

Magnetic-tape cassette apparatus with a control device

The invention relates to a magnetic tape cassette apparatus having a control device for controlling tape-deck functions including the drawing-in and ejection of a cassette by means of a drive mechanism having a motor, which drive mechanism comprises a control rod which is movable back and forth in a longitudinal direction by a
5 servo motor, which control rod can be moved along its path of movement between end points and, in given operating positions, controls tape-deck functions in conjunction with switch actuators and a logic circuit.

US-A 3,882,542 discloses a deck for a magnetic tape cassette apparatus, which deck comprises a rod which can draw in a magnetic tape cassette. During
10 drawing-in this rod travels as far as an end point situated at the end of the path of inward movement and stops there. A switch actuated by the rod starts the motor for the play mode and a drive mechanism proceeds to play the magnetic tape. The end point is determined by a pin which actuates the motor switch and simultaneously switches over a servo mechanism, which is prepared for ejection of the cassette when the tape has
15 stopped at the end of the tape in the reverse direction of rotation.

It is an object of the invention to provide a magnetic tape cassette apparatus with a control device of the type defined in the opening paragraph, in which the movements of the control rod at and between the end points of movement can activate tape-deck functions with little technical effort.

20 According to the invention this object is achieved in a first embodiment in that

- a coupling rod is guided on the control rod so as to be movable in the longitudinal direction thereof,
- the coupling rod can be lock to the control rod along a part of the path of
25 movement of the control rod,
- the coupling rod is mechanically coupled to the loading mechanism of the tape deck,
- by means of switch actuators provided on the coupling rod and the control rod to produce switching signals said coupling rod and control rod act on a control

switch which applies the commands imparted by switch actuators to the logic circuit, which derives therefrom switching commands for apparatus functions.

In a second embodiment the object set is achieved according to the invention in that

- 5 - a coupling rod, which can be moved transversely of the longitudinal direction of movement of the control rod, is arranged on the control rod,
- the coupling rod can be coupled to the loading mechanism of the tape deck,
- the coupling rod can be coupled to or disengaged from the loading mechanism by transverse movements with the aid of stationary guides on the tape deck,
- 10 - by means of at least one switch actuator provided on the control rod to produce switching signals at least said control rod acts on a control switch which applies the commands imparted by switch actuator to the logic circuit, which derives therefrom switching commands for apparatus functions.

By way of the coupling to the loading mechanism the control rod is also adapted to draw in and eject cassettes. If the cassette holder acts upon the control rod only indirectly, *i.e.* by way of the coupling rod, the coupling rod can release the mechanical connection between control rod and cassette holder owing to a movement independent of the control rod, thus enabling the control rod to stop before the end of the inward movement a cassette or at the beginning of the ejection movement. At the end of the inward movement and the beginning of ejection spring-loaded levers can take over. In addition, the control rod and the coupling rod, or the control rod alone, can directly or indirectly trigger switching signals at the switch.

In a variant of both embodiments of the invention all the switch actuators of the control device act on a single control switch which controls all the electrical control functions of the tape deck *via* the logic circuit.

The fact that all the switch actuators act upon a single control switch, in conjunction with the logic circuit, considerably simplifies the deck. The derivation of electrical signal pulses from mechanical movements in conjunction with a logic circuit leads to a considerable simplification of the control device.

30 In a further variant of both embodiments of the invention at least at the end points of their path of movement the control rod and the coupling rod are disengaged from one another so that their switch actuators can act on the control switch and, if desired, further function parts independently of the position of the respective

other rod: Thus, when disengaged from the loading mechanism, the control rod can proceed to the end point of its path of movement where, apart from a switch actuator which causes the direction of rotation of the servo motor to be reversed, it can bring the head plate into its play position.

- 5 In a further variant of the invention a two-arm latching lever is arranged on the control rod, whose first latching arm is spring-loaded to engage a recess in the coupling rod for the purpose of coupling the control rod and the coupling rod, and whose second latching arm cooperates with stationary guides which act to pivot the latching lever, opposed by spring force, in such a manner that the first latching arm
10 cannot engage the recess and thus cannot couple. By means of the projection it is thus possible to deliberately disengage the coupling between the control rod and the coupling rod at desired positions of the rods.

- In a further variant of both embodiments of the invention the control switch has a switching nose which, when not mechanically loaded, is in a neutral centre
15 position and which, when released or actuated, in one or in the other direction of movement of the control rod, causes the switch actuators to supply switching pulses. The control switch can thus be caused to supply signal pulses in response two opposite cycles of movement.

- In a further variant of both embodiments of the invention the control rod
20 has rack teeth and a gear wheel of the servo mechanism cooperates with said rack teeth. The construction as a toothed rack is a simple and reliable method of transmitting motion.

- In a further variant of both embodiments of the invention during its longitudinal movement in the draw-in direction of a cassette the control rod, after
25 disengagement from the loading mechanism, up to an end point of its path of movement, can be moved independently of the loading mechanism, *i.e.* so far that it strikes against a limb of the head plate of the apparatus and thus pivots the head plate into its play position, a switch actuator on the control rod actuating the control switch in order to cause a reversal of the direction of rotation of the servo motor. The
30 disengagement enables this overtravel of the control rod to be obtained.

In a further variant of the first embodiment of the invention the coupling rod is provided with a switch actuator which, during the insertion of the cassette, causes the control switch to supply a starting pulse and, during ejection, causes it to supply a

stop pulse for the servo motor. Thus, operating functions can be started and stopped easily *via* the coupling rod.

In a further variant of the second embodiment of the invention, having an actuating lever which is mounted for pivotal movement adjacent the loading mechanism and, extending over the loading mechanism, acts on a cassette driver which can be moved between an eject and a draw-in position by the actuating lever, the actuating lever acts with a switching pin, serving as switch actuator, on the sole control switch to supply start and stop pulses. Thus, during insertion the deck is switched on by means of the one control switch *via* the actuating lever in response to the insertion of the cassette by hand.

In a further variant of both embodiments of the invention there has been provided a switching member for the servo mechanism, which switching member is pivotable about a pivot and also has a switch actuator for the one control switch which after completion of the servo movements of the servo mechanism by actuation of the control switch gives the logic circuit the signal that servo operations, such as drawing-in of the cassette or the movement of the head plate into the play position, have been completed. When the control member gives the signal that the servo movement has been completed the control member has already switched off the servo mechanism. As a matter of fact, in a further variant of the invention switching off is effected in that the pivotable switching member can be held in the servo driving position by the control rod itself by means of a servo gear wheel carried by said switching member and capable of establishing the connection between the servo motor and the teeth of the control rod, and, for the purpose of switching over from the servo mode to the play mode, can be released from this connection by the control rod to pivot and effect the switching over with simultaneous actuation of the control switch.

