

PATENT SPECIFICATION (11)

1 552 766

(21) Application No. 49109/75 (22) Filed 18 Sept. 1975 (19)

(62) Divided Out of No. 38458/75

(23) Complete Specification filed 28 June 1976

(44) Complete Specification published 19 Sept. 1979

(51) INT. CL.³ G11B 21/26 21/04 21/18 21/22

(52) Index at acceptance

G5R B08 B251 B25Y B261 B262 B263 B361 B36Y B482
B545 B581 B58X B58Y B59X B59Y B611 B613 B61X
B61Y B623 B638 B789

(72) Inventor MARVIN ALLAN LEEDOM

(54) SIGNAL SYSTEM FOR A DISC RECORD PLAYER



(71) We, RCA CORPORATION, a Corporation organized under the laws of the State of Delaware, United States of America, of 30 Rockefeller Plaza, City and State of New York, 10020, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention generally relates to a record disc player, and more particularly, to a releasable coupling between a connector plate of a stylus arm unit of a support member of the player.

In the U.S. Patent No. 3,917,903 (Taylor, et al), a magnetic coupling for detachably securing a stylus arm to a support member of a video disc player (of the type described in U.K. Patents Nos. 1,392,201—206) is described. In the magnetic coupling of the type described in Taylor, et al. patent, it is desirable to keep stray magnetic particles present in the vicinity of the coupling away from the mating surfaces of the support member and a connector plate secured to the stylus arm to assure a rigid coupling therebetween.

The rigid coupling between the support member and the connector plate is particularly important where the support member is rendered subject to cyclical motion to correct velocity errors between the stylus and a record rotatably mounted in the player, to assure faithful transmission of cyclical motion. Reference may be made to U.S. Patent No. 3,711,641 for an illustration of an "armstretcher" apparatus for rendering cyclical motion to the support member.

In accordance with the principles of the present invention, a first coupling element is secured to the stylus arm. A second coupling element is supported in the player (being in a preferred embodiment of the invention subject to cyclical motion as aforesaid). Both coupling elements are made from magnetizable materials. A permanent magnet

is centrally mounted in a recess provided in the second coupling element. When the coupling elements are engaged, the separation between the permanent magnet and the first coupling element is greater than the separation between the permanent magnet and the walls defining the recess to assure that the greatest magnetic flux is between the permanent magnet and the walls.

In the accompanying drawings which are similar to those in divisional Application No. 4092/78 (Serial No. 1,552,770) to which attention is hereby directed:

Figure 1 shows a video-disc player incorporating the present invention;

Figure 2 is a perspective view of a stylus arm unit housed in the cartridge of Figure 1;

Figure 3 is a perspective view of an arrangement used for suspending the stylus arm unit of Figure 2 in the cartridge of Figure 1;

Figure 4 shows a support member mounted in a carriage of the video disc player of Figure 1 for engagement with a connector plate of the stylus arm unit of Figures 2 and 3;

Figures 5a and 5b illustrate two embodiments of an apparatus for moving an arm-stretcher apparatus located in the carriage for effecting engagement of the support member of Figure 4 with the connector plate of Figures 2 and 3;

Figure 6 illustrates a locked groove escape apparatus for moving a groove-riding stylus out of a locked groove of a record; and

Figures 7—12 illustrate a sequence operations involved in installing the cartridge in the carriage of the video disc player of Figure 1; still another embodiment of the apparatus for moving the armstretcher apparatus located in the carriage being illustrated in Figures 7—12.

In Figure 1, numeral 30 indicates a video disc player of the general type shown in the U.S. Patent No. 3,842,194 (Clements). A record 31 is rotatably mounted for playback on a turntable 32 secured to a motor-

board 33. A carriage 34 is mounted for lateral motion relative to the motorboard 33 in correlation with lateral motion of a stylus 55 (Figure 2) riding in a spiral-groove 35 disposed on the surface of the record 31 during playback. Slots 36 and 37 are provided in the motorboard 33 to permit lateral motion of the carriage 34 from an off-record rest position 38 to an above-record play position 39. Reference may be made to the U.S. Patent No. 3,870,835 (Stave) for illustration of an apparatus for laterally driving the carriage 34 in correlation with the groove-riding stylus 55 during playback. When the carriage 34 is in the off-record rest position 38, a hinged plate 40 overlies the carriage.

