United States Patent [19]

DeBell et al.

[11] **3,833,922**

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[54] **DRIVE MEANS FOR EFFECTING PIVOTAL VERTICAL MOVEMENT OF A TRANSDUCER HEAD INTO OPERATIVE POSITION**

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[73] Assignees: **The Economy Company; David D. Price, Jr.; Ford C. Price,** all of Oklahoma City, Okla. ; part interest to each

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[21] Appl. No.: **340,178**

[52] **U.S. Cl.** **360/105**

[51] **Int. Cl.** **G11b 21/02,** G11b 21/22

[58] **Field of Search** ..... 179/100.2 CA, 100.2 Z; 274/4 A, 11 A

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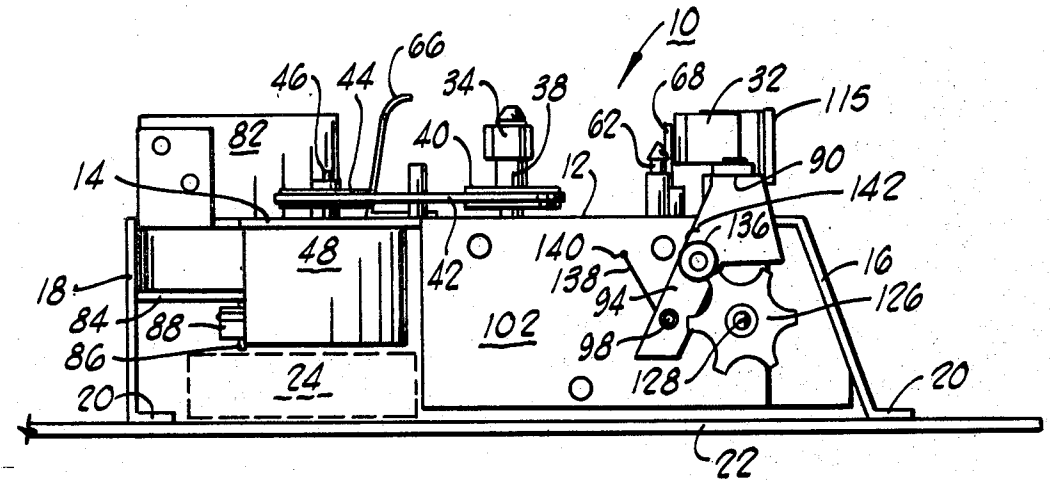
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Primary Examiner—Bernard Konick
Assistant Examiner—Robert S. Tupper

[57] **ABSTRACT**

An apparatus for use in combination with record transducing apparatus of the type which moves a record medium past a fixed position for operative contact with a record or reproducing transducer, and which consists of a control bar carrying a transducer head and capstan idler thereon which is pivotable about a horizontal axis to move the transducer and idler into engagement or out of engagement with the record medium; the pivotal control bar movement is effected by means of a rotationally driven mechanical linkage, including a star wheel in engagement with the control bar, a gear train assembly and an electric motor which supplies the rotational drive.

