pin 86; a spring 108 is stretched between this pin 86 and the sidewall 41 or the decorative frame 101, thereby making the pushbutton 102 always pushed out of the decorative frame 101. Accordingly, as shown in FIG. 2, the sliding bar 10 can freely slide in the direction of the length of the guiding grooves 85, 85 within the scope limited by the pins 87, 87 and the guiding grooves 85, 85 provided on the projection 4' of the fitting table formed along the sidewall 41. On the tip of the sliding bar 10 is formed a bent engaging part 93 which, as it is pushed along, engages with the lower end 43' of the knock piece 43 and restores said piece 43, which has been pushed forward by the insertion of the cartridge 98 or 99, to the forward tilting position as shown in FIG. 1. Thus the knock piece 43 pushes back an appropriate amount the inserted cartridge 98 or 99 out of the cartridge insertion hole 110. As shown in FIG. 2, the tail end 62 of the working member 16 is in the front of the sliding table 2 and is positioned to the side of the pinch roller 88, and also faces the bent receiver 63 formed in one side of the tip of the engaging member 75. Thus, when the working member 16 is pushed by the insertion of the above-mentioned two reel-type cartridge, the push of the tail end 62 to said receiver 63 effects the end of the engaging member 75, thereby consequently pushing the engaging part 68 outside, with pivot 76 being a center, and in such a way that the engaging metal piece 77 is disengaged from the engaging part 68. Thus disengagement of the engaging metal piece 77 from the engaging part 68 forwards the pushup bar 48 by the force of the tension spring 72, and accordingly the inclined edge 48' pushes the inclined plate 35, and in consequence the elevator 3 is to be pushed up, resisting the spring 30. There is wound a belt 69 between the pulley 89 of the motor 8 and the flywheel 6 and also a wound belt 92 between a small roller 90 coaxially provided with said flywheel 6 and an intermediate wheel 60 coaxially provided with said pulley 38. Said intermediate wheel 60 has a comparatively wide, flat engaging groove 94 and it is so arranged that at the time of inserting a two reel-type cartridge, in each case when the elevator 3 and the sliding table 2 rise and when the elevator 3 and the sliding table 2 fall, said belt 92 can move up and down automatically by its tension in said flat groove 94, thereby in both conditions transmitting the rotating force and driving the intermediate wheel 60. Meanwhile, said small roller 90 is provided with said capstan 42 on the surface of the main table 1 (on the fitting table 4). The pivot 144 of the opening and shutting door 105 is equipped with a spring 145, which causes door 105 to close the insertion hole 110; also this door 105 is equipped with a holding spring 95, which effectively holds the inserted cartridge, particularly a two reel-type cartridge 97, in position on the main table 1. The revolutions of the flywheel 6 rotating together with the capstan 42, or those of the small roller 90 are obviously different from those of the intermediate wheel 60 which has a larger diameter than that of small roller 90 and that of the reel shaft 31. Accordingly, the tape driven speed given by the capstan 42 becomes obviously different from that given by the capstan 42 coaxial with the intermediate wheel 60, and that by the reel shaft 31; the former is designed according to the rate of tape feed with use of a one reel-type cartridge 98 or 99, with or without a built-in pinch roller; and the latter is designed to the rate of tape feed with use of a two reel-type cartridge.

To explain the function according to this invention, either of the one reel-type cartridges 98, 99, when inserted, passes

between the guides 7, 7; and being pushed along smoothly by rolling on the elastic roller 14 of the roller bracket 13 and the fixed rollers 15, 15 the end of the cartridge is opposite to the head 54, the capstan 42 or to the detector 56; and these come to go adequately into the opening of the cartridge 99, thereby assuring the contact with the tape. A little prior to this contact, the knock piece 43 is pressed by the cartridge 99 and, thereby depending on the channel position of the tape in the inserted cartridge 99, the contact relation is selected between the adjusting shaft 53 of the head 54 and the head change cam. Particularly, in the case of a cartridge 98 without built-in pinch roller, the rotating shaft 17 is driven by the pushing of the knock piece 43 and it is pressed against the capstan 42 by the raising of the pinch roller 88, the tape being inserted between them. In the case of a cartridge 99 with a built-in pinch roller, the pinch roller 141 built in said cartridge is pressed against the capstan 42, the tape being also inserted between said roller 141 and said capstan 42. The knock piece 43, when pushed, causes the spring 47 to close the start switch 46 and drive the motor 6; and under the above described arrangement, the capstan 42 makes a constant speed rotation; the tape is fed through the guide 57 precisely before the head 54 for desirable playing back or erasing or recording.