There are five basic chambers in the carriage 34. Chambers 41, 42, and 43 are for enclosing respective circuit boards for respective elements of the signal processing circuitry of the playback system: (a) resonator (forming a tuned circuit with the stylus electrode/record capacitance), (b) oscillator (supplying UHF oscillations to the tuned circuit), and (c) preamplifier (responding to the detected version of modulated oscillations derived from the tuned circuit). Chamber 44 contains a replaceable pickup cartridge 45, a retractable armstretcher 46, and a stylus arm lifter 47. The armstretcher may be of the type shown in U.S. Patent No. 3,711,641 (Palmer). Chamber 48 forms a wiring channel to hold the lead wires to the various circuit boards.

The cartridge 45 houses an insert molded stylus arm unit 50 shown in Figure 2. The insert molded stylus arm unit 50 consists of a stylus arm 51 formed of an aluminum tube (e.g., 0.024 inch outer diameter and 0.002 inch thickness) with a plastic stylus holder 52 glued at one end of the stylus arm and a compliant member 53 molded at the other end of the stylus arm to connect the stylus arm with a metal connector plate 54. The compliant member 53 is in unstressed condition when it is aligned with the stylus arm 51. The angle between the stylus arm 51 and the connector plate 54 is 94° for reasons given subsequently. The plastic stylus holder 52 contains a slot to hold the stylus 55 when it is glued in place. A small projection 56 is molded at the top of the plastic stylus holder 52 to engage with an abutment 49 (Figure 6) to relieve the stylus 55 from a locked groove of the record 31.

The arrangement for suspending the stylus arm unit 50 in the cartridge 45 will now be explained with reference to Figures 3 and 4. As shown in Figure 3, a pair of elastic straps 57 and 58 are glued to the connector plate 54 of the stylus arm unit 50. The elastic straps 57 and 58 are secured to a pair of slanted bearing surfaces 59 and 60 provided at the rear end of the cartridge 45.

The slanted rear bearing surfaces 50 and 60 establish an 8° angle between the connector plate 54 and a direction perpendicular to the bottom surface of the cartridge 45. Figure 7 shows the slanted bearing surface 60.

The cartridge 45 further includes a leaf spring 61, in the form of a conductive ribbon, for urging the stylus 55 into the record groove 45 during playback as shown in Figure 12. One end of the leaf spring 61 is secured to the stylus 55 in electrical contact with an electrode included in the stylus. The other end of the leaf spring 61 is secured to the free end 62 of a cantilever beam 63. Slots 63^a in the top wall of the cartridge 45, as shown in Figure 1, allow a strip-like portion of the top wall to function as the cantilever beam. While in this particulate embodiment the cantilever beam 63 is integral with the cartridge 45, it could be separately secured to the top wall of the cartridge.

The location of the free end 62 of the cantilever beam 63 with respect to the bottom surface of the cartridge 45, and the configuration of the leaf spring 61 are such that the stylus arm 51 is retained in a retracted position within the cartridge for protection (Figure 8). The retracted position provides a location for the stylus 55 withdrawn within the confines of the cartridge 45 remote from an opening in the bottom surface of the cartridge through which the stylus protrudes when the carriage 34 is in the off-record rest position 38 (Figure 11) and the above-record play position (Figure 12).

When the cartridge 45 is outside the player (Figure 7), or when inside the player but not engaged with the armstretcher 46 (Figure 8), the stylus arm 51 is held in a retracted position in the cartridge for protection. In either of these positions, the compliant member 53 is not bent or stressed, and therefore the formation of a permanent "set" in the compliant member, which could cause mistracking of the stylus 55 during playback, is prevented.

