

United States Patent

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[45] Patented **June 1, 1971**
[73] Assignee **Lear Jet Industries, Inc.**
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[54] **HOUSING FOR RADIO/TAPE CARTRIDGE
PLAYERS**
8 Claims, 4 Drawing Figs.

[52] U.S. Cl. 312/7
[51] Int. Cl. A47b 81/06,
H05k 5/00
[50] Field of Search 312/7;
242/55.19

ABSTRACT: Magnetic tape cartridge players, with or without contained radio reception, are manufactured with basic common housings. Inexpensive decorative bezels are arranged for ready securement to the front end of the housings. These appear to be normally part of the assembly, and harmonize with the housing. Design changes, as different models, are thereby readily feasible for a basic player in mass production. Also, a universal mounting bracket is supplied with the basic player that accommodates most mobile installations.

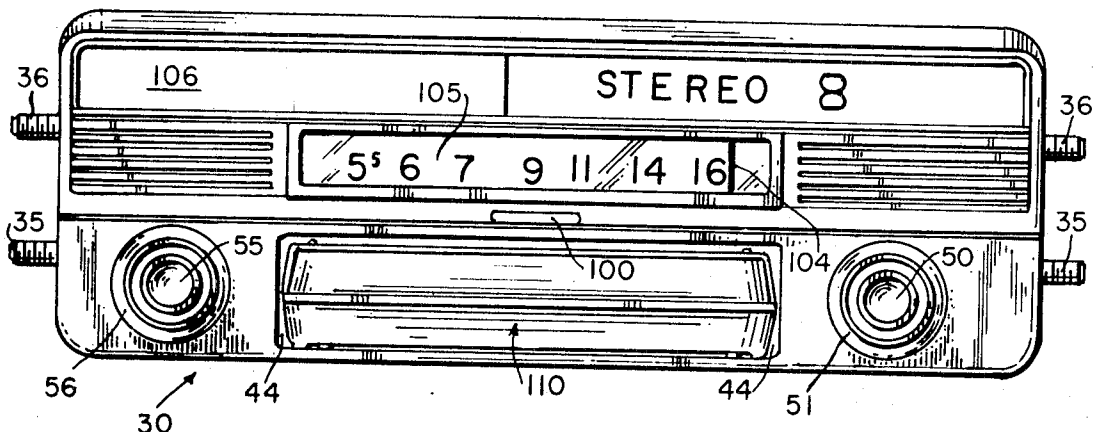


FIG. 1

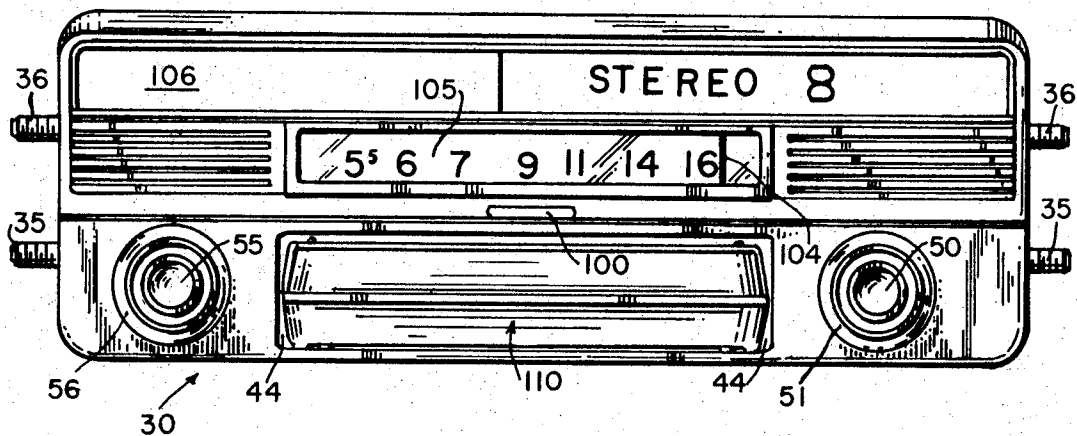
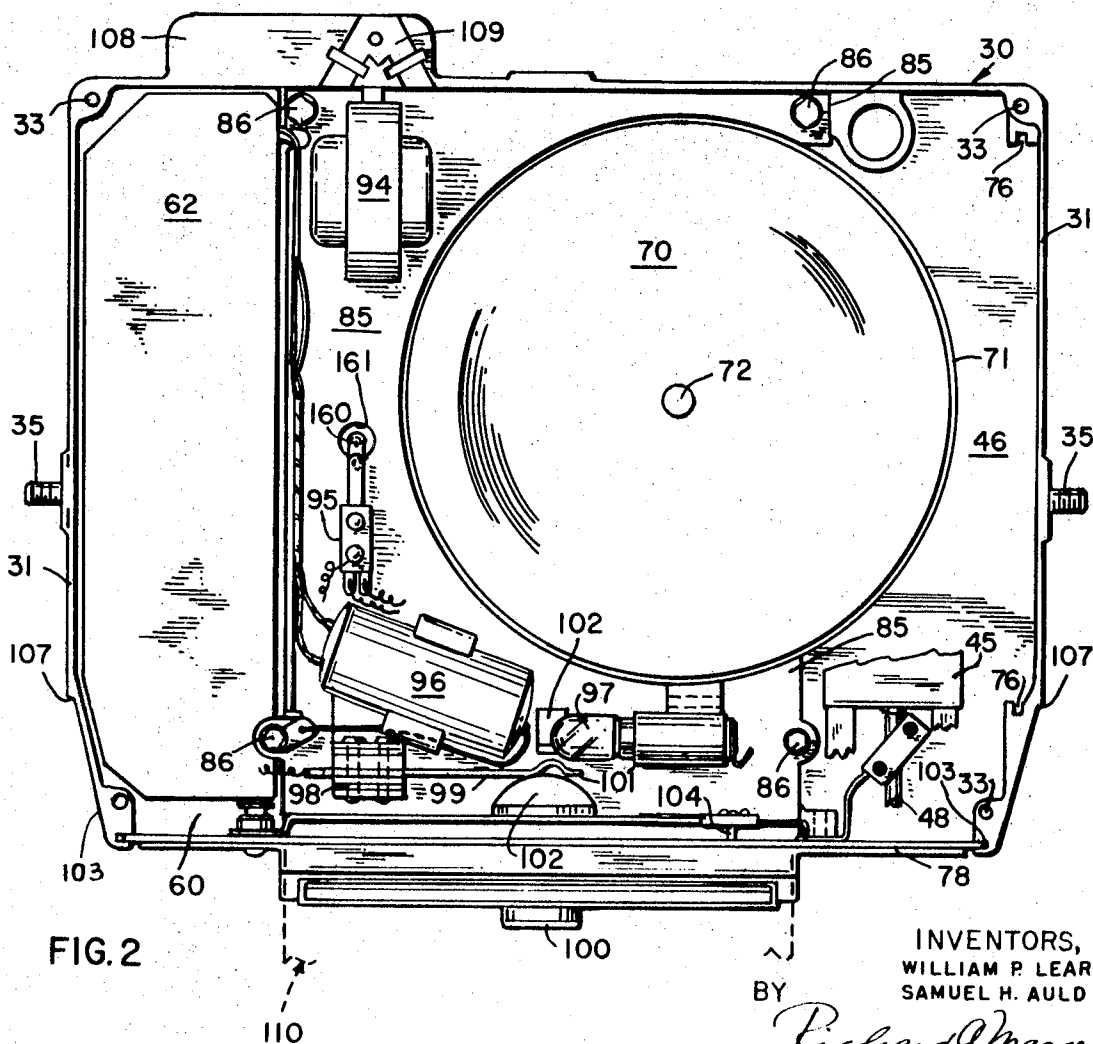