To take out the cartridge 98 or 99, thus inserted, the push button 102 is pressed; as described earlier, when the tail end 43' is pushed forward as shown in FIG. 2, the knock piece 43 is restored to push back the inserted cartridge 98 or 99 out of the insertion hole 110 to an appropriate extent which makes it possible to take out said cartridge.

The action of the tape player when inserted with a two reel-type tape cartridge 97, which characterized this invention, is illustrated by FIGS. 3, 4, 5 and so on. Said cartridge 97, as already known, has approximately the same width as the above-mentioned one reel-type cartridge 98 or 99; therefore, it is similarly inserted between guides 7, 7 installed at the farther end of the insertion hole 110, but as seen from FIG. 11, it is very much shorter and thinner; and as seen from FIGS. 3 and 4, this cartridge is unique in that it has a ridge 97' formed at the center on the top and bottom of the inserted end. When this two reel-type cartridge 97 is inserted into the said insertion hole 110, the holding spring 95 installed at the door 105 holds said cartridge 97 and presses it onto the main table 1. As the main table 1 has on the side of its insertion hole 110 a considerably large opening 20 equipped with a step 20' on one side, the ridge 97' centrally situated at the end of said cartridge 97 which has been inserted by pushing the door 105 falls into this opening 20, as shown in FIG. 3, (but with both ends remaining on the main table 1). When thus the cartridge is inserted with its ridge 97' falling into the opening 20, the fallen ridge 97' presses against the tail end 62 of the receiver 63 of the engaging member 75 pushed by the tension spring 74 (see FIG. 2); and thereby the working member 16 exposed with adequate inclination at the bottom of the step 20' of the main table 1, as shown in FIG. 1, is pushed to bring the exposed part up to the line meeting the edge of the step 20'. When the exposed part of the working member 16 is thus pushed in, said working member 16 turns around the pin 61 as indicated in FIG. 5, and accordingly said tail end 62 pushes the receiver 63 against the force of tension spring 74, thereby causing the member 75 to disengage the engaging piece 77; as a result the pushup piece 48 is moved forward to push up both the elevator 3 and the sliding table 2 to make them float through the inclined plate 35 by the inclined edge 48'. Thereupon, the head 21, and the pinch roller 24 which have been below the plane of the main table 1 will be instantaneously exposed on the plane of the main table 1. And thereby, the fitting shafts 32, 32 provided on the elevator 3 which vertically moves guided by the guide hole 11' 36' will respectively fit into the fitting holes bored near the forward end of the inserted cartridge 97, thereby deciding the inserted position of said cartridge 97, while at the same time the reel shafts 31, 31 installed on the same elevator 3 will fit into the reel holes bored at the center of said cartridge 97, to be ready for being

driven. Meanwhile, the forward edge 2' of the sliding table 2 in the subsided stage as shown in FIG. 3 is extended beyond the forward edge 3' of the elevator 3 under the action of the elastic rod 22 provided at the post 120, but as illustrated in FIG. 4, when the sliding table 2 and the elevator 3 rise and the pushup piece 48 is pushed forward, it is the elastic rod 79, fixed at midpoint of said pushup piece 48 and which is stronger than said elastic rod 22, which pushes the protruding forward edge 2' of the sliding table 2 until said edge 2' meets the forward edge 3' of the elevator 3. Therefore, the head 21 and the pinch roller 24 provided on the sliding table 2 are inserted into the opening at the forward part of the cartridge 97 and come into pressed contact with the tape within the cartridge 97. The pinch roller 24 thus going into the cartridge 97 will be separated from the stopper 27 and will effectively press the tape to the capstan 96 by the force of the spring 130.