Figures 7-12 illustrate a sequence of operations involved in installation of the cartridge 45 in the carriage compartment 44. From Figure 7, it can be seen that armstretcher 46 has a support member 64 for engagement with the connector plate 54 of the cartridge 45 during containment thereof in the carriage compartment 44. The armstretcher 46 is slidably mounted in the carriage compartment 44 for movement between a withdrawn position when a lid 65 of the carriage is open (Figure 7) and an advanced position when the carriage lid is closed (Figures 10-12) in response to the motion of the carriage lid. A coil spring 66 connected between the armstretcher 46 and the carriage 34 returns the armstretcher

to the withdrawn position when the carriage lid 65 is opened.

5 An apparatus for traversing the arm-
stretcher 46 in the carriage compartment 44
to effect rigid engagement between the sup-
port member 64 and the connector plate 54
is shown in Figure 5a. A cam 67 is mounted
in the carriage 34 for rotation about a pivot
pin P in response to the motion of the
10 carriage lid 65. The peripheral surfaces of
the cam 67 engage the armstretcher 46
to cause relative displacement be-
tween the armstretcher and the car-
riage 34. A portion 68 in the arm-
15 stretcher 46 is relieved to permit a small
amount of overtravel by the cam 67. Further,
relief 68 helps to spring load the arm-
stretcher 46 against the cartridge 45, when
the carriage lid 65 is closed, to assure ac-
20 curate positioning of the cartridge in the
carriage compartment. Additionally, the
relief 68 tolerates a slight variation in the
dimensions of the armstretcher 46, cartridge
45, and the carriage compartment 44.

25 The operation of another embodiment of
the apparatus for moving the armstretcher
46 in the carriage compartment 44 to effect
rigid engagement between the support mem-
ber 64 and the connector plate 54 can be
30 seen from Figure 5b. The operation of the
moving apparatus of Figure 5b is similar
to the moving apparatus of Figure 5a except
that in the moving apparatus of Figure 5b
the return spring 66 is not required. In
35 the moving apparatus of Figure 5b, the
carriage lid 65 and the cam 67 are fixedly
secured to a pivot pin which is rotatably
mounted in the carriage 34. When the
carriage lid 65 is opened, the cam 67 is
40 rotated to retract the armstretcher 46 to
the withdrawn position.

The operation of still another embodi-
ment of the apparatus for moving the arm-
stretcher 46 in the carriage compartment 44
45 to effect rigid engagement between the
support member 64 and the connector plate
54 can be seen from Figures 8-12.

The cartridge 45 is placed in the
carriage compartment 44 as shown in
50 Figure 8, and the carriage lid 65 is closed.
The cartridge 45 overlies the stylus arm
lifter 47 during containment of the cart-
ridge in the carriage compartment 44.

55 The support member 64 enters the interior
of the cartridge 45 through an opening 69
at the rear end of the cartridge for engage-
ment with the connector plate 54 as shown
in Figure 9. As the armstretcher moves
60 forward, the support member 64 moves the
connector plate 54 from the initial tilted
position (e.g., 8° as shown in Figure 8) to a
position matching the engaging surface of
the support member (e.g., perpendicular to
65 the bottom surface of the cartridge 45 as
shown in Figure 9). The elastic straps 57

and 58 permit the connector plate 54 to
assume the new orientation.

The connector plate 54 is made from mag-
netizable material. The support member 64
70 is also magnetizable. The support member
64 has walls defining a recess 70 as shown in
Figure 4. A permanent magnet 71 is cen-
trally mounted in the recess 70. The flux
of the permanent magnet 71 secures the con-
75 nector plate 54 to the support member 64
for rigidly transmitting cyclical motion of
the support member to the connector plate
during the support member/connector plate
engagement. The separation between the
80 permanent magnet 71 and the connector plate
54 is made greater than the separation be-
tween the permanent magnet and the walls
of the support member 64 so that the
strongest magnetic field is in the annular
85 cavity. The magnetic field in the annular
cavity attracts any stray magnetic particles
present in the vicinity away from the mating
surfaces the connector plate 54 and the
support member 64. Such an arrangement
90 assures rigid connection between the sup-
port member 64 and the connector plate 54.