13 Claims, 9 Drawing Figures



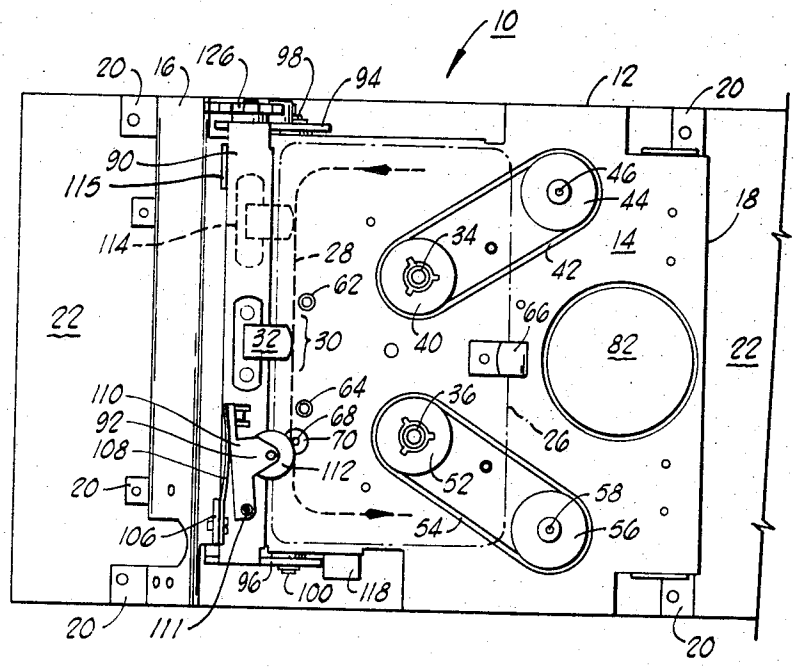


FIG. 1

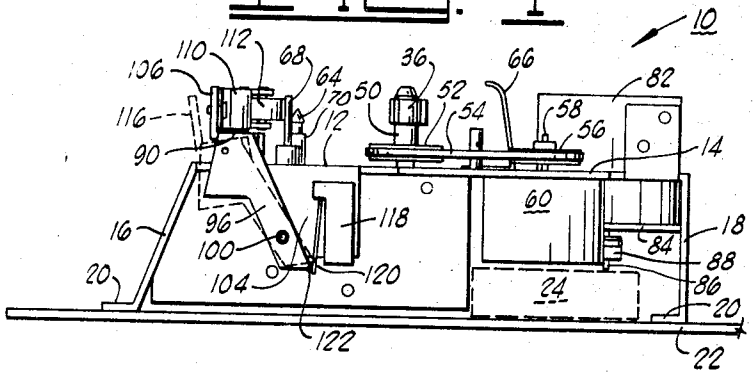


FIG. 2

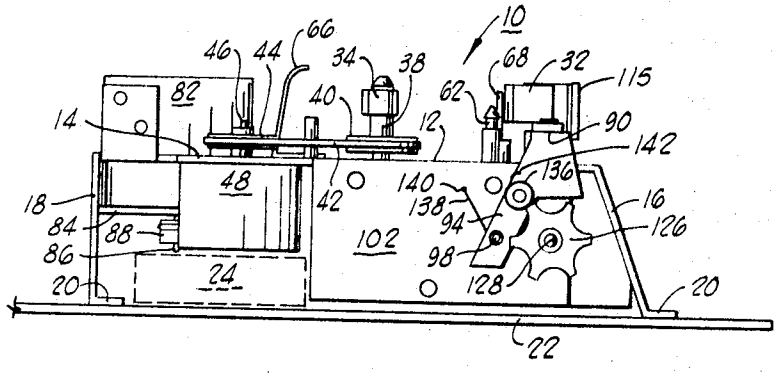


FIG. 3

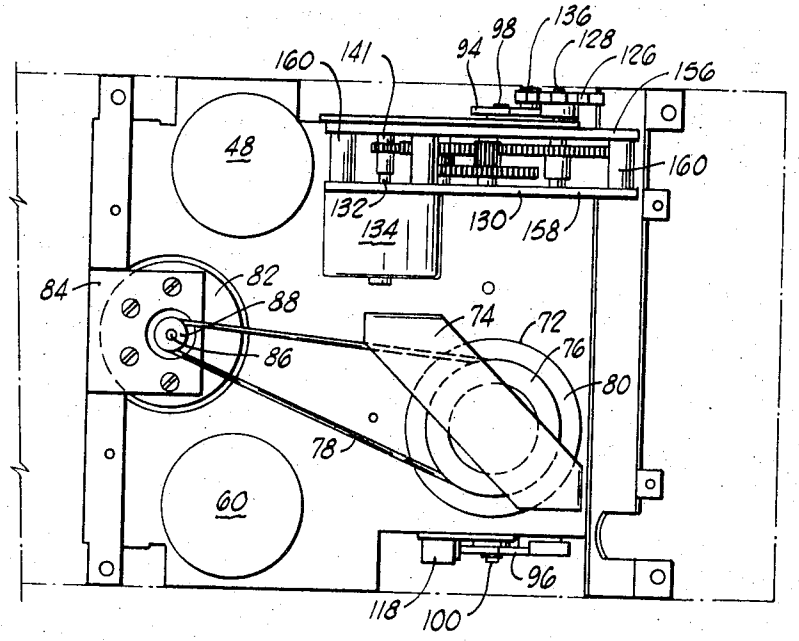

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FIG. 4

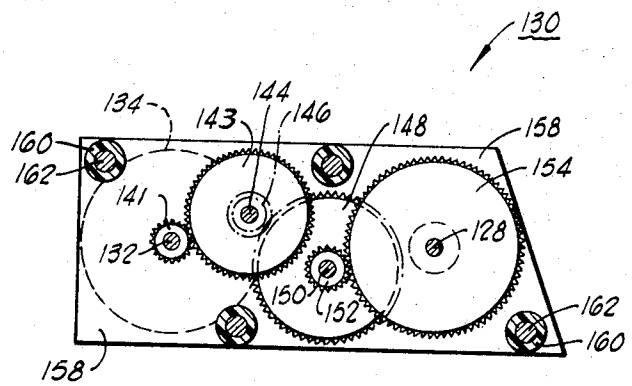

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FIG. 5

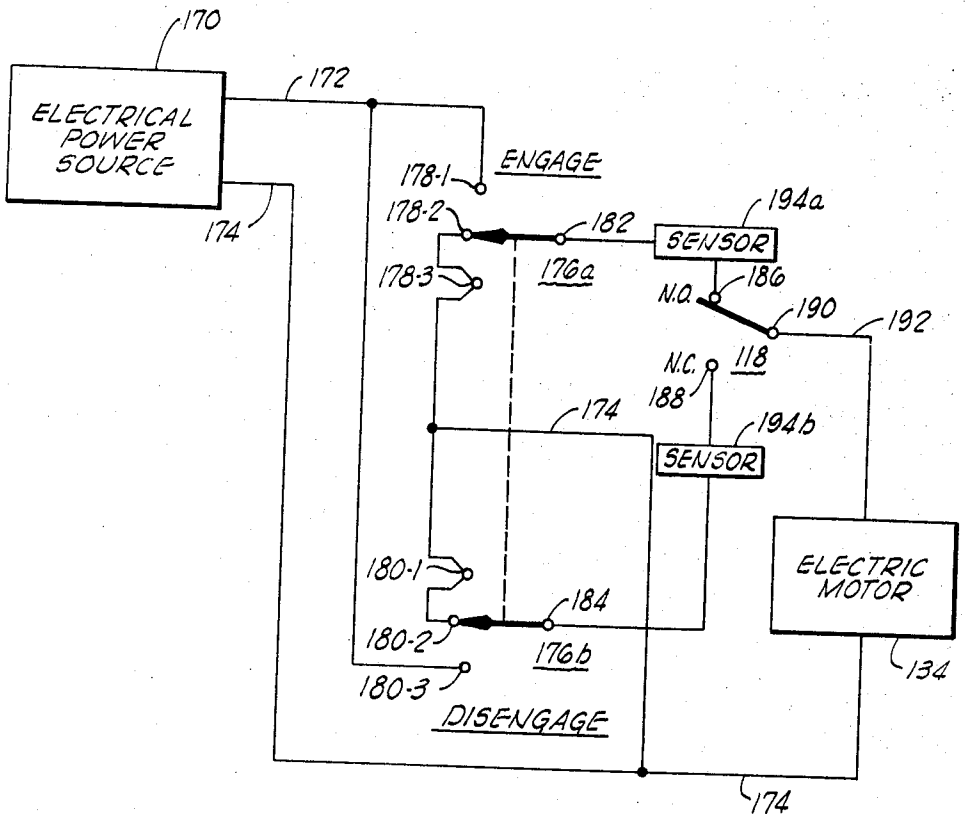


FIG. 6

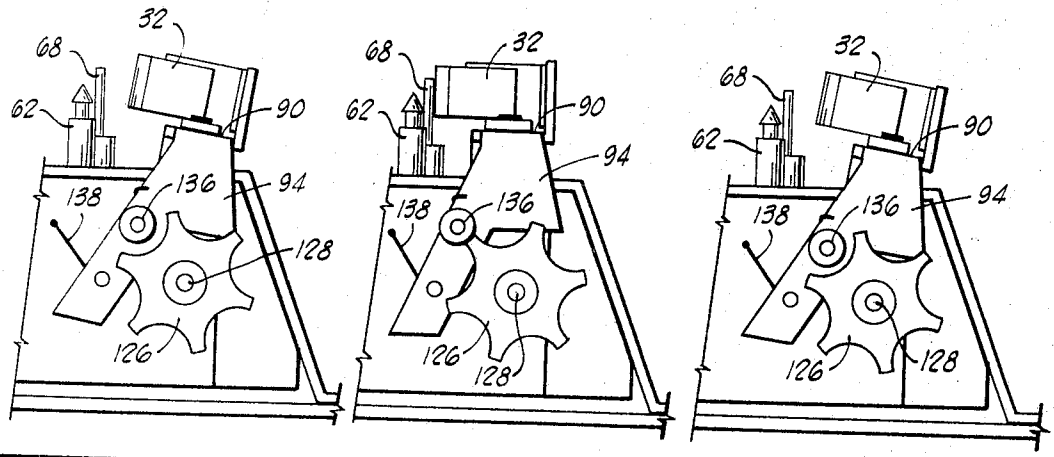


FIG. 7A FIG. 7B FIG. 7C

DRIVE MEANS FOR EFFECTING PIVOTAL VERTICAL MOVEMENT OF A TRANSDUCER HEAD INTO OPERATIVE POSITION

CROSS-REFERENCE TO RELATED APPLICATIONS

The subject matter of the present invention is related to the inventions disclosed and claimed in U.S. Patent application Ser. No. 239,944, filed on Mar. 31, 1972 and entitled "Improvements in Tape Transport Apparatus,"now U.S. Pat. No. 3,780,231 and U.S. Patent Application Ser. No. 340,701, filed concurrently herewith and entitled "Improvements in Circuitry for Record Apparatus,"both applications being in the name of the present inventors.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates generally to record transducing apparatus and, more particularly, but not by way of limitation, it relates to improvements in transducer head positioning control for use with record tape transport apparatus.