In a further variant of the invention the switching member has a stop pin which, in conjunction with the limb of the head plate, holds the servo mechanism in the position of engagement with the control rod or releases it for switching over. The switching member can thus be held in a stand-by position. Since in a further variant of both embodiments of the invention the switching member, as it pivots, releases a coupling pin of a reversing mechanism from a fork-shaped member to allow the reversing mechanism to bring a transmission gear wheel in mesh with the one or the other reel disc for the purpose of coupling the central gear wheel to one of the reel

discs, the transmission gear wheel can be kept disengaged from the reel discs in this stand-by position.

In a further variant of the invention the switching member has a guide pin which, during movement of the control rod, engages behind a guide edge of the control rod and thereby holds the switching member in a pivoted position in which the servo mechanism drives the control rod and the reversing mechanism is disengaged from the reel discs. As a result, the control rod holds the switching member in the position in which the switching member couples the servo mechanism to the toothed rack of the control rod during the control rod movement.

In a further variant of the second embodiment of the invention the coupling rod is pivotably mounted on the control rod and adjacent one end face of the control rod forms a coupling recess in which a coupling member of the loading mechanism is engageable. Thus, the loading mechanism and the control rod are coupled and disengaged by the pivotal movement of the coupling rod.

In a further variant of the invention for the formation of the coupling recess the coupling rod has a coupling projection which, in the coupling position, is spaced from an end face of the control rod, the recess being formed between the coupling projection, the end face and the control rod. Thus, the coupling recess is formed each time that the coupling member is to be coupled to the control rod.

In a further variant of the invention the coupling rod is extended beyond the catch pocket and the extension cooperates with the guides provided on the drive mechanism in such a way that said guides pivot the coupling rod so as to catch the coupling member in or disengage it from the recess, the coupling rod being capable of resilient deflection in the longitudinal direction.

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The invention will now be described in more detail with reference to the drawings. In the drawings:

Fig. 1 shows a diagrammatic view of the deck of a magnetic tape apparatus,

Fig. 2 is a diagrammatic exploded view showing the lift mechanism and the control mechanism of a head plate and of the lift mechanism,

Figs. 3 and 4 are a diagrammatic plan view and underneath view, respectively, showing a control rod with coupling rod mounted on it,

Fig. 5 shows diagrammatically the mechanism of the apparatus in the eject position,

Fig. 5a shows a part of Fig. 5, featuring the servo mechanism of the apparatus in the eject position,

5 Fig. 6 shows the servo mechanism in a position in which the control rod, when the end point of the inward path of movement is reached, has brought the head plate into the play position,

Fig. 7 shows the mechanism of Fig. 5 in its play position,

10 Fig. 7a shows a part of Fig. 7 with the servo mechanism in the play position,

Fig. 8 shows the mechanism of Fig. 5 in the stand-by position, and

Fig. 8a shows a part of Fig. 8,

Fig. 9 shows the mechanism of Fig. 5 in the fast-winding position,

15 Fig. 9a shows a part of Fig. 9 with the servo mechanism in the fast-winding position,

Fig. 10 shows diagrammatically a second embodiment of a loading mechanism,

Fig. 11 shows another construction of the apparatus mechanism belonging to the loading mechanism shown in Fig. 10,

20 Figs. 12 and 13 show diagrammatically a control rod with associated coupling rod, belonging to the apparatus mechanism of Fig. 11,

Fig. 14 shows the servo mechanism of Fig. 11 in the eject position,

Fig. 15 shows the servo mechanism of Fig. 11 in a position in which the control rod has brought the head plate into the play position when the end point of the
25 inward path of movement is reached,

Fig. 16 shows the servo mechanism of Fig. 11 in the play position,

Fig. 17 shows the servo mechanism of Fig. 11 in the fast-winding MSS position,

30 Fig. 18 shows the servo mechanism of Fig. 11 in the stand-by position.

Figs. 1 and 2 show a deck plate 1 serving as a chassis of a magnetic tape cassette apparatus having a head plate 3 which is pivotable about an eccentric pivot 5. The head plate 3 is U-shaped and has first and second limbs 9 and 11 projecting in the

same direction from the ends of its base 7. The limbs 9 and 11 are connected in corner areas 12 and 13. The first limb 9 has a transport projection 19 cooperating with a control rod 14 (not visible in Fig. 1), and the second limb 11 forms a functional part which cooperates with a holding-electromagnet device 15.

- 5 The base 7 of the head plate 3 carries a magnetic head 16 and pressure rollers 17a, 17b, which are pivotable relative to the base 7. The pressure rollers 17a and 17b can be applied to capstans 18a and 18b to guide the magnetic tape past the magnetic head 16 in one direction or the other.

- The head plate 3 is pivoted *via* the control rod 14, which is only visible in
10 Fig. 2. By means of the control rod 14 the head plate 3 can pivot about the eccentric pivot 5 and can pivot in the clockwise direction upon each actuation by means of the control rod 14.

- The holding-electromagnet device 15 comprises a magnet coil 20, in whose cavity 21 (Fig. 5) limbs of U-shaped magnetically isolated armature cores 22, 23
15 extend. The two armature cores 22, 23 lie one above the other, the respective armature core limbs 22a, 23a overlapping in pairs. The iron yokes 22b, 23b are situated at opposite coil ends 20a, 20b. The holding-electromagnet device 15 is fixedly secured to the deck plate 1.

- Pole shoes 23c and 22c, which cooperate with a first armature plate 24
20 and a second armature plate 25, are formed at the free ends of the limbs. The first armature plate 24 is mounted on a slide 26 so as to be pivotable about a pin 24a. With the pin 24a this slide 26 engages a guide slot 27 in the limb 11. A guide pin 26b of the slide 26 can be guided along a curved slot 28 in the functional part 11. The arcuate slot 28 extends arcuately at an oblique angle towards the holding-electromagnet device 15. A
25 spring 29 ensures that in the normal case the guide pin 26b moves into the end portion 28a of the arcuate groove 28. In this position the slide 26 extends above and parallel to the limb 11.

- The second armature plate 25 is arranged on an arm 30 so as to be pivotable about a pin 25a. The arm 30 itself is L-shaped and has a short arm portion
30 30a, which also carries the second armature plate 25, and at its end 30b is pivotable about a pivot 31 in the directions indicated by a double arrow 32. A long arm portion 30c extends parallel to the magnet coil 20 up to a side face 33 of the slide 26, where it terminates in oblique run-on surface 35 in the proximity of a nose 34 of the slide.