FIG. 2

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FIG. 3

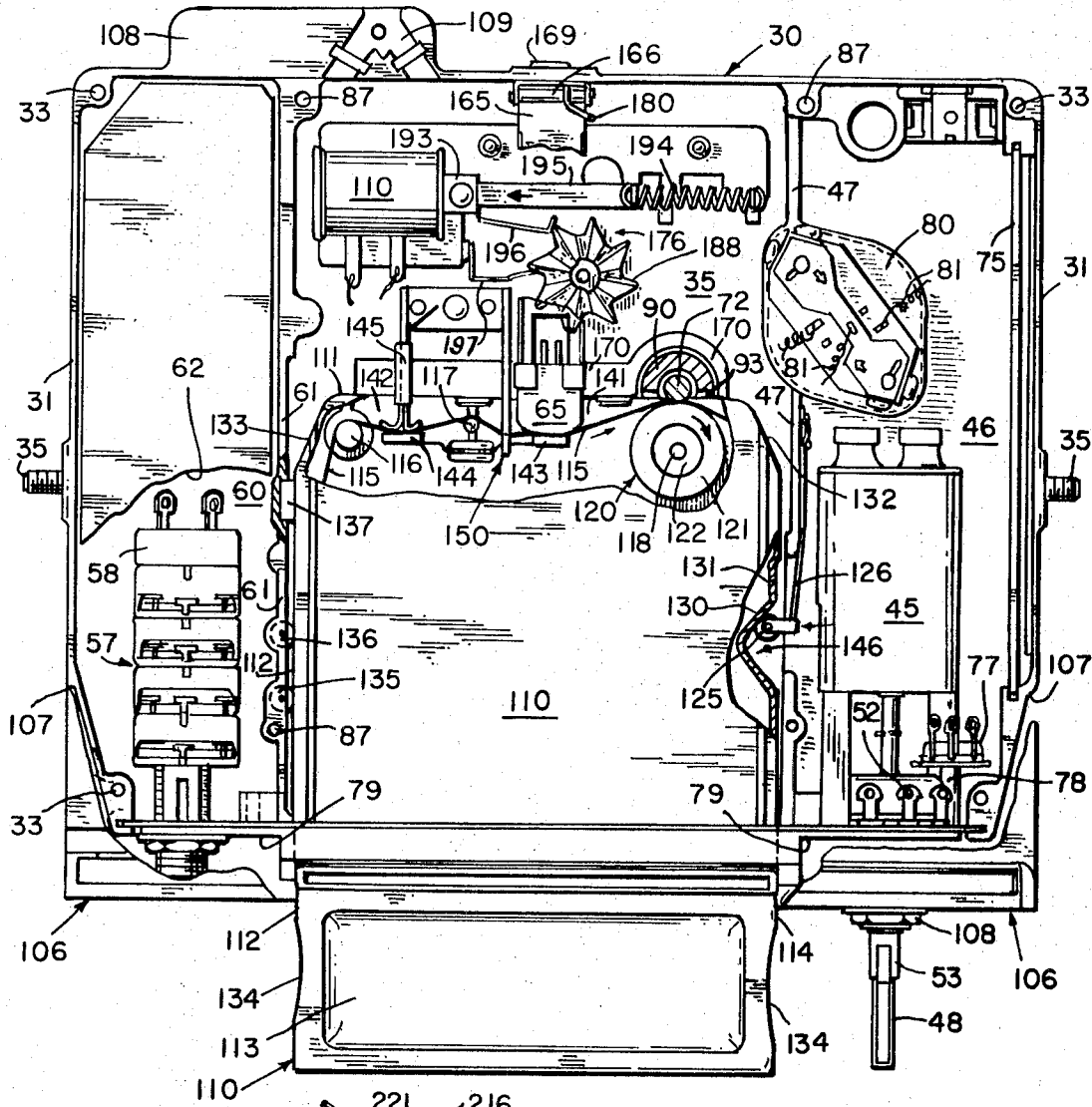
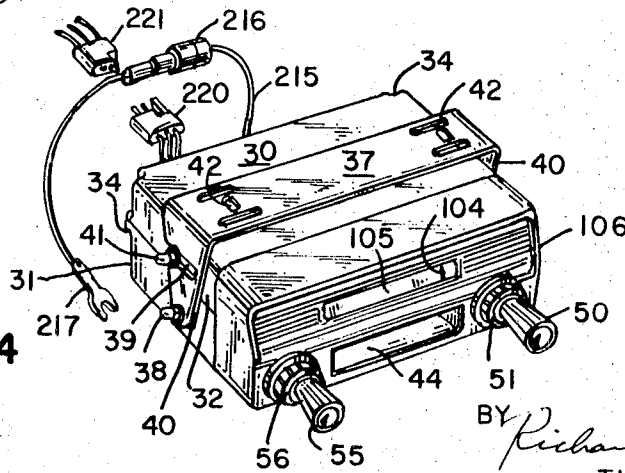


FIG. 4



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HOUSING FOR RADIO/TAPE CARTRIDGE PLAYERS

BACKGROUND AND SUMMARY OF THE INVENTION

This U.S. Pat. application is a division of our copending application Ser. No. 540,289 filed Apr. 5, 1966 for "Compact Player for Magnetic Tape Cartridges" now U.S. Pat. No. 3,478,973.