2. Description of the Prior Art

The prior art includes various types of auxiliary mechanism for use with tape transport devices which function to enable and disable operative contact of the transducing head with the associated record medium. Such control is effected by numerous and diverse mechanical linkages but in all known cases this type of linkage takes the form of spring-return, slide-latch mechanism, and the like. This is particularly true with respect to cassette-type record transport devices and it is generally necessitated by design considerations as to space and economy. Further, there are no known prior art teachings which are directed to control of transducer head engagement and disengagement through the use of a mechanically actuated, pivotal head engagement structure which is energized by a separate electric motor or drive source.

SUMMARY OF THE INVENTION

The present invention contemplates an improved transducer head control mechanism for use with continuous record medium transport devices. In a more limited aspect, the invention consists of a pivotal control bar carrying one or more transducer heads thereon and which is pivotably movable into or out of a fixed position through which the associated recording medium passes from supply to take-up. The control bar is pivoted between engaged and disengaged positions by selective intermittent energization of an electric motor which, in turn, after rotational speed reduction, drives a star wheel in engagement with a cam follower stud which is secured to drive the control bar reciprocally between the limit of its positions.

Therefore, it is an object of the present invention to provide a tape transport apparatus having a transducer head control mechanism which enables an increased number of operational control functions, both manual and automatic.

It is also an object of the invention to provide a tape transport apparatus for operation with cassette-type tape records which is more reliable of operation yet economical of construction.

It is still another object of the present invention to provide a tape transport apparatus which includes a play enabling control mechanism which does not require slide-latches or solenoid actuation in control thereof.

Finally, it is an object of the present invention to provide an improved tape cassette record/reproduce transport having an increased number of operational control functions as well as greater component reliability and comparative economy of construction.

Other objects and advantages of the invention will be evident from the following detailed description when read in conjunction with the accompanying drawings which illustrate the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of a tape transport constructed in accordance with the invention;

FIG. **2** is a side elevation of one side of the tape transport of FIG. **1**;

FIG. **3** is a side elevation of the opposite side of the tape transport of FIG. **1**;

FIG. **4** is a bottom plan view of the tape transport of FIG. **1** with the base circuit board shown in dot-dash line;

FIG. **5** is a sectional view of the gear train assembly of FIG. **4**;

FIG. **6** is a partially block circuit diagram of control circuitry utilized in the present invention; and

FIGS. **7A**, **7B** and **7C** represent consecutive operational side elevation views of transducer head control structure of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a tape transport **10** consists of a support structure or chassis **12** which is formed as a planar top surface **14**, a slanted front surface **16** and a rear surface **18** (see also FIGS. **2** and **3**). A plurality of attaching flanges **20** are formed in suitably balanced relationship to extend from front surface **16** and rear surface **18** in order to provide secure attachment directly to a circuit board base **22.** As described in the above-identified related application, Ser. No. 239,944, the circuit board base **22** provides multiple function in that it serves as a unit base as well as a printed circuit board for associated electronic components which are located generally within the area **24** outlined by dash-line; the circuit board base **22** also includes coactive switch element configurations, receptacles, battery contacts and associated circuitry, all as previously described in the co-pending U.S. application Ser. No. 239,944.

The tape transport **10** is adapted to receive a standard form of magnetic tape cassette as shown by dash-line **26** in FIG. **1.** The cassette **26** includes the conventional forms of internal reel and pulley arrangement whereby an endless magnetic tape **28** is continually moved past a fixed position, indicated generally by bracket **30,** whereat contact is made with a transducer head **32.**

Rotary drive to the cassette **26** is supplied by independently driven tape drive spurs **34** and **36** which fit into engagement within the respective drive sprockets of tape cassette **26.** The tape supply drive spur **34** is supported on a shaft **38** (see FIG. **3**) extending axially upward from a drive pulley **40.** The drive pulley **40** receives rotation from a drive belt **42** which, in turn, is moved by a drive pulley **44** secured to an output shaft

46 of a supply drive motor 48 as secured to the underside of chassis top surface 14.

Similar structure is employed for the take-up function as take-up drive spur 36 is secured to a shaft 50 (see FIG. 2) and drive pulley 52 which receives rotary motion via a drive belt 54 from output drive pulley 56. The output drive pulley 56 is secured to motor shaft 58 of a take-up motor 60. Both the supply motor 48 and the take-up motor 60 may be such as a commercially available form of D-C motor identified under Model No. MHN-5LB3 as manufactured by Matsushita Industrial Electric Company Ltd. of Tokyo, Japan. Each of motors 48 and 60 are suitably mounted to extend respective output shafts 46 and 58 in non-interfering manner up through chassis top surface 14.

A cassette 26 is received in operative placement with the aid of standard-spaced guide pins 62 and 64 as suitably secured on top surface 14. The rear edge of cassette 26 is secured in captive retention by a spring clip 66 as secured by suitable fastener to top surface 14. Thus, the placement of cassette 26 in proper position beneath spring clip 66, and with downward insertion over guide pins 62 and 64, assures positioning of magnetic tape 28 at fixed position 30 for contact with transducer 32 and a drive capstan 68.