When the armature plates 24 and 25 have been applied to the pole shoes 23c and 22c, respectively, they can stick to the pole shoes upon energisation of the magnet coil 20. Thus, they can define two operating positions of the head plate 3 as long as the magnet coil 20 is energised. Depending on whether one or both armature plates had been applied one or both armature plates is/are not released until the magnet coil 20 is deenergised and a spring 37, which acts on the base 7 of the head plate 3, can pivot the head plate 3 anticlockwise into a rest position. The holding-magnet device is described in detail in German Patent Application P 37 14 704.8.

The cooperation of the head plate with the holding-electromagnet will now be described with reference to their functions. Figs. 8 and 8a show the so-called stand-by or rest position. The magnet coil 20 is de-energised and the armature plate 24 has moved away from the pole shoes 23c of the armature core 23. A spring 36 ensures that the armature plate 25 constantly lies against the pole shoes 22c. A spring 37 keeps the head plate 3 pivoted anticlockwise in the rest or stand-by position. Both the magnetic head 16 and the pressure rollers 17a and 17b are entirely clear of a magnetic tape, not shown, which extends between the pressure roller/capstan pairs 17a, 18a/17b, 18b along the magnetic head 16. If the head plate is to be pivoted into and should remain the play position (Figs. 6, 7 and 7a) the control rod 14 strikes against a transport projection 19, causing the head plate 3 to be pivoted clockwise. The magnet coil 20 remains initially deenergised. When the head plate 3 is pivoted clockwise the limb 11 also moves towards the holding-electromagnet device 15. The nose 34 of the slide 26 strikes against the oblique surface 35 of the long arm portion 30c. The spring 36 is sufficiently weak for the nose 34 to force the surface 35 and thus the long arm portion 30c outward in the anticlockwise direction. The guide pin 26b remains in the end portion 28a. The functional part 11 moves the first armature plate 24 against the pole shoes 23c. The magnet coil 20 is now energised and the armature plate 24 is held against the pole shoes 23c (Figs. 6 and 7). Thus, the head plate 3 is simultaneously held in the play position. If the play mode has ended the magnet coil 20 is deenergised and the spring 37 pivots the head plate anticlockwise into the rest or stand-by position. The play position can be reached again from this rest or stand-by position. Now it will be explained how the fast-winding position can be reached and maintained.

To go to the fast-winding position (Figs. 9 and 9a) the control rod 14 pushes the head plate into the play position and the magnet coil 20 is energised. The

second armature plate 25 has already been applied to the pole shoes 22c, and the magnetic holding force now adds to the force of the spring 36. Thus, it has become more difficult to pivot the long arm portion 30c away in the anticlockwise direction. The nose 34 of the slide 26 is now no longer capable of pivoting the long arm portion 30c away. This means that the nose 34 must give way to the surface 35 of the long arm portion 30c. As a result, the guide pin 26b is moved to the other end 28b of the arcuate slot 28. This movement causes the slide 26 with the guide pin 24a in the slot 27 to be moved towards the holding-electromagnet device 15 while simultaneously being pivoted in the direction indicated by an arrow 26c. This means that the limb 11 is virtually extended towards the holding-electromagnet device 15. As a result of this extension the limb 11 cannot advance so far towards the holding electromagnet device 15 as described above for the play position. The head plate 3 thus remains slightly out of the play position shown in Figs. 6 and 7 and the magnetic tape is slightly clear of the magnetic head 16. In addition, neither of the pressure rollers 17a and 17b is applied to either of the capstans 18a, 18b. Thus, the position for fast forward and reverse winding is reached.

If fast forward or reverse winding is to be stopped the magnet coil 20 is deenergised. As a result of this, the armature plate 24 is disengaged from the pole shoes 23c and the spring 37 can pivot the head plate 3 anticlockwise back into the rest or stand-by position (Fig. 8).

The deck plate 1 carries two motors 40, 41. The motor 40 serves to control the movements of the head plate 3, the movement of the servo mechanism and the drive of the reel discs 42, 43. The motor 41 serves to drive the capstans 18a, 18b via a belt 44. This is effected by means of flywheels 45a, 45b. The belt 44 is passed around the flywheels 45a, 45b in an S-shape in order to obtain opposite directions of rotation of the capstans 18a, 18b. The motors are controlled via a logic circuit 46 arranged on a circuit board 47. The circuit board 47 is mounted on the deck plate 1.

The motor 40 drives a central gear wheel 50 via a worm shaft 48 and a reduction gear 49 comprising two gear wheels 49a and 49b. A pivotal arm 51 on which a transmission gear wheel 52 is mounted for rotation is pivotable about the spindle 50a of the central gear wheel 50. By means of a friction clutch (not shown) between the pivotal arm 51 and the central gear wheel 50 the transmission gear wheel 52 can be

pivoted in such a way that the transmission gear wheel 52 can selectively drive one reel disc 42 or the other reel disc 43.

The control rod (Figs. 3 and 4) carries a coupling rod 14a, which is longitudinally movable on the control rod. The coupling rod 14a has a hook-shaped recess 14b, which is engageable by a coupling member 82 of a lift slide to be described hereinafter. A further coupling recess 14c is intended for engagement of a coupling projection 14d (Fig. 4). The control rod 14 has rack teeth 14e. Fig. 3 is a plan view of the control rod, showing a two-arm latching lever 53 which is pivotable about a spindle 14f and has a first latching arm 53a, whose coupling projection 14d tends to engage the coupling recess 14c of the coupling rod 14a as a result of the spring load exerted by a spring 54 acting on a second latching arm 53b. At its free end the second latching arm 53b has a run-on portion 55 which cooperates with fixed guides 56 and 57 on the chassis.

The control rod 14 can be driven so as to be longitudinally movable by the servo motor 40 with the aid of a servo mechanism 50a, which includes a switching wheel 58. The switching wheel 58 is disposed on a switching member 59 and can transmit its rotation from a gear wheel 50b, which is rotatable on the spindle of the central gear wheel 50 together with the latter, to the teeth 14e of the control rod via gear wheels 60 and 61. The switching member 59 is mounted so as to be pivotable about a pivot 62 and is urged in the clockwise direction by a spring 63. The switching member 59 further has a latching fork 78, which diverges in a finger-like fashion, a switching actuator 65, a guide pin 66, which can move along a guide edge 66a of the control rod 14 until it leaves the latter, and a stop pin 67, which engages a slot 68 in the deck plate 1 and cooperates with the head portion 69 of the limb 9.

A control switch 70, whose switching nose 71 assumes a neutral central position when not loaded, is mounted on the deck plate 1. The switching nose 71 can be actuated from both directions of movement, indicated by arrows A and B in Fig. 5a, by switch actuators, causing the switch to supply signal pulses to the logic circuit 46. The switch actuators are a coupling hook 14g on the coupling rod 14a, a switching-member hook 65 and a control-rod projection 72.