To take out the cartridge 97 inserted in this way, said pushbutton 102 is pressed in the same way as in the conventional tape player. The sliding bar 10 connected to said pushbutton 102 is fitted with an engaging piece 73, which pushes the inclined plate 35 by the force of the tension spring 72 and pushes the engaging metal piece 77 (the engaging part 77' thereof) of the pushup piece 48 which has been pushing up the elevator 3 and the sliding table 2, thereby withdrawing the pushup piece 48 against the force of the tension spring 72; accordingly, both the elevator 3 and the sliding table 2 are pulled down by the elastic piece 30. As the withdrawal of the pushup piece 48 cancels the action of the elastic piece 79 on the forward edge 2' of the sliding table 2, the sliding table 2 will go back under the action of the elastic rod 22; the head 21 and the pinch roller 24 will be pulled out of the cartridge; and then, as the elevator 3 and the sliding table 2 go down under the action of the elastic piece 30, the fitting shafts 32, 32 and the reel shafts 31, 31 will get out of the cartridge 97. When the engaging metal piece 77 is pushed back to the line of the stop 68 of the member 75, the force of the tension spring 74 pulls the stop metal piece 75, bringing the stop 68 and the engaging part 77' into engaged relation. And when thus under the action of the tension spring 74 the member 75 is pulled, the receiver 63 pushes the tail end 62 of the working member 16, thereby bringing back the working member 16 which has been in line with the edge of the step 20' as shown in FIG. 1. The end of the working member 16 thus pushed back acts on said ridge 97' on the cartridge 97, thereby pushing out of the insertion hole 110 said cartridge 97 whose fitting shafts 32, 32 and reel shafts 31, 31 have already been pulled out. Thus, said cartridge 97 can be easily taken out.

I claim:

1. A tape player comprising a casing having a side with an opening capable of receiving a tape cartridge, cartridge guides mounted within said casing at opposite sides of said opening, an elevator slideably mounted in said casing below said cartridge guides for movement to and from said guides, a sliding table slidably mounted on said elevator for movement to and from said casing side, resilient means tending to retain said elevator away from said guides below said opening, further resilient means tending to hold said table away from said casing side, and a two reel-type tape cartridge having reel holes and a tape wound between two reels; said cartridge guides being so arranged as to enable the insertion of said two reel-type cartridge to slide through and from said opening; reel shafts on said elevator which can engage with or disengage from the reel holes of said cartridge; a head on said sliding table capable of being pressed to the tape within said cartridge, means operable by said cartridge when said cartridge is inserted between said guides and capable of pushing both said elevator and said table towards said cartridge whereby said elevator is first raised and said reel shafts are fitted into the reel holes of said inserted cartridge and then causing said sliding table to slide, whereby said head is pressed to the tape within said cartridge.

2. A tape player as set forth in claim 1, including a main table, guides installed at opposite sides of said main table form-

ing said cartridge guides, and an opening being formed on said main table for the purpose of exposing said elevator and said sliding table.

3. A tape player as set forth in claim 1, including a capstan extending through said elevator and sliding table and positioned for engaging the tape of an inserted cartridge, means for driving said capstan at a constant speed with one of the reel shafts; and a pinch roller mounted on said sliding table, a head mounted on said sliding table, said pinch roller and head being positioned to engage the tape of an inserted cartridge to said capstan.

4. A tape player as set forth in claim 3, including an arm pivotally mounted on said sliding table and supporting said pinch roller; and elastic piece stretched between said arm and said sliding table; a stop on said sliding table for stopping said arm at a fixed position and normally positioning said pinch roller away from said capstan; and at the time of said sliding table sliding in one direction said arm and said stop being separated, whereby said pinch roller presses to said capstan through the action of said elastic piece.

