United States Patent

[11] 3,588,119

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[54] DICTATING AND TRANSCRIBING APPARATUS WITH RAPID TRANSCRIBER ALIGNMENT AND MOVEMENT FACILITIES

7 Claims, 26 Drawing Figs.

[52] **U.S. Cl.** **274/4J,** 197/91, 254/110
[51] **Int. Cl.** **G11b 5/00**
[50] **Field of Search** ..... 274/4.2, 17, 21, 22, 23, 11 (E), 11 (D); 179/100.1 (DR), 100.2 (T); 197/91; 254/109, 110

[56] **References Cited**

UNITED STATES PATENTS

3,222,074	12/1965	Walker	274/11(D)
3,222,460	12/1965	Albanes	179/100.1(D)
3,242,268	3/1966	Wolfner	179/100.1(D)
3,365,200	1/1968	Dollenmayer	274/17
3,456,951	7/1969	Rhoades	179/100.2(T)
3,056,606	10/1962	Schueler	274/17

OTHER REFERENCES

IBM Technical Disclosure Bulletin, Vol. 6, #4, pp. 21, 22, September, 1963— Copy in Class 274— 17

IBM Technical Disclosure Bulletin, Vol. 8, No. 5, pp. 738—740, October, 1965.

Primary Examiner—Leonard Forman
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ABSTRACT: The invention concerns dictating and transcribing apparatus using a magnetic belt record media and having a variety of automatic and semiautomatic features. The dictating unit has an associated microphone with control buttons for establishing modes of operation, initiating forward and backspacing movements, controlling the marking of an index slip, and similar operations. The transcribing unit has an associated head set and foot control and various operating controls, provided on the front of the transcribing unit. Transcribing operations are under control of a foot pedal and include starting and stopping of the belt movement, a symmetrical forward and reverse review which is repeatable, and other operations required for transcribing. Each unit is provided with independent mechanisms for restoring the sound transducer when a belt is unloaded; control means for establishing one initial margin during recording and another initial margin during playback; and means for rapidly aligning the sound head in relation to the record media following a manual scan operation. Appropriate warning signals to indicate end of belt, belt positioning, etc. are provided.

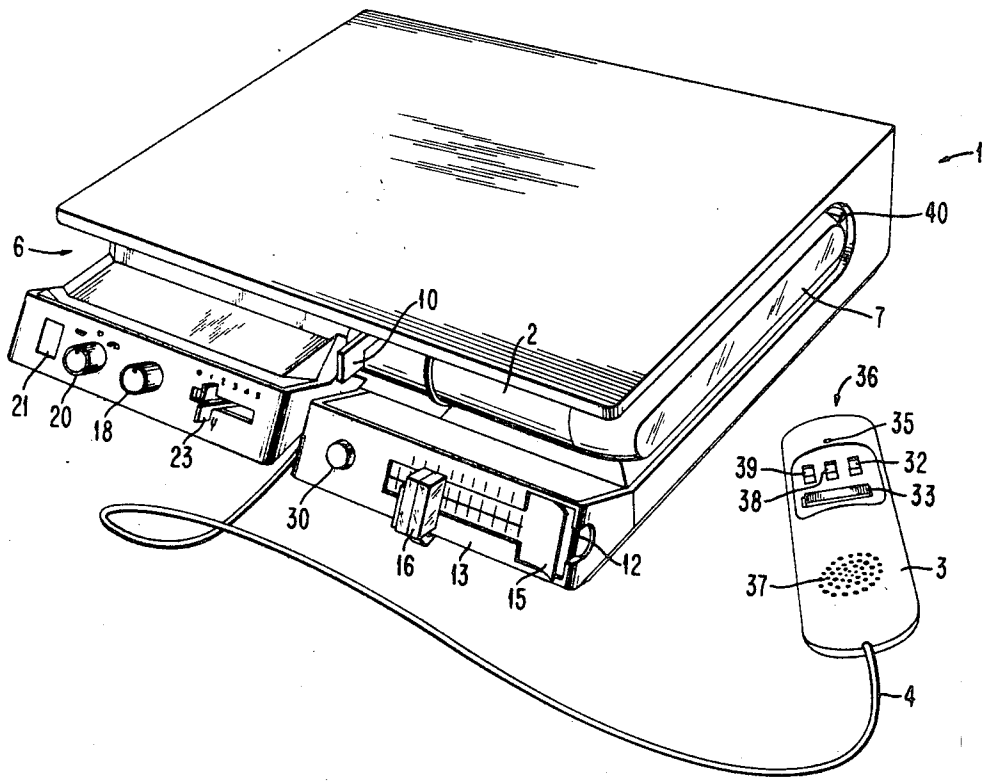


FIG. 1