The coupling member 82 establishes the connection to a lift slide 83 (Fig. 2). The direction of an arrow 85 (arrow B in Fig. 5a) indicates the direction of insertion

of a cassette 86 into a loading mechanism 87, which includes the lift slide 83. The loading mechanism 87 has a lift compartment 88, which receives the cassette 86.

The lift slide 83 is guided in a slideway 89 so as to be longitudinally movable in the directions indicated by a double arrow AB. The slideway 89 belongs to a plastics part 90 which is connected to the deck plate 1 in a manner not shown. In the representation according to Fig. 2 the lift slide 83 is substantially U-shaped with a long limb 91, a base 92 and a short limb 93. The long limb 91 has two oblique guideways 94 in which pins 95 of the lift compartment 88 are guided. The short limb 93 is likewise provided with an oblique guideway 96, which cooperates with a projection 97 of the lift compartment. In this way, the lift compartment 88 has a kind of three-point mounting or guidance relative to the lift slide 83. Moreover, an overcentre spring 98 is supported on the plastics component 90 and on the long limb 91 of the lift slide 83.

The plastics component 90 has a horizontal edge 90a which is bounded by a vertical edge surface 90b. A further vertical edge surface 90c extends parallel to the vertical edge surface 90b. The distance between the two vertical edges 90b and 90c corresponds to the distance between the pins 95, the pins 95 being able to move between the vertical edge surfaces 90b and 90c along the latter.

Fig. 1 furthermore shows that the pivotal arm 51, which supports the transmission gear wheel 52 and is pivotable about the spindle of the central gear 50, is arranged between the reel discs. The pivotal arm carries a stop pin 77 which engages the latching fork of the switching member 59. By engagement with the stop pin 77 the latching fork is capable of urging the transmission gear wheel 52 away from the reel discs 42, 43 and thereby disengaging the drive coupling between one of the reel discs 42, 43 and the servo motor 40 or the central gear wheel 50. The pivotal arm 51 furthermore has a joint 99 on which an actuating lever 100 acts, which lever is pivotable about a pivot 101. In a range of the pivotal movement of the transmission gear wheel 52 a stationary toothed segment 102 is arranged with which the transmission gear wheel 52 can mesh. For this purpose, the transmission gear wheel has teeth 52a on its underside. At its side which is remote from the point 99 the actuating lever 100 carries a pin 103, which is movable to a limited extent in a slot 104. The slot 104 has been provided in a slide 105 having pins 106 which are movable in slots 107 in the deck plate, specifically parallel to the double arrow 70.

Cams 109 connected to toothed segments 110 are pivotable about pivots 108 on the deck plate 1. These toothed segments 110 cooperate with toothed racks 111 of the slide 105. Thus, by a pivotal movement of the actuating lever 100 about the pivot 101 the pin 103 can move the slide 105 in one or other direction of the double arrow 70 when one of the ends of the slot 104 is reached. During this movement the cams 109 are rotated. The pressure rollers 17a, 17b are supported in members 112a, 112b which are pivotable about pivots 113. The pivots 113 are arranged on the head plate 3. The members 112a and 112b have pins 114 which can follow the surfaces of the cams 109. The members 112a and 112b are spring-loaded towards the capstans 18a, 18b with the aid of springs 115a, 115b. The springs 115a and 115b always urge the pins 114 against the cams 109.

If there is no cassette 86 in the deck the individual parts of this deck will assume the positions relative to one another as shown in Figs. 5 and 5a. If the apparatus is to be put into operation a cassette 86 is inserted into the lift compartment 88. During manual insertion of the cassette the coupling member 82 of the lift compartment 88 takes along the coupling rod 14a. The control rod 14 remains positioned against a stop on the chassis 1 at its one end point C for the time being.

In the eject position of the cassette 86 and of the lift compartment 88 the switching nose 71 has been pivoted onto the coupling hook 14g. If the lift compartment 88 moves the coupling rod 14a in direction B the coupling hook 14g releases the switching nose 71. This results in the first pulse to the logic circuit 46, said pulse causing the logic circuit to start the servo motor 40, *i.e.* to set it to rapid rotation with a drive voltage of 12 V and a large torque.

In the eject position (Figs. 5 and 5a) of the cassette 86 and the lift compartment 88 the run-on portion 55 of the latching lever 53 is situated on the guide 56. The latching lever 53 has thus been pivoted in such a way against the action of the spring 54 that the coupling projection 14d is lifted out of the coupling recess 14c. The control rod 14 and coupling rod 14a have thus been disengaged from one another. Thus, it is possible for the coupling rod 14a to be moved in the direction of arrow B while the control rod 14 is stationary. When the servo motor 40 is started (the coupling hook 14g has released the switching nose 71, whereupon the latter supplies the starting signal to the logic circuit) the run-on portion 55 has left the guide 56 *via* the oblique surface 56a and the latching lever has coupled the control rod and the coupling rod in that the

coupling projection 14d engages the coupling recess 14c. By means of the servo mechanism 50a, which comprises the gear wheels 50, 58, 60, 61, both rods 14 and 14a are now moved to the right in the direction indicated by the arrow. The switching member 59 holds the stop pin 77 via the latching fork 78, as a result of which the
5 transmission gear wheel 52 meshes with neither of the reel discs.

The inward movement of the cassette by hand can be taken over directly by the coupled control rod 14, 14a. After a certain travel along the path of inward movement the run-on portion 55 runs onto the guide 57 via an oblique surface 57a. As a result, the control rod 14 and the coupling rod 14a are disengaged again. The
10 coupling rod 14a remains stationary because the lift compartment 88 has reached the end position of the inward movement. However, driven on by the servo mechanism 50a, the control rod 14 moves further to the right until its leading edge 14h strikes against a transport projection 19 of the limb 9 of the head plate 3 and presses the latter up against one end 74 of a slot 75 in the deck plate (Fig. 6). At this instant the control
15 rod projection 72 has pivoted the switching nose 71 so far that the switch 70 can supply a signal pulse to the logic circuit 46. This signal pulse causes the logic circuit to reverse the direction of rotation of the servo motor 40 and the holding magnet 15 to be attracted. While the control rod 14 moves back in the direction indicated by the arrow A the head plate remains in its play position as a result of the attraction force of the
20 holding magnet 15. In the meantime, the guide pin 66 has run onto the guide edge 66a. During the return of the control rod 14 the guide pin 66 leaves the guide edge 66a and the spring 63 pivots the switching member 59 clockwise until the stop pin 67 reaches the end 68a of the slot 68. The switching member hook 65 has been pivoted upwards and strikes against the switching nose 71 of the switch 70. The switch 70 again supplies
25 a signal pulse to indicate that the function of bringing the head plate 3 into the play position has been performed correctly and the servo mechanism has been set into its stand-by position. If the command to effect a playing operation has been present from the beginning said signal pulse can initiate the start of the playing operation. Indeed, the head plate has remained in the position shown in Fig. 6 owing to the attraction of the
30 holding magnet 15. The play position of the servo mechanism and tape transport mechanism is illustrated in Figs. 7 and 7a. During the pivotal movement of the switching member further mechanical switching functions have been performed. For example, the central gear wheel 50 has been disengaged from the gear wheel 58. The

servo mechanism has thus been switched off. The latching fork 78 has simultaneously released the stop pin 77. This has enabled the transmission gear wheel 52 to mesh with a reel disc 42, with the result that the servo motor now drives the reel disc 42. The servo motor is switched over from the 12 V drive voltage to the 2 V drive voltage.