As the carriage lid 65 is closed further,
a defeat lever 72 depresses the free end
62 of the cantilever beam 63, as shown in
Figure 10. This lowers the leaf spring 61
95 to allow the stylus arm 51 to rest on a
control rod 73 of the stylus arm lifter 47.

The end of the leaf spring 61 affixed to
the cantilever beam 63 is urged against a
contact rivet 74 provided on a resonator
100 circuit board 75 to establish an electrical
path between the stylus electrode and the
signal processing circuit via the leaf spring.

When the carriage lid 65 is closed, a spring
76, secured to the carriage lid, presses the
105 armstretcher 46 down into the carriage com-
partment 44 to establish proper seating of
the armstretcher as shown in Figure 10.
From Figure 1, it can be seen that a spring
77, secured to the carriage compartment 44,
110 presses the armstretcher 46 against the side
wall of the carriage compartment to assure
lateral alignment of the armstretcher.

The engagement of the defeat lever 72
with the cartridge 45 assures proper seating
115 of the cartridge in the carriage compart-
ment 44. In order to assure lateral align-
ment of the rear end of the cartridge 45
with the armstretcher 56, the armstretcher
has a projection 78 which enters a recess
120 79 provided in the rear end of the car-
tridge during relative motion between the
armstretcher and the cartridge as shown in
Figure 1.

Further, in order to assure lateral align-
125 ment of the front end of the cartridge 45
with the contact rivet 74, the cartridge has a
cavity at the front end for receiving a por-
tion provided in a structure associated with
the resonator circuit board 75 during rela-
130

tive motion between the cartridge and the carriage 34.

When the hinged plate 40 is closed, a projection 82 depresses a plunger 83 connected to the rod 73 of the stylus arm lifter 47. An aperture 84 is provided at the top of the cartridge 45 to permit passage of the plunger 83 as shown in Figure 1.

When the carriage 34 is in the off-record rest position 38 under the plate 40, the plunger 83 depresses the stylus arm lifter rod 73 as shown in Figure 11 and the stylus rests on a stylus brush 85. Further, when the carriage 34 moves from the off-record rest position 38 to the above-record play position 39, the stylus arm lifter rod 73 lifts the stylus arm 51 as depression of the plunger 83 is no longer obtained by the projection 82. Again, when the carriage 34 reaches the above-record play position 39, the stylus arm lifter 47 is activated to permit the stylus 55 to rest on the record 31.

The stylus arm lifting/lowering arrangement may be of the type disclosed in U.S. Patent No. 4,053,161 (U.K. Cognate Applications Nos. 37347/37 849/75) (Serial No. 1,543,550).

When the stylus 55 is resting on the stylus brush 85 or the record 31, the compliant member is not bent or stressed. This feature prevents formation of a set in the compliant member during containment of the cartridge 45 in the carriage compartment 44. Thus, compliant member is in unstressed condition while the cartridge is outside the carriage compartment, and also while the cartridge is contained in the carriage compartment and the carriage is in the off-record rest position or in the above-record play position. The compliant member is stressed only in the interval between the off-record rest position and the above-record play position of the carriage (Figure 10) as the stylus arm is lifted to permit the stylus to clear the outside bead of the record. This interval is so short, that it has no noticeable effect on the "set" of the compliant member.

An aperture in the outer wall of the cartridge 45 permits passage of wiring between the stylus arm lifter 47 and the wiring channel 48. The cartridge 45 is provided with inner walls closely flanking the stylus arm unit 50 to limit access thereto. The keyed end shape and the solid cover of the cartridge 45 prevent backward or inverted insertion of the cartridge into the stylus housing compartment 44.