This invention relates generally to radio and/or cartridge tape players. In one aspect, their outward appearance is effectively enhanced with an inexpensive bezel that is simply secured against its front end. The bezel is hollow, and readily molded to desired shape and design. It is production plated or painted for decorative effects. The front end of the housing has bevelled edges against which the bezel fits snugly. The player control shafts protrude through openings in the bezel. The bezel is secured with the player, as by locknuts at the shafts. A universal bracket is provided for direct installation of the basic players in many types of arrangements, particularly vehicles. The player housing contains threaded extensions at its sides that engage with the slots in a U-shaped bracket for this purpose bracket. Thus players hereof can be mass produced in one basic configuration for economy, yet be sold in various designs, and for universal mounting in vehicles.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front face view of an exemplary radio/tape cartridge player, with the decorative bezel.

FIG. 2 is a plan view of the lower housing of the player, showing its front end configuration.

FIG. 3 is a plan view of the player, the bezel being mounted therewith.

FIG. 4 is perspective view of the player, assembled with both the bezel and universal bracket.

DETAILED DESCRIPTION

The housing of the player 30 is composed of two half sections 31,32 that are fastened together by machine screws or bolts at corner apertures 33,33. The sections 30,31 are preferably rugged castings to afford suitable rigidity and reference platforms for stably supporting the player motor and mechanism in their precision transport and tracking of the magnetic tape 51 in a cartridge 50 inserted for play. The castings 31,32 may be of aluminum or magnesium alloy to conserve weight. Two pairs of threaded studs 35,36 extend centrally out of the sides of the player sections 31,32. The stud sets 35,36 are for securing the assembled player 30 onto a suitable bracket for adjustably mounting it in play position in a vehicle.

The magnetic tape cartridge 50 is inserted in a slot or tunnel 44, therefor, extending into the player from its front. A radio tuner-detector unit 45 is incorporated with the exemplary player 30. It is transistorized and fitted in a longitudinal compartment 46 at the right side of partition 47 in base 31. The radio tuning of unit 45 is performed through shaft 48 that extends to front or central tuning knob 50. Circuitry for the radio tuner-detector, for clarity, is not shown, nor are those for the stereo amplifiers and motor control; the present invention not being concerned as to their details.

The balance control potentiometer 52 for stereophonic sound output control has a concentric sleeve 53 that is secured with the outer or back knob 51. Such knob array is of course optional. Clockwise rotation of knob 51 increases the right sound channel output while decreasing that on the left. Counterclockwise rotation will produce the opposite effect.

The set of control knobs 55,56 at the left side are used herein as follows: The front or central knob 55 functions as the overall radio/player on-off switch, and volume setting. The outer or back knob 56 couples to a pair of potentiometers that effect tone control on both the stereo amplifier channels. This permits one to select the most pleasing tonal range for both the radio and tape playing. When it is turned clockwise the tone is more treble or brilliant. Turning knob 56 counterclockwise makes the tone more mellow and accentuates the bass tones.

A four-section potentiometer 57 (see FIG. 3) is used for the volume and tone control, in tandem for both stereo amplifiers. These are suitably ganged to the shaft and sleeve for control knobs 55,56. At its rear section is the on-off electrical switch 58, above referred to. The exemplary dual stereo amplifier is a transistorized printed circuit array that is fitted within the longitudinal compartment 60 with ganged control 57,58, at the left side of chassis base 31. Compartment 60 is defined by the left wall of base 31 and an interior wall 61 (see FIG. 3). The compact stereo amplifier pair includes preamplification for the low-level magnetic head signal pickup of the tape record, and is diagrammatically indicated by its backboard 62 for simplicity of illustration. The dual magnetic (stereo) head is presented at 65, with individual tape channel pickup sections 66,67.