5 If the deck receives an external command to stop *via* a hand actuated function key the logic circuit switches off the holding-magnet device. This results in the head plate being pivoted anticlockwise and a head portion of the head plate 3 urging the switching member 59 back in the anticlockwise direction *via* a stop pin 67 (Figs. 8 and 8a). The guide pin 66 is then positioned in front of the guide edge 66a and the fork 64
10 is engaged by the stop pin 77, the transmission gear wheel 52 being moved away from the instantaneously driven reel disc 42, 43. The gear wheel 60 of the servo mechanism meshes with the teeth 14e of the control rod 14. The switch actuator 65 on the switching member 59 has pivoted away from the switching nose 71 of the switch 70. The logic circuit 46 interprets a switching pulse produced by the switch 70 in response
15 to the pivotal movement as a command to switch off the servo motor 40 and the capstan motor 41. The logic circuit 46 switches off both motors 40, 41. The apparatus is in its stand-by position.

 It is possible to switch directly from the stand-by position to the play position. By manual actuation of an external function button the servo motor is switched
20 to 12 V operating voltage. The servo mechanism moves the head plate 3 into the play position as far as the stop *via* the transport projection (Fig. 6). The logic circuit recognises a control pulse from the switch 70 as a signal to reverse the direction of rotation of the servo motor 44 and to actuate the holding-magnet device 15. The control rod 14 moves back until the guide edge 66a releases the guide pin 66 and the switching
25 member is pivoted clockwise under spring load. The switch actuator 72 produces the control signal to switch the servo motor 40 back to 2 V and to switch on the capstan motor 41. The latching fork 78 releases the stop pin 77 and the transmission gear wheel 52 meshes with the respective reel disc 42, 43 in order to drive it. During the pivotal movement of the switching member 59 the servo mechanism has been disengaged from
30 the teeth 14e of the control rod 14 (Figs. 9 and 9b). The deck operates in the play mode.

The change-over of the drive voltage of the servo motor between 2 V and 12 V is important because a large torque is required for carrying out servo functions. When the reel discs 42, 43 are driven in the play mode only a low torque is required.

A pressure-roller movement has occurred simultaneously with the change
5 from the stand-by position to the play position. As a result of the disengagement of the stop pin 77 the actuating lever 100 has moved the slide 105 to the left in the direction indicated by an arrow 120. By means of the toothed segments 110 the toothed racks 111 have rotated the cams 109 in the clockwise direction. The pin 114 of the right-hand member 112a has left the surface 121 of the cam 109 and has run up against an edge
10 122, the pin 114 being constantly urged against the edge 122 by the spring 115a. At the same time the pressure roller 17a has been positioned against the capstan 18a. The movement of the pin 114 off the surface 121 to the edge 122 *via* a corner portion 123 has simultaneously resulted in the pin 114 taking over the movement of the slide 105 in the direction indicated by the arrow 120, which movement has previously been initiated
15 by the actuating lever 100. While the pin 114 of the right-hand cam 109 has now run onto the lower edge 122 the pin 114 of the left-hand cam 109 has now run from the edge 122 onto the surface 121 *via* the corner portion 123. As a result, the member 112b is pivoted clockwise in opposition to the force exerted by the spring 115b and the pressure roller 17b is lifted off the capstan 18b. Parallel to this the pressure roller 17a
20 has been applied to capstan 18a. The tape-transport direction has thus been reversed.

Control of the apparatus is always effected *via* the logic circuit 46. All the external control commands pass to the logic circuit *via* keys or the like and all internal control commands pass from the switch 70 to the logic circuit. If the transport direction of the apparatus is to be reversed the logic circuit gives the motor 40 the command to
25 reverse its direction of rotation either at the end of the tape or by means of a key. For the tape transport parts this reversal of the direction of rotation has the effect that the actuating lever 100 first of all moves the slide 105 in the direction indicated by an arrow 124 until, at the left-hand cam 109, the pin 114 has moved past the corner portion 123 and pin 114 has taken over, *via* the edge 122, the subsequent movement of
30 the slide 105 in the direction indicated by the arrow 124. The pressure roller 17a is then disengaged from the capstan 18a and the pressure roller 17b is applied to the capstan 18b. The transmission gear wheel 52 has simultaneously been pivoted from the reel disc 42 to the reel disc 43.

If the play mode is to be ended, which is possible, for example, by actuation of a key or an interruption of the supply voltage, the holding-magnet device 15 is deenergised and the head plate 3 is pivoted anticlockwise under the influence of the spring 37.

5 Fig. 10 shows diagrammatically a second embodiment of a loading mechanism. This loading mechanism is arranged on the deck plate 1. The deck plate 1 carries least one vertical supporting plate 205 provided with a vertical supporting-plate slot 206. The deck plate 1 has guideways 207 and 208, which guide a slide 209 in the inward and eject directions AB in a vertical position and in engagement with the vertical
10 supporting plate 205. The guideway 207 consists of a slot 207a, in which a limb 210 of the slide 209 is movable in the directions AB. The guideway 208 consists of a slot 211 in the deck plate 1, which slot is engaged by a coupling member 82 of the slide 209. The coupling member 82 can be slid back and forth in the directions indicated by a double arrow 213. The directions of movement corresponds to the inward and eject
15 directions AB.

The slide has at least two lift slots 214 in the side shown as the front side in the Figure. A third lift slot 214 may be provided in the opposite side of the slide. Each lift slot 214 has a central portion 214a which is inclined relative to the vertical supporting-plate slot 206 at a given angle of, for example, 8° . All central portions 214a
20 are inclined at the same angle relative to the vertical. The inclined upper ends of the central portions 214a of the lift slots 214 are adjoined by substantially horizontal rearward end portions 214b, which extend towards the rear side of the mechanism and which allow an overtravel for the ejection movement of the slide. The lower ends of the central portions 214a are adjoined by forward end portions 214c which extend in the
25 forward direction and which are inclined in the lowering direction, to allow an overtravel at the end of the inward movement.