Referring particularly to FIGS. 1 through 4, the capstan 68 is rotatably retained in a bushing 70 secured through chassis top surface 14; and, therebelow, the lower shaft end of capstan 68 is secured through a capstan drive pulley 72 for rotatable support on a bearing bracket 74 as secured on the underside of chassis top surface 14. The precise structure and component formation of capstan 68, drive pulley 72 and bearing bracket 74 is more particularly set forth in the aforementioned related U.S. Pat. application Ser. No. 239,944.

The capstan drive pulley 72 is unitarily formed as a combination pulley and inertial device, having a first or lower small diameter pulley portion 76 receiving a capstan drive belt 78 and being formed to have a diameter consonant with proper drive speed requirements. The capstan drive pulley 72 also includes a larger diameter portion 80 which serves to provide a desired angular momentum factor to the capstan drive system.

Capstan drive is generated by a capstan motor 82 suitably secured on a flange bracket 84 to project motor shaft 86 and an affixed drive pulley 88 in proper plane to receive capstan drive belt 78. The flange bracket 84 may be formed through use of conventional sheet metal bending and forming techniques as a unitary formation of support chassis 12. As the invention is presently constructed, capstan drive motor 82 is a Type MHI-5L6C, commercially available from Matsushita Industrial Electric Company Ltd.

A control bar 90 carries the transducer head 32 and a capstan idler assembly 92 and serves the function of controllably moving associated components into and out of operative position relative to tape cassette 26 and fixed position 30. The control bar 90 is formed to include right-angle extending pivot arms 94 and 96 from opposite ends thereof, pivot arms 94 and 96 then each being pivotally affixed at pivot posts 98 and 100 as secured to respective flange brackets 102 and 104. The flange brackets 102 and 104 may also be formed unitarily with the support chassis 12.

A flange 106 extending vertically from control bar 90 has one end of a flat spring 108 secured thereto. The opposite end of flat spring 108 contacts a pulley yoke 110, pivotally secured by a pivot post 111, to carry capstan idler pulley 112 into position to urge idler pulley 112 against capstan 68 when in operative position. The transducer head 32 may be affixed directly on top of control bar 90 as by screw fasteners or the like, and modifications of the transport may include additional heads such as a recording transducer head, as shown by dashed-lines 114. An additional control bar flange 115 is provided for microswitch seating in the event that additional position sensing and control functions may be desired.

FIGS. 1, 2 and 3 each show control bar 90 in the engaged or operative position; however, the opposite or disengaged control bar position is shown by dash-lines 116 in FIG. 2, and this will be explained in greater detail below. An engage sense microswitch 118 is securely mounted on flange bracket 104 such that feeler contact 120 is placed in engagement with an actuating corner 122 of pivot arm 96. The microswitch 118 is connected normal open (N.O.) when control bar 90 is in the disengage (dash-lines 116) position, and will conduct normal closed (N.C.) when control bar 90 is in the engaged upright or operative position and feeler contact 120 is relaxed. The particular mode of switch interconnection enables a dynamic stop function to head engage motor 134; thus, the engage sense switch 118 will be further described below.

Pivotal actuation of control bar 90 is effected by means of a star wheel 126 as driven by a rotary output shaft 128 from a gear train assembly 130. Rotary input to gear train assembly 130 is via a shaft 132 from a head engage motor 134. A cam follower 136, a roller or post, is secured to control bar pivot arm 94 in coactive position with star wheel 126 such that movement of the star wheel and positioning of cam roller 136 at the outer star wheel diameter will place control bar 90 in the engage position, while movement of cam roller 136 down into the lands or inner diameter of star wheel 126 will allow the control bar 90 to move to the disengage position. A wire spring 138 locked through an aperture 140 of flange bracket 102 is led down beneath pivot post 98 and upward for spring-retained hook engagement by hook end 142 over the edge of pivot arm 94. The wire spring 138 serves to urge control bar 90 toward the disengage position as permitted by star wheel 126.

The gear train assembly 130 provides a speed reducing function for input to star wheel 126. As utilized in present construction, gear train assembly 130 functions at a ratio of 62.22:1. Referring to FIG. 5, an upright sectional view of gear train assembly 130, input rotation on shaft 132 is transferred through a 12 tooth spur gear 141 to a large diameter or 40 tooth spur gear 143 which is commonly secured to a shaft 144 with a 12 tooth spur gear 146. Spur gear 146 then drives another larger 48 tooth spur gear 148 as commonly affixed on shaft 150 with 12 tooth spur gear 152 which, in turn, drives a still larger diameter 56 tooth spur gear 154 to rotate output shaft 128.

As presently designed, the entire gear train assembly 130 is fabricated from suitable plastic material, e.g. nylon or other plastics having similar strength and resiliency. Presently, star wheel 126 is formed of nylon to gain advantage of desirable strength, resiliency and texture characteristics for smooth operation. Thus, gear train assembly 130 is formed as opposite side panels

156 and 158 secured in parallel disposition by means of plural spacers 160 and fasteners 162 to captively retain the plurality of gearing elements, viz. drive spur gear 141, gear shaft 144, gear shaft 150 and output shaft 128.