The exemplary tape drive motor 70 is a low-voltage low-speed DC permanent magnet type. Its rotor 71 is external and contains the predominate mass thereof to serve as a flywheel. Its central drive shaft 72 is the capstan for direct contact with and transport of the magnetic tape, see FIGS. 2, 3. The precise motor speed in r.p.m. is automatically controlled by an electronic motor control circuit energized by the vehicle low-voltage source, as a 12-volt storage battery. A suitable practical motor control system is set forth in U.S. Pat. No. 3,396,323 "Electronic Motor Speed Control." It is to be understood that other drive systems may be used in the basic player hereof, as for example an AC motor with a separate flywheel, as for home-use models with an available 60-cycle source.

Most of the motor control circuit is readily assembled on a compact printed-circuit board, indicated at 75 (FIG. 3). Such board is held vertically along the side of the player, by insertion in slots 76,76 provided in base 31. A small potentiometer 77 has a forward projecting shaft 78 accessible through a small aperture in the front panel 79 for adjusting the speed of motor 70. The sizeable power transistor that directly controls the current through the motor circuit, is mounted in a well 80 formed in the bottom of base 31 into the region 46, as seen in FIG. 3. This transistor (not shown) is mounted on the outside of base 31 for better ventilation, and suitably secured against the metal surface of well 80 that serves as a heat sink for circuit stability. Leads 81,81 extend from the control transistor terminals into compartment 46 for connection in the control circuit.

The motor control circuit regulates the motor speed to the predetermined r.p.m. for transporting the magnetic tape longitudinally passed head 65, e.g. at 3.75 inches per second. Such motor speed is normally held substantially uniform over wide variation in ambient temperature or available battery voltage. Should the motor speed somehow be off noticeably, a stroboscopic pattern premarked on its flat top can directly ascertain this. Slight adjustment of the potentiometer 77, performed simply from the player front, is generally sufficient to synchronize the motor pattern, and its speed.

A central subchassis 85, as a stiff steel plate, is secured to base 31 by self-tapping screws 86,86 into apertures 87,87. Plate 85 mounts the stator 88 of motor 70 with screws 89,89, see FIG. 2. A sleeve 90 is secured to the center of rotor 88 and extends into a well formed just below the level of base 31. A cutout 93 in sleeve 90 provides access for the tape to the surface-roughened capstan thereat.

The motor 70 as a whole, including sleeve 90 and shaft 72, is thus mounted as a simple subassembly with chassis plate 85. Its placement in the player is direct, sleeve 90 fitted into the well and the four screws 86,86 securing plate 85 in proper position on base 31. This reduces production cost and service time. Its simplicity of parts and placement reduces cost and improves quality of the reproduced sound, with minimum wow and flutter and minimum wear and tear.

Circuit components are readily fitted on chassis plate 85. However, the vertically low motor 70, of relatively high diameter, takes up the predominate portion of the volume available above plate 85 and a large part of the space over compartment 46. The low-and-wide cylindrical configuration of rotor 71 enhances its rotational moment of inertia for a

given power rating for the motor 70 and weight. These inertia factors hereof provide excellent stabilizing flywheel action requisite for high-quality sound reproduction of tape records. The motor drive and flywheel action and capstan operation at precise rotational speed, are all provided by a single flat moving part, namely rotor 71 with its central shaft 72. Compactness in volume with minimum player height are thereby provided.

Motor plate 85 carries thereon circuit transformer 94, cartridge operated radio/tape play-mode switch 95, electrolytic condenser 96, pilot light 97, and program or tape-track selector switch 98. The function and operation of play-mode switch 95 is set forth hereinafter in connection with FIG. 2. The program-select switch 98 comprises a leaf spring 99 that coacts with a pushbutton 100 slideably mounted centrally in front panel 78. The tip 101 of leaf spring 99 is arranged to normally press against the rear 102 of button 100, (FIG. 2). When the button is pressed inwardly, manually, tip 101 is displaced to contact grounded lug 102. A circuit is thereupon completed that energizes solenoid 110, to in turn effect the shifting of pickup head 65 to the next stereo track pair or program position on the tape record.