In addition to its forward vertical slide-plate portion 209a the lift slide has a rearward vertical plate portion 209b. Both plate portions 209a and 209b are connected by at least one substantially horizontal slide connecting plate 209c. Likewise, a
30 backplate connecting the rear edges may be provided at the rear edges 209d.

A cassette holder 215 is situated between the slide plate portions 209a and 209b. This cassette holder 215 essentially comprises two guide plates 215a, 215b which are spaced apart one above the other in horizontal planes and are connected at

longitudinal edges 215d by guide plates 215c. The guide plate 215c shown at the front has two pins 216 which project laterally from it and extend through the lift slots 214. A third pin 216 engages the third slot 214 in the plate portion 209b of the slide 209. In the forward part of the loading mechanism the pins 216 extend through the lift slot 214 and the supporting-plate slot 206. The cassette holder 215 is moved up and down by sliding the slide 209 backwards and forwards by means of the coupling member 212.

A cassette driver 217, which is guided in a guide slot 218 of the slide connecting plate 209c, serves for drawing in and ejecting a cassette. The guiding slot 218 extends in the directions indicated by the double arrows 213 and AB.

The cassette driver 217 has a coupling pin 219 which extends through a slot 220 in an actuating lever 221. This actuating lever 221 has a bearing 222. This bearing 222 comprises an upright dome 223 provided on a support 224 connected to the deck plate 1. Preferably, it is an injection-moulded part which is integral with the deck plate 1. The dome 223 is surrounded by a bearing sleeve 225 which is part of the actuating lever 221. At its lower end the bearing sleeve 225 has a collar 226, over which a hook 227 of the support 224 engages.

The actuating lever 221 has a guide slot 228 through which a coupling pin 229 arranged on the slide connecting plate 209a extends.

The dome 223 is situated adjacent the slide 209. By coupling the slide to the actuating lever 221 via the coupling pin 229 two lever arms L_k and L_l of different lengths are obtained, which are of significance for the path of movement of the cassette driver 217. Even short slide movements result in long paths of movement of the cassette driver 217.

A return spring 230 is fitted on the dome 223 in the upper part of the bearing 222. The sleeve 225 of the actuating lever 221 extends beyond this return spring 230, which is a helical spring. The helical spring has an end arm 231 and 232 at each of its ends. As seen from the insertion side 233 of the cassette holder 215 the end arm 231 lies against the coupling pin 229. The other end arm is supported on a projection 234 of the bearing sleeve 225. The device serves to return the cassette if the draw-in mechanism of the magnetic tape apparatus does not respond.

The cassette loading mechanism operates as follows. A magnetic tape cassette 86 is inserted into the cassette holder 215 at the insertion side 233. The pins 216 of the cassette holder 215 are situated in the rearward end portions 214b of the lift

slots 214. The reel-hub opening situated at the front of the inserted cassette (not shown) in the insertion direction moves underneath a coupling hook 217a of the cassette driver 217 until it engages the reel-hub opening of the cassette. As insertion proceeds the cassette driver will move the actuating lever in the direction indicated by an arrow 235.

- 5 At this instant provision is made for the loading mechanism of the magnetic tape apparatus to be switched on and for the coupling member 82 to be moved in the inward direction. When the loading mechanism is put into operation and the slide 209 travels towards the rear the coupling pin 229 also travels towards the rear. The slide can thus travel as far as its rearward end position, the cassette holder 215 being lowered in the
- 10 lift slots 214 by means of the pins 216.

If the loading mechanism does not respond and the slide 209 thus stops in its initial position the coupling pin 229 also remains in the same position and the helical spring 230 is tensioned between the coupling pin 229 and the projection 234 as the cassette is pushed in by hand. As a result, the actuating lever 321 pushes back the

15 cassette as soon as the insertion force ceases. This insertion force is exerted by the hand of the user. In the case of an apparatus fault the cassette can therefore never disappear inside the mechanism.

As is shown in Fig. 10, a switching pin 237 is arranged on the sleeve 225 and engages in a coupling slot 239 of a switching lever 240 at the other side of the deck

20 plate 1. As shown in Fig. 11, the switching lever 240 can be pivoted about a pivot 241. The switching lever 240 is a two-arm lever having a first lever arm 240a, in which the switching pin 237 engages, and a second lever arm 240b, which carries a switching element 260 which can act on the switching nose 71.

Fig. 11 shows the second embodiment of the apparatus servo mechanism,

25 many parts of which correspond to the mechanism shown in Figs. 5 to 9. For this reason, parts having the same functions bear the same reference numerals as in Figs. 1 to 9. In the same way as in Fig. 5, the servo motor 40 drives the central gear wheel 50 and, via the latter, the servo mechanism 50a. The control rod 14 can pivot the head plate 3 clockwise and the switching nose 71 of the switch 70 can cause the actuation of

30 the holding-magnet device in the pivotal end position. When the control rod assumes the play position a switching member 59 ensures not only the actuation of the switching nose 71 but also the change-over of the servo mechanism 50a from driving the control rod to driving the reel discs.

As is shown Figs. 12 and 13, the control rod 14 has teeth 14e. A coupling rod 14k is mounted on the control rod so as to be pivotable about a spindle 14f. The coupling rod 14k has a projection 141 which extends well beyond the control rod 14 in the inward direction, substantially in the longitudinal direction. A coupling projection 14n which, in the coupling position shown in Fig. 12, is spaced from an end face 140 of the control rod 14, is situated on the coupling rod 14k to form a coupling recess 14m, the recess 14m being formed between the coupling projection 14n, the end face 140 and the control rod 14. The projection 141 cooperates with guides 242 on the deck in such a way that these guides 242 pivot the coupling rod 14k for engagement or disengagement of the coupling member 82 in/from the recess 14m. To achieve guidance with a certain reliability the coupling rod 14k can deflect resiliently in the longitudinal direction. An excessive deflection in a direction in which the coupling recess 14m is eliminated is prevented by a lever arm 14p of the coupling rod 14k, said lever arm 14p abutting against a wall 14r of the control rod 14 in the case of a clockwise pivotal movement (as shown in Fig. 12). The control rod 14 has a projection 72 which presses against the switching nose 71 in the end position of the control rod 14 to be described later, in which position the head plate is pressed into its playing position.