It should be understood that while specific gear reduction ratio and gear arrangement is described, the actual function may be accomplished by a wide variation of gear combinations which will provide the desirable range of rotational speed reduction. For example, generally satisfactory operation has been accomplished utilizing a commercially available motor/speed reducer combination such as the type: MSG-F15, 7.5 volt D-C motor as manufactured by Meguro Seiki Co., Ltd. of Tokyo, Japan. When gear train assembly 130 is employed, the motor 134 is a commerically available motor of Type MHN–5LB3 as manufactured by Matsushita Industrial Electric Company Ltd.

FIG. 6 illustrates control circuitry which may be employed in the present invention. An electrical power source 170, which in present designs is a 6 volt D-C current source, provides positive supply on a lead 172 and negative supply on a lead 174 which is connected to one side of the head engage drive motor 134. An ENGAGE/DISENGAGE control switch may consist of such as ganged three-terminal switches 176*a* and 176*b*. The positive lead 172 is connected to opposed outside terminals 178–1 and 180–3 of respective switches 176*a* and 176*b*, while all remaining terminals 178–2, 178–3, 180–1 and 180–2 are connected in short and in connection with negative lead 174.

Common terminals 182 and 184 of respective switches 176*a* and 176*b* are then connected to terminals 186 and 188, respectively, of engage sense switch 118 (see also FIG. 2). The engage sense switch 118, a microswitch actuated when control bar 90 is in its disengaged position, has the common terminal 190 connected via lead 192 to the remaining input of electric motor 134. Thus, if the ENGAGE/DISENGAGE switch 176*a*/176*b* is maintained with the wiper element at the center terminal, unidirectional current flow through electric motor 134 may be utilized for either the engage or the disengage functions as enabled by the changing switch position of microswitch 118 in response to the position of control bar 90. Also, the intermediate switch contacts 178–2 and 180–2 enable a dynamic stop function since cessation of energization in either direction will place a direct ground short across motor 134 and counter EMF will effect dynamic stopping of armature rotation.

Automatic head positioning control may be effected by controlling energization or de-energization of motor 134 directly from a condition sense stage 194, sensors 194*a* and 194*b*. The condition sense stage 194 may be maintained responsive to any of several operating conditions, such as tape stop, tape overspeed, etc., to provide direct energization output through the engage sense microswitch 118 to motor 134. Condition sense 194 may effect either head engagement or disengagement, depending upon the desired functional coaction. The specific automation circuitry as well as the condition sensing components and circuits are disclosed in the co-pending patent application entitled "Improvements in Circuitry for Record Apparatus" as filed concurrently herewith.

It should be understood that while the previous description proceeded with reference to D-C motors and the inclusion of a D-C power source, the entire transport operation including engage/disengage control may be carried out using A-C motors if the exigencies of certain situations or equipment applications should require. The provision of A-C type motors for each of supply motor 48, take-up motor 60, capstan drive motor 82 and the head engage motor 134 may be selected from commercially available equivalents having similar rating and functional capabilities.

OPERATION

Description of the operation is with reference to FIGS. 6, 7A, 7B and 7C, and reference to other figures as indicated. FIG. 7A illustrates the control bar 90 in its disengaged position with transducer head 32 and capstan idler 92 withdrawn from operative position. It is in this position where cassettes may be inserted or removed, and it is also a position automatically achieved in response to certain transport repeat functions, tape difficulty indications, and other automatic responses which are not the subject of the present application but are described in a co-pending application filed concurrently herewith.

When control bar 90 is in the disengage position (FIG. 7A), cam follower 136 on pivot arm 94 is urged into a land, or towards the inner diameter, of star wheel 126 by means of wire spring 138. Also, and with reference to FIG. 2, the actuating corner 122 will have urged micro-switch feeler contact 120 through actuation to its normal open position with the switch element connecting terminals 190 and 186. In this position, the circuit is in readiness to effect head engagement by the single clock-wise switching of ENGAGE/DISENGAGE switch 176*a–b*.

Thus, clockwise switching of switch 176*a–b* completes the circuit from positive lead 172 and contact 178–1 through common terminals 182, normal open contact 186 and lead 192 to electric motor 134 thereby effecting energization. Output rotation from electric motor 134 is then transmitted via shaft 132, gear train assembly 130 and output shaft 128 (see FIG. 5) to rotate star wheel 126 until cam follower 136 has progressed up onto the outside diameter of star wheel 126 as shown in FIG. 7B. At this time, and referring again to FIG. 2, actuating corner 122 of pivot arm 96 releases again to FIG. 2, actuating corner 122 of pivot arm 96 releases feeler contact 120 thereby to place the sense engage microswitch 118 in its normal closed position, or that position where the switch element connects common terminal 190 and normal closed contact 188. Power is removed from electric motor 134 to stop star wheel 126 in the position shown in FIG. 7B, and at this point the control bar 90 maintains transducer head 32 into secure operative engagement with the magnetic tape 28 while capstan idler assembly 92 urges tape 28 against the drive capstan 68. The various reproduce, record and other related functions of the tape transport are then carried out as control bar 90 is maintained in the position shown in FIG. 7B.