The front panel 78 is a self-contained subassembly that is inserted in vertical slots at the front corners 103, 103 of base 31, and companion ones in cover 32. When a radio tuner 45 is included in the player, a radio dial 105 is used. A movable pointer 104 is mechanically coupled to radio tuning shaft controlled by knob 50, (not shown). Dial 105 is linear, parallel to cartridge tunnel 44, and placed above the tape cartridge position in the player. In this way one can view the radio tuning operation while a cartridge remains in player 30 in the "radio-play" position to be described.

A decorative front cover or bezel 106 is readily combined with the player hereof. Its purpose is to enhance the appearance of the player, or permit ready change of design as viewed from the front. Bezel 106 may be inexpensively molded of tough plastic material, and coated with a metallic film to constitute a shiny player front. It is made to harmonize with the knobs.

Openings are provided to expose radio dial 105 and cartridge tunnel 44. An opening is also provided for the program-select button 100 to project through, and an aperture for access to the motor speed control shaft 78. The bezel is hollow and proportioned to fit against vertical recesses 107, 107 in the sidewalls of base 31 and cover 32. The player sides are toed-in or tapered from recesses 107, 107. Bezel 106 is mounted against the player front by its having holes that fit over the front control shafts and sleeves when the knobs 50, 51 and 55, 56 are removed. The control shaft lock-nuts, 108 or the knobs themselves, are positioned against bezel 106, holding it in position on the player at grooves or recesses 107, 107.

The exemplary cartridge 110 contains a reel of magnetic tape 115 therein, in endless array. A loop of the tape extends adjacent the forward end 111 thereof: about corner guide post 116, intermediate guide post 117, and pinch roller 120. The pinch roller hereof is rotatably supported on a fixed stud or post 118 of the cartridge housing, and contains a tire 121 or suitable elastic material as silicone, rubber of the like, concentric on its hub 122. More detailed description of cartridges similar to the one 110 hereof are set forth in U.S. Pat. No. 3,482,792 for "Endless Tape Cartridge" and U.S. Pat. No. 3,403,868 for "Magnetic Tape Cartridge System."

Tape cartridge 110 is inserted into player 30 at frontal slot or tunnel 44. FIG. 3 illustrates the cartridge fully inserted and firmly and stably held in the tape-play position. A retention roller 125 is arranged at the right side of the tunnel, biased inwardly towards the cartridge position by leaf spring 126, as indicated by the adjacent arrow. Roller 125 is held firmly pressed against an inclined wall 130 in the side of cartridge 110. The angle and location of wall 130 is arranged to establish a force component that presses pinch roller 120 against capstan 72 as well as a force component pressing the opposite cartridge side 112 firmly against side rollers 135, 136 and projecting member 137.

Rollers 135, 136 are mounted on respective vertical axes in partition wall 61; member 137 being affixed with wall 61. The rollers 135, 136 are preferably of solid self-lubricating material as Teflon, nylon, Delrin. They materially facilitate the insertion and removal of the cartridge from the close fitting tunnel 44, and coact to stably hold the cartridge in a "floating" condition for smooth tape play in conjunction with the engaged retention roller 125 on inclined wall 130.

Proper pressure is established and maintained between the pinch roller 120 and capstan 72 for even and firm longitudinal transport of the magnetic tape therebetween. The capstan 72 and pinch roller 120 automatically align and adjust for optimum operation therefor in the novel effective floating arrangement hereof. Irregularities among cartridges as to true "squareness" or warpage, tire 121 resiliency or wear, are directly resolved in efficient tape play. No unpredictable friction on the cartridge sides is encountered which otherwise could constrain it into unsatisfactory tape presented for play at head 65.

When cartridge 110 is fully inserted in the play mode shown in FIG. 3, it is engaged with capstan 72 as hereinabove described. The capstan presses on the tape 115 as exposed through a front opening 140 in the cartridge at pinch roller 120. A further opening 141 admits pickup head 65 to coact with the transported tape 115. A pressure pad 143 maintains the tape against the surface of head 65. A tape guide 150 mounted in the player adjacent head 65 is arranged to hold the tape firmly in a predetermined plane for head 65, and at a set level for precise tracking. Details of the exemplary tape guide 150 and its operation herein are set forth hereinafter in connection with FIGS. 15, 16 and 16A.