WHAT WE CLAIM IS:—

1. Apparatus for playing back signals prerecorded along a spiral on a record disc; said apparatus including a support element, a stylus arm carrying a stylus at one end thereof, a first magnetizable coupling ele-

ment secured to the other end of said stylus arm, a second magnetizable coupling element secured to said support element, said second coupling element having walls defining a recess; and a permanent magnet so mounted in said recess so that it forms an annular cavity with said walls, said first coupling element being releasably engageable with said second coupling element and the dimensions of said permanent magnet being such as to establish between said permanent magnet and said first coupling element during such engagement, a gap greater than the separation between said permanent magnet and said walls.

2. Apparatus as defined in Claim 1 further comprising:

a cartridge having walls defining a protective enclosure for said stylus and said stylus arm, said cartridge being insertable in a compartment provided in said support element;

means mounted in said cartridge for flexibly suspending said first coupling element within said cartridge at a location permitting alignment thereof with said second coupling element when said cartridge is inserted in said compartment; and

means for displacing said second coupling element relative to said support element to effect said engagement between said coupling elements following insertion of the said cartridge in said compartment.

3. Apparatus as defined in Claim 2 further including:

means mounted in said cartridge for releasably retracting said stylus arm within the confines of said cartridge remote from an opening in said cartridge through which said stylus may otherwise protrude; and

means secured to said support element for defeating said releasable retracting means for permitting protrusion of said stylus through said opening when said cartridge is received in said compartment and when said coupling elements are in engagement.

4. Apparatus as defined in Claim 3 wherein a compliant member secures said first coupling element to said stylus arm; and wherein said suspending means establishes an angular orientation of said first coupling element with respect to said cartridge such that, when said stylus arm is held in said retracted position in said cartridge, said compliant member is unstressed.

5. Apparatus as defined in Claim 4 wherein the angular orientation of said first coupling element relative to said cartridge, when said first coupling element is in engagement with said second coupling element, and the angular orientation of said compliant member with respect to said first coupling element, permit said stylus to protrude through said opening when said



tive motion between the cartridge and the carriage 34.

When the hinged plate 40 is closed, a projection 82 depresses a plunger 83 connected to the rod 73 of the stylus arm lifter 47. An aperture 84 is provided at the top of the cartridge 45 to permit passage of the plunger 83 as shown in Figure 1.

When the carriage 34 is in the off-record rest position 38 under the plate 40, the plunger 83 depresses the stylus arm lifter rod 73 as shown in Figure 11 and the stylus rests on a stylus brush 85. Further, when the carriage 34 moves from the off-record rest position 38 to the above-record play position 39, the stylus arm lifter rod 73 lifts the stylus arm 51 as depression of the plunger 83 is no longer obtained by the projection 82. Again, when the carriage 34 reaches the above-record play position 39, the stylus arm lifter 47 is activated to permit the stylus 55 to rest on the record 31.

The stylus arm lifting/lowering arrangement may be of the type disclosed in U.S. Patent No. 4,053,161 (U.K. Cognate Applications Nos. 37347/37 849/75) (Serial No. 1,543,550).

When the stylus 55 is resting on the stylus brush 85 or the record 31, the compliant member is not bent or stressed. This feature prevents formation of a set in the compliant member during containment of the cartridge 45 in the carriage compartment 44. Thus, compliant member is in unstressed condition while the cartridge is outside the carriage compartment, and also while the cartridge is contained in the carriage compartment and the carriage is in the off-record rest position or in the above-record play position. The compliant member is stressed only in the interval between the off-record rest position and the above-record play position of the carriage (Figure 10) as the stylus arm is lifted to permit the stylus to clear the outside bead of the record. This interval is so short, that it has no noticeable effect on the "set" of the compliant member.

An aperture in the outer wall of the cartridge 45 permits passage of wiring between the stylus arm lifter 47 and the wiring channel 48. The cartridge 45 is provided with inner walls closely flanking the stylus arm unit 50 to limit access thereto. The keyed end shape and the solid cover of the cartridge 45 prevent backward or inverted insertion of the cartridge into the stylus housing compartment 44.