5. A tape player as set forth in claim 1, wherein said means includes an inclined plate on said elevator, a working member pivotally mounted in said casing for being pivoted by the inserted cartridge, and a push bar operable by said working member when said cartridge is inserted and moves said working member, for acting on said inclined plate of the elevator for raising said elevator.

6. A tape player as set forth in claim 5 wherein said working member has an end portion and a pivotable engaging member has receiving part and an engaging part and said receiving part is capable of contacting said working member end portion and a pushup bar is provided with an engaging part and said pushup bar engaging part is capable of engaging with and disengaging from said working member engaging part.

7. A tape player as set forth in claim 5, wherein said elastic pressing piece is mounted on said pushup bar, a shaft is mounted on said elevator, a pin is fixedly mounted on said sliding table, and an elastic rod is provided between said shaft on said elevator and said fixed pin on said sliding table; whereby under normal conditions the edge of said sliding table projecting beyond the edge of said elevator is pressed by said elastic rod of said pushup bar forward, thereby causing a sliding of said sliding table towards said casing side.

8. A tape player comprising a main player assembly consisting of a casing, guides mounted within said casing for guiding a relatively thick one reel-type cartridge, a first head, a first capstan and said head being arranged between said cartridge guides, a front plate arranged at the front of said cartridge guide and equipped with a cartridge insertion opening, an elevator slideably mounted beneath said cartridge guides and said cartridge insertion opening and capable of sliding to and from said guides, and a sliding table slidably provided on said elevator and capable of sliding to and from said front plate, resilient means tending to retain said elevator away from said guides, further resilient means tending to retain said sliding table towards said front plate, a one reel-type cartridge; and a two reel-type cartridge with the tape wound between two reels; said cartridge guide being so arranged as to enable each inserted cartridge to slide to and from said front plate, a reel shaft on said elevator for engaging with and disengaging from the reel of said two reel-type cartridge; a second head on said sliding table capable of being pressed to the tape within said two reel-type cartridge; said first head and capstan being positioned for engaging the tape of said one reel-type cartridge when inserted between said guides, means operable by said two reel cartridge when inserted between said guides, for raising said elevator at first up to the reel of said cartridge thereby fitting said reel shaft therein, and then said sliding table until said second head presses the tape within said two reel-type tape cartridge.

9. A tape player as set forth in claim 8, including a door pivotally mounted on said front plate for closing said opening, a holding spring is provided on said door at said insertion opening, and positioned for pressing on the inserted cartridge.

10. A tape player as set forth in claim 8, including a rotary shaft, a pinch roller on said rotary shaft, head adjustment cams, means for changing the position of said head adjustment cams, a knock piece pivotally mounted between said cartridge guides; said knock piece being positioned for being moved by a one reel-type cartridge without built-in pinch roller when inserted between said cartridge guides, means operatively connecting said knock piece to said shaft for movement together to raise said pinch roller to said inserted cartridge, an adjusting shaft for said first head, and means operatively connecting said shaft to said cam changing means for changing the contact relation of said head change cams in relation to said head.

11. A tape player as set forth in claim 8, including a motor supported in said casing, a flywheel provided on said first capstan, a first belt wound between said motor and said flywheel, an intermediate wheel, a second belt wound between said in-

intermediate wheel and said flywheel; a small pulley provided on said reel shaft, a third belt wound between said intermediate wheel and said small pulley for driving said reel shaft.

12. A tape player as set forth in claim 6, including a push-button on said casing equipped with a sliding bar, a return spring connected to said sliding bar, a cam formed on said sliding bar, means operable by said cam capable of moving said rotary shaft for lowering said raised first pinch roller, an engaging piece provided at the tip of said sliding bar capable at the same time of moving the working piece thereby returning the pushed-forward working piece and said engaging piece fitted to said sliding bar at the same time is capable of pushing said engaging part fitted to said pushup bar which acts on said inclined plate fitted on said elevator, thereby restoring the engaged real relation between the part disengaged and said stop.

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