Another opening 142 at the cartridge front permits the insertion of sensing contactor 145 to establish continuous contact with the passing tape 115. Pressure pad 144 facilitates this. Two individual curved contact arms detect the passage of a conductive strip adhered to the endless tape at its record and start position. A circuit is thereby closed to energize solenoid 110 and initiate the shift of head 65 to the next successive track-playing position on tape 115.

Upon the full insertion of the cartridge in the player, as shown in FIG. 3, the speed control circuit for the drive motor 70 is directly activated to energize and operate the motor and its integral capstan 72. Towards this end, cartridge-operated switch 95 is actuated, and the contained tape 115 is promptly transported for play by the capstan action. Switch 95, mounted above tunnel 44 on subchassis plate 85, has its central leaf spring 160 extend over an aperture 161 in plate 85. The circuitual operation of the player on-off mode and of the radio through actuation by the cartridge 110 is set forth in the parent U.S. Pat. application Ser. No. 540,289 referred-to above.

FIG. 4 illustrates the under-the-dashboard mounting mode in an automobile. Threaded caps 38 attach tip apertures of U-bracket 37 onto lower studs 35. The player is pivoted on the lower studs 35. The proper angle setting is fixed with the upper studs 36 coating in arcuate slotted regions 39 of the arms 40, 40 of bracket 37. The caps 41 on upper studs 36 are then fastened against the arms 40 and sides of player 30 to hold it in play position, as desired. For floor mounting in a car, boat or airplane the bracket 37 is positioned upside down with the upper studs 36 becoming the pivots and the lower ones 35 determining the angle in the slots 39. The plurality of slots 42, 42 in the body of bracket 37 are for securement thereof to the corresponding portion of the vehicle at which the assembly is mounted for use.

The complete player 30 is illustrated in perspective in FIG. 4. Its compactness affords ready mounting in an automobile dashboard, or in other locations with bracket 37 as stated hereinabove. The front bezel 106 is an optional inexpensive decorative element. The battery lead 215 extends from the player as through a channel 109 in a ledge 108 formed in the rear of the player sections 31, 32 (see FIGS. 2, 3). A fuse and holder 216 is in cable 215 that has a terminal lug 217 for battery connection. The multispeaker cable also extends from in-

side the player and has a plug 220 for receptacle 211 that terminates the speaker system mounted in the vehicle. By placing say two speakers for each channel, one set on each side of the car occupants, stereophonic reproduction of the tape record is experienced, as the signal separation of the taped channels is excellent, as is their tracking hereof.

What we claim is:

1. A player comprising a housing with the corners of its front end being bevelled, each said corner being recessed along the inner end of its bevel, and a bezel with a decorative face having sides that extend about the housing front end, edge regions of the bezel sides being in juxtaposition with the said corner recesses, said bezel having frontal openings exposing operational player sections.

2. A player as claimed in claim 1, further including a control shaft extending from the player housing and through an aperture in said bezel, and means securing said bezel and shaft together and thereby retain the bezel in position on the front housing end.

3. A player as claimed in claim 2, in which the said securing means is a locknut on said shaft.

4. A combination radio and tape cartridge player comprising a housing with the corners of its front end being bevelled, each said corner being recessed along the inner end of its bevel, and a bezel with a decorative face having sides that ex-

tend about the housing front end, edge regions of the bezel sides being in juxtaposition with the said corner recesses, said radio containing a tuning dial and control shafts, the face of said bezel containing an opening exposing said tuning dial and an aperture through which each of said shafts project.

5. A player as claimed in claim 4, further including means securing said bezel and shafts together and thereby retain the bezel in position on the front housing end.

6. A player as claimed in claim 5, in which the said securing means is a locknut on said shafts.

7. A player comprising a housing having two pairs of extending studs, each stud pair being symmetrically located on opposite sides of the housing, a U-shaped bracket for operatively mounting the player in a vehicle, the central region of said bracket being arranged for attachment to the vehicle, the tip of each spaced arm that extends from the bracket being securable to one of said studs, an intermediate portion of each arm having an opening for adjustable engagement of the portion with the adjacent second stud for stably mounting the player.

8. A player as claimed in claim 7, in which the said openings in said bracket arms are arcuate slots for angularly adjusting the player position in the vehicle.

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