When a next operative sequence occurs which requires a disengagement, either manual or automatic in response to a sensed condition, positive current applied on lead 192 to motor 134 will intiate the disengage sequence. Thus, manually, movement of ENGAGE/-DISENGAGE switch 176*a–b* to the counter-clockwise position serves to apply current from positive lead 172 through terminal 180 and common terminal 184 and

further through the normally closed contacts **188** and common contact **190** of microswitch **118** to again energize the electric motor **134.** It must be kept in mind that prior operative positioning of control bar **90** placed microswitch **118** with its normal closed contact **188** shorted. Energization of electric motor **134** then effects rotary movement through gear train assembly **130** and finally to star wheel **126,** and as rotation of star wheel **126** progresses the cam follower **136** is allowed to ride down into the next successive land portion of star wheel **126.** The wire spring **138** urges cam follower **136** into the land and, accordingly, control bar **90** is urged into the disengaged position. Upon reaching the disengaged position, the lower actuating corner **122** of control bar pivot arm **96** (see FIG. **2**) once again forces feeler contact **120** through switch actuation to place the microswitch contacts in their normal open connection, as shown in FIG. **6.**

Should the head engage and disengage function be desired in specific automation or protective functions, a selected condition responsive circuit or condition sense stage **194,** i.e. sensors **194***a* or **194***b*, may be utilized to energize or de-energize motor **134.** For example, the condition responsive circuit may be such as to provide control output upon sense indication of tape over-speed, tape underspeed, end of tape, etc., and deriving indication of such conditions is the subject of the aforementioned, concurrently filed patent application.

The utilization of an intermittently energizable head engagement mechanism such as described herein enables the capability of manual control as well as many desirable automatic control and monitor functions in the operation of a continuous or endless record transport apparatus. Such additional functions as record movement, record speed, end of record and other electronically or mechanically sensed conditions may be employed in automatic coaction with the head engage/-disengage apparatus of the present invention thereby to greatly enlarge the capabilities of the record transport for various specialized or unspecialized usages. It should be understood, too, that while the foregoing description has been carried out with particular reference to cassette-type tape record transports, the same or similar head engagement control apparatus may be utilized with any of the well-known forms of record transport, viz. reel-to-reel tape, wire, pneumatically driven tape, eight-track cartridge endless tape, etc.

The foregoing discloses novel record transport apparatus which greatly simplifies construction and operation while allowing desirable reliability versus economy attributes. A transport constructed in accordance with the present invention is capable of achieving greater control as to record speed, record sensing and protective functions, and it is adaptable variously for use with record transports which utilize a continuous record medium as moved past a fixed position.

Changes may be made in the combination and arrangement of elements as heretofore set forth in the specification and shown in the drawings; it being understood that changes may be made in the embodiments disclosed without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. In record transport apparatus which includes chassis support structure and supply means for supplying record medium to a fixed transducer position and past a drive capstan to a record take-up means, operational control apparatus comprising:

control bar means disposed across said support structure adjacent to said fixed transducer position and having pivot arms pivotally secured to said support structure and being vertically arcuately movable about a horizontal pivotal axis and capstan idler means on line **16** after "means" insert; record transducing means secured on said control bar means; mechanical drive means for effecting vertical arcuate movement of said control bar means including a cam follower mounted on one of said control bar means pivot arms and spaced from the point of pivotal securing, and cam means having an outside diameter and inner diameter which is rotatably supported by said support structure in contact with said cam follower such that contact of said cam follower at the outside diameter of said cam means positions the control bar means and transducer head in operative position at said fixed position, and contact of said cam follower with said cam means at said inner diameter positions said control bar means and transducer means removed from said fixed position; and

actuation means for providing rotational input to said cam means, said means being selectively actuable thereby to effect said vertical arcuate movement of said control bar means and transducer means into and out of operative engagement with said record medium at said fixed position to enable a selected mode of operation.

2. Control apparatus as set forth in claim **1** which is further characterized to include:

a capstan idler assembly secured on said control bar means in disposition to urge said record medium against the drive capstan when the control bar means and transducer means are in operative engagement at said fixed position.

3. Control apparatus as set forth in claim **1** wherein said octuation means for providing rotational input comprises:

an electrical source;

an electric motor providing rotational output upon being energized by said electric source; and

speed converter means receiving said rotational output from said electric motor and providing rotational output of reduced speed for input to said cam means.

4. Control apparatus as set forth in claim **3** wherein said speed converter means comprises:

gear train means receiving said rotational input from said electrical motor and providing output rotation reduced by a ratio of approximately 60:1.