Of the servo mechanism 50a the switching member 59 carries only the gear wheel 60, which can be brought into mesh with the teeth 14e of the control rod 14. The entire servo mechanism 50a comprises a pinion 50b mounted on the shaft of the central gear wheel 50, an intermediate gear wheel 50c mounted rotatably on the deck 1, the gear 60 wheel, which is mounted on the switching member 59 and is used for the servo drive, and the transmission gear wheel 52, which serves for the reel disc drive. The switching member 59 is pivotable about a pivot 62 and is urged clockwise by a spring 63. A switching member hook 65 provided on the switching member 59 can act on the switching nose 71.

Figs. 11 and 14 show the servo mechanism in the same position, *i.e.* in the eject position, in which there is no cassette 86 in the cassette holder 215. If the deck is to be put into operation a cassette 86 is inserted into the slot 233. After a given inward movement the resilient limb 217a of the cassette driver 217 snaps into the reel-spindle hole of the cassette. The cassette driver 217 is then pushed backwards together with the manually inserted cassette and the actuating lever 221 pivots in the direction indicated by the arrow 235. As a consequence, the sleeve 225 also rotates anticlockwise

as indicated by the arrow 235 and the switching pin 237 also pivots the switching lever 240 anticlockwise about the switching lever pivot 241. The switching element 260 on the second lever arm 240b thus moves away from the switching nose 71 and the switching nose 71 automatically follows 241 the switching element 260 until it stops in its central position defined by the switch 70. At the stopping instant the switch 70 supplies a pulse to the microprocessor 46, which causes the servo motor 40 to be started. The servo motor 40 thus rotates the central gear wheel 50. This central gear wheel 50 in its turn rotates the pinion 50b, the intermediate gear wheel 50c and the gear wheel 60, which is in mesh with the teeth 14e. The control rod 14 is thus moved to the right out of the position shown in Figs. 11 and 14. The switching member 59 keeps the servo mechanism 50a in engagement with the teeth 14 because the stop pin 67 on the switching member 59 engages with the head portion 69 of the head-plate limb 9.

Fig. 14 shows that the extension 14l of the coupling rod 14k is urged clockwise by the guide 242, as a result of which the coupling member 82 engages the recess 14m. If, with the servo motor voltage switched to 12 V, the control rod 14 now travels to the right, a deflector edge 244 of the coupling rod portion 14p runs onto the guide 242a. As a result, as is shown in Fig. 16, the coupling rod 14k is tilted and releases the coupling member 82.

The control rod 14 now travels further to the right and its leading edge 14h finally strikes against the transport projection 19 of the head plate 9. Prior to this, the guide pin 66 has run onto the guide edge 66a, thereby preventing the switching member 59 from being pivoted clockwise. At the instant at which the transport projection 19 of the head plate 9 has been pushed into the play position the control rod projection 72 has also pivoted the switching nose 71 of the switch 70 and pressed it against the switching element 260. The switch 70 then once more supplies a signal to the microprocessor 46, which causes direction of rotation of the servo motor to be reversed.

From the position shown in Fig. 15, in which the head plate has been moved into the play position and the holding-magnet device now also holds the head plate in the play position, the servo motor 40 moves the control rod 14 back to the left into a position shown in Fig. 16. Since during the movement of the head plate into the play position the head portion 69 of the limb 9 has moved to the right the stop pin 67 has lost its support on the head portion 60. Initially this has no effect because the

switching member is positioned on the guiding edge 66a with its guide pin 66 and thus remains locked against pivotal movement. This locking is maintained until, as the control rod 14 moves further to the left, the guide pin 66 leaves the guide edge 66a. The switching member 59 is consequently free to pivot and pivots in the clockwise
5 direction insofar as this is permitted by the slot 68 in the deck plate 1.

The pivotal movement of the switching member 59 has three effects. Firstly, gear wheel 60 is moved out of mesh with the teeth 14e. Secondly, the latching fork 78 has released the stop pin 77, so that the transmission gear wheel 52 can mesh with the reel disc 42 or 43. Thirdly and finally, the switching member hook 65 has once
10 more abutted against the switching nose 71 of the switch 70, so that the switch 70 can again supply a signal to the microprocessor. In response to this abutment the microprocessor starts the drive motor 41 for the capstans and switches the servo motor from 12 V to 2 V. At the same time the actuating lever 100 has applied the desired pressure roller to the corresponding capstan, which now rotates.

15 Music search (MSS) does not require any change of the servo mechanism out of the position shown in Fig. 16. Music search is achieved exclusively *via* the holding-magnet device in that the slightly tilting head plate is immediately recaptured and held. The servo motor 40 is not restarted until music search has ended and the control rod 14 is then pressed against the transport projection 19 until the head plate has again
20 reached its play position and the holding-magnet device 15 has effected holding in the play position.

When playing of a cassette is stopped, for example by actuation of a key, the head plate is released after deenergisation of the holding-magnet device 15 and assumes the position shown in Fig. 18. In this so-called stand-by position the reel discs
25 are disengaged because the latching fork 78 has pivoted the pivotal arm *via* the stop pin 77 in such a way that the transmission gear 52 is moved out of mesh with one of the reel discs. The cassette is still in the inserted position and playing can be restarted by means of an external key command, the control rod 14 then being moved wholly to the right, as shown in Fig. 15, until the head plate has resumed its play position. If the
30 cassette is to be ejected from this stand-by position an eject command from by the microprocessor starts the servo motor 40 and the servo mechanism 50a moves the control rod 14 to the left. As a consequence, the arm 14p of the coupling rod 14k is released by guide 242a and, by pressure on the free end 245, the guide 242 has caused

the coupling member 82 to reengage the recess 14m. The coupling member 82 is now moved in the eject direction, the cassette holder 250 is lifted, and the pin 229 moves the actuating lever 221 in the eject direction. The cassette driver 217 then moves the cassette in the eject direction until, finally, this cassette can be removed by hand.

Claims

1. A magnetic tape cassette apparatus having a control device for controlling tape-deck functions including the drawing-in and ejection of a cassette (86) by means of a drive mechanism having a motor (40), which drive mechanism comprises a control rod (14) which is movable back and forth in a longitudinal direction by a servo motor (40), which control rod can be moved along its path of movement between end points and, in given operating positions, controls tape-deck functions in conjunction with switch actuators and a logic circuit, characterised in that
- a coupling rod (14a) is guided on the control rod (14) so as to be movable in the longitudinal direction thereof,
 - 10 - the coupling rod (14a) can be lock to the control rod (14) along a part of the path of movement of the control rod,
 - the coupling rod (14a) is mechanically coupled to the loading mechanism of the tape deck,
 - by means of switch actuators provided on the coupling rod (14a) and the control rod (14) to produce switching signals said coupling rod and control rod act on a control switch (70) which applies the commands imparted by switch actuators (14g, 72) to the logic circuit, which derives therefrom switching commands for apparatus functions.
2. A magnetic tape cassette apparatus having a control device for controlling tape-deck functions including the drawing-in and ejection of a cassette (86) by means of a drive mechanism having a motor (40), which drive mechanism comprises a control rod (14) which is movable back and forth in a longitudinal direction by a servo motor (40), which control rod can be moved along its path of movement between end points and, in given operating positions, controls tape-deck functions in conjunction with switch actuators and a logic circuit, characterised in that
- a coupling rod (14k), which can be moved transversely of the longitudinal direction of movement of the control rod (14), is arranged on the control rod (14),



- the coupling rod (14k) can be coupled to the loading mechanism of the tape deck,
 - the coupling rod (14k) can be coupled to or disengaged from the loading mechanism by transverse movements with the aid of stationary guides (242, 242a) on the tape deck,
 - by means of at least one switch actuator (72) provided on the control rod (14) to produce switching signals at least said control rod acts on a control switch (70) which applies the commands imparted by switch actuator (72) to the logic circuit, which derives therefrom switching commands for apparatus functions.
3. An apparatus as claimed in Claim 1 or 2, characterised in that all the switch actuators (14a, 14g, 65, 72) of the control device act on a single control switch (70) which controls all the electrical control functions of the tape deck *via* the logic circuit.
4. An apparatus as claimed in Claim 1 or 2, characterised in that at least at the end points (C,D) of their path of movement the control rod (14) and the coupling rod (14a, 14k) are disengaged from one another so that their switch actuators (14g, 72) can act on the control switch (70) independently of the position of the respective other rod.
5. An apparatus as claimed in Claim 1, characterised in that a two-arm latching lever (53) is arranged on the control rod (14), whose first latching arm (53a) is spring-loaded to engage a recess (14c) in the coupling rod (14a) for the purpose of coupling the control rod (14) and the coupling rod (14a), and whose second latching arm (53b) cooperates with stationary guides (56, 57) which act to pivot the latching lever (53), opposed by spring force, in such a manner that the first latching arm (53a) cannot engage the recess (14c) and thus cannot couple.
6. An apparatus as claimed in Claim 1 or 2, characterised in that the control switch (70) has a switching nose (71) which, when not mechanically loaded, is in a neutral centre position and which, when released or actuated, in one or in the other direction of movement of the control rod, causes the switch actuators (14g, 14a, 65, 72) to supply switching pulses.
7. An apparatus as claimed in Claim 1 or 2, characterised in that the control rod (14) has rack teeth (14e) and a gear wheel (60) of the servo mechanism cooperates with said rack teeth (14e).



8. An apparatus as claimed in Claim 1 or 2, characterised in that during its longitudinal movement in the draw-in direction of a cassette (86) the control rod (14), after disengagement from the loading mechanism, up to an end point of its path of movement, can be moved independently of the loading mechanism, *i.e.* so far that it strikes against a limb (9) of the head plate (3) of the apparatus and thus pivots the head plate (3) into its play position, a switch actuator on the control rod (14) actuating the control switch (70) in order to cause a reversal of the direction of rotation of the servo motor.

9. An apparatus as claimed in Claim 1, characterised in that the coupling rod (14a) is provided with a switch actuator (14g) which, during the insertion of the cassette (86), causes the control switch (70) to supply a starting pulse and, during ejection, causes it to supply a stop pulse for the servo motor (40).

10. An apparatus as claimed in Claims 2 and 3, having an actuating lever (221) which is mounted for pivotal movement adjacent the loading mechanism and, extending over the loading mechanism, acts on a cassette driver (217) which can be moved between an eject and a draw-in position by the actuating lever (221), characterised in that the actuating lever (221) acts with a switching pin (237), serving as switch actuator, on the sole control switch (70) to supply start and stop pulses.

11. An apparatus as claimed in Claim 1 or 2, characterised in that there has been provided a switching member (59) for the servo mechanism, which switching member is pivotable about a pivot (62) and also has a switch actuator (65) for the one control switch (70) which after completion of the servo movements of the servo mechanism by actuation of the control switch (70) gives the logic circuit (46) the signal that servo operations, such as drawing-in of the cassette or the movement of the head plate into the play position, have been completed.

12. An apparatus as claimed in Claim 11, characterised in that the pivotable switching member (59) can be held in the servo driving position by the control rod (14) itself by means of a servo gear wheel (60) carried by said switching member and capable of establishing the connection between the servo motor (40) and the teeth (14e) of the control rod (14), and, for the purpose of switching over from the servo mode to the play mode, can be released from this connection by the control rod (14) to pivot and effect the switching over with simultaneous actuation of the control switch (70).



13. An apparatus as claimed in Claim 11, characterised in that the switching member (59) has a stop pin (67) which, in conjunction with the limb (9) of the head plate (3), holds the servo mechanism in the position of engagement with the control rod (14) or releases it for switching over.
- 5 14. An apparatus as claimed in Claim 12, characterised in that the switching member (59), as it pivots, releases a coupling pin (99) of a reversing mechanism (100) from a fork-shaped member (78) to allow the reversing mechanism (100) to bring a transmission gear wheel (52) in mesh with the one or the other reel disc (42, 43) for the purpose of coupling the central gear wheel (50) to one of the reel discs (42, 43).
- 10 15. An apparatus as claimed in Claim 13, characterised in that the switching member (59) has a guide pin (66) which, during movement of the control rod (14), engages behind a guide edge (66a) of the control rod (14) and thereby holds the switching member (59) in a pivoted position in which the servo mechanism (50a) drives the control rod (14) and the reversing mechanism (52) is disengaged from the reel discs
- 15 (42, 43).
16. An apparatus as claimed in Claim 2, characterised in that the coupling rod (14k) is pivotably mounted on the control rod (14) and adjacent one end face (140) of the control rod (14) forms a coupling recess (14m) in which a coupling member (82) of the loading mechanism is engageable.
- 20 17. An apparatus according to Claim 16, characterised in that for the formation of the coupling recess (14m) the coupling rod (14k) has a coupling projection (14n) which, in the coupling position, is spaced from an end face (140) of the control rod (14), the recess (14m) being formed between the coupling projection (14n), the end face (140) and the control rod (14).
- 25 18. An apparatus as claimed in Claim 15, characterised in that the coupling rod (14k) is extended beyond the catch pocket (14m) and the extension (14c) cooperates with the guides (242, 242a) provided on the drive mechanism in such a way that said guides (242, 242a) pivot the coupling rod (14k) so as to catch the coupling member (82) in or disengage it from the recess (14m).
- 30 19. An apparatus as claimed in Claim 2, characterised in that the coupling rod (14k) is capable of resilient deflection in the longitudinal direction.