60 WHAT WE CLAIM IS:—

1. Apparatus for playing back signals prerecorded along a spiral on a record disc; said apparatus including a support element, a stylus arm carrying a stylus at one end thereof, a first magnetizable coupling ele-

ment secured to the other end of said stylus arm, a second magnetizable coupling element secured to said support element, said second coupling element having walls defining a recess; and a permanent magnet so mounted in said recess so that it forms an annular cavity with said walls, said first coupling element being releasably engageable with said second coupling element and the dimensions of said permanent magnet being such as to establish between said permanent magnet and said first coupling element during such engagement, a gap greater than the separation between said permanent magnet and said walls.

2. Apparatus as defined in Claim 1 further comprising:

a cartridge having walls defining a protective enclosure for said stylus and said stylus arm, said cartridge being insertable in a compartment provided in said support element;

means mounted in said cartridge for flexibly suspending said first coupling element within said cartridge at a location permitting alignment thereof with said second coupling element when said cartridge is inserted in said compartment; and

means for displacing said second coupling element relative to said support element to effect said engagement between said coupling elements following insertion of the said cartridge in said compartment.

3. Apparatus as defined in Claim 2 further including:

means mounted in said cartridge for releasably retracting said stylus arm within the confines of said cartridge remote from an opening in said cartridge through which said stylus may otherwise protrude; and

means secured to said support element for defeating said releasable retracting means for permitting protrusion of said stylus through said opening when said cartridge is received in said compartment and when said coupling elements are in engagement.

4. Apparatus as defined in Claim 3 wherein a compliant member secures said first coupling element to said stylus arm; and wherein said suspending means establishes an angular orientation of said first coupling element with respect to said cartridge such that, when said stylus arm is held in said retracted position in said cartridge, said compliant member is unstressed.

5. Apparatus as defined in Claim 4 wherein the angular orientation of said first coupling element relative to said cartridge, when said first coupling element is in engagement with said second coupling element, and the angular orientation of said compliant member with respect to said first coupling element, permit said stylus to protrude through said opening when said



19

1,552,766

5

5

releasable retracting means is defeated without stressing said compliant member.

6. Apparatus as defined in Claim 3, Claim 4 or Claim 5, wherein said releasable retracting means comprises:

a spring for urging said stylus into playback relationship with said record during playback, a first end of said spring being secured to said stylus; and

10 a cantilever member secured to the top wall of said cartridge; wherein a second end of said spring is secured adjacent to the free end of said cantilever member; and wherein the location of said free end of said cantilever member and the configuration of said stylus spring are such that said stylus arm is held in said retracted position for a first position of said cantilever member, and such that said stylus is permitted to protrude through said opening for a second position of said cantilever member.

7. Apparatus as defined in Claim 6 wherein said defeating means comprises a lever secured to a lid of said support element; wherein the location of said lever is such that it depresses said free end of said cantilever member to said second position.

8. Apparatus as defined in Claim 7 wherein an input terminal of a signal processing circuit is secured to said support element; said stylus includes an electrode; said stylus spring is conductive; said securing of said first end of said stylus spring to said stylus effects an electrical connection be-

tween said stylus electrode and said first end of said stylus spring; and the location of said input terminal with respect to said support element is such that said depression of said free end of said cantilever member during containment of said cartridge in said compartment effects an electrical connection between said second end of stylus spring and said input terminal to establish an electrical path between said stylus electrode and said signal processing circuit through said conductive spring.

9. Apparatus as defined in any preceding Claim wherein said support element comprises a carriage mounted for lateral motion relative to a base of said player in correlation with progressive lateral motion of said stylus as it follows said record spiral during playback.

10. Apparatus as defined in any preceding Claim further including means for imparting cyclical motion to said second coupling element in a manner that opposes deviations of stylus/record relative velocity from a predetermined speed.

11. Record playback apparatus substantially as herein before described with reference to the accompanying drawings.

T. I. M. SMITH,
Chartered Patent Agent,
50 Curzon Street,
London, W1Y 8EU.
Agent for the Applicants.