5. Control apparatus as set forth in claim **3** which is further characterized to include:

switch means mounted on said transport support structure and actuated upon movement of said control bar means and transducer head into operative engagement to remove said electrical source from energizing connection with said electric motor.

6. Control apparatus as set forth in claim **3** which is further characterized to include:

a capstan idler assembly secured on said control bar means in disposition to urge said record medium against the drive capstan when the control bar

means and transducer means are in operative into engagement at said fixed position.

7. Control apparatus as set forth in claim **3** which is further characterized to include:

first switch means having first and second terminals connected to said electric motor which is mounted on said transport support structure and is actuated by said control bar means and transducer head at said position out of operative engagement to alternate connection of said first and second terminals thereof to said electric motor; and

second switch means secured to said transport support structure which is selectively actuatable between first and second positions, each of which positions will provide connection from said electrical source to the respective first and second terminals for connection to said electric motor through said first switch means.

8. Control apparatus as set forth in claim **3** wherein said speed converter means comprises:

gear housing structure;

a first drive spur gear connected to receive rotational output from said electric motor and disposed rotatable within said gear housing;

first large diameter spur gear rotatably retained within said gear housing in mesh with said drive spur gear and having first small diameter spur gear secured for synchronous rotation therewith;

second large diameter spur gear rotatably retained within said gear housing in mesh with said drive spur gear and having second small diameter spur gear secured for synchronous rotation therewith; and

a third large diameter spur gear rotatably retained within said gear housing in mesh with said second small diameter spur gear, said third large diameter spur gear being connected to an output shaft providing rotational output to said mechanical drive means.

9. Control apparatus as set forth in claim **3** which is further characterized to include:

switch means connected between said electrical source and said electric motor to energize said electric motor, and which is selectively actuatable to connect a short circuit across said electric motor in order to provide dynamic braking.

10. Control apparatus as set forth in claim **3** which is further characterized to include:

first switch means actuated by said control bar means at said position out of operative engagement to alternate connection of normal open and normal closed switch terminals thereof to said electric motor;

second switch means selectively actuatable between first, second and third contacts, said first contact connecting the electrical source to said first switch at the normal open terminal, and said second and third contacts connecting said first switch normal open terminal to the return to said electric motor; and

third switch means selectively actuatable between fourth, fifth and sixth contacts, said sixth contact connecting the electrical source to said first switch normal closed terminal, and said fourth and fifth contacts connecting said first switch normal closed terminal to the return to said electric motor, said second and third switch means being linked for ganged actuation to enable dynamic braking of said electric motor.

11. Control apparatus as set forth in claim **3** which is further characterized to include:

first switch means mounted on said transport support structure and actuated by movement of said control bar means to said position out of operative engagement, said switch means having normal open and closed contacts with a common contact connected to said electric motor, said first switch means when actuated connecting the normal open contact with said common contact;

second switch means selectively operable to connect said electrical source to said normal open contact of said first switch means; and

third switch means selectively operable exclusive to operation of said second switch means to connect said electrical source to the normal closed contact of said first switch means.

12. Control apparatus as set forth in claim **11** which is further characterized in that:

said second switch means and said third switch means are mechanically connected for ganged switching operability.

13. In record transport apparatus of the type which utilizes cassette-type magnetic tape, a chassis support structure having operatively associated therewith tape supply drive means and tape take-up drive means for coacting with a tape cassette to supply record tape from a supply spool past a fixed transducer position to a drive capstan and then to a cassette tape take-up spool, a transducer and capstan idler control apparatus comprising:

an electric power source;

control bar means disposed across said support structure in parallel spaced relationship thereto and being vertically arcuately movable about a horizontal pivotal axis, said control bar means having right-angle extended pivot arms pivotally secured to said support structure;

record transducing means and capstan idler means secured on said control bar means adjacent to said fixed position;

mechanical drive means for effecting vertical arcuate movement of said control bar means including a cam follower mounted on one of said control bar means pivot arms and spaced from the point of pivotal securing, and cam means having an inner and outer diameter and being rotatably supported by said support structure in contact with said cam follower such that contact of the cam follower at the outside diameter of the cam means positions the control bar means and transducer head into the fixed position in operative engagement with said tape, and contact of said cam follower with the cam means at the inner diameter positions said control bar means and transducer head out of the fixed position and disengaged from said tape; and

electrical drive means energized by said electric power source for providing rotational input to said mechanical drive means, said electrical drive means being selectively energizable to effect said vertical arcuate movement of said control bar means to position said record transducing means in operative engagement and disengagement with the tape at said fixed transducer position to enable a selective mode of operation.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,833,922 Dated September 3, 1974

Inventor(s) Lawrence R. DeBell and David D. Price, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1, Column 8, lines 7 and 8; after the word "axis" the words --and capstan idler means on line 16 after "means" insert-- should be deleted.

Signed and sealed this 26th day of November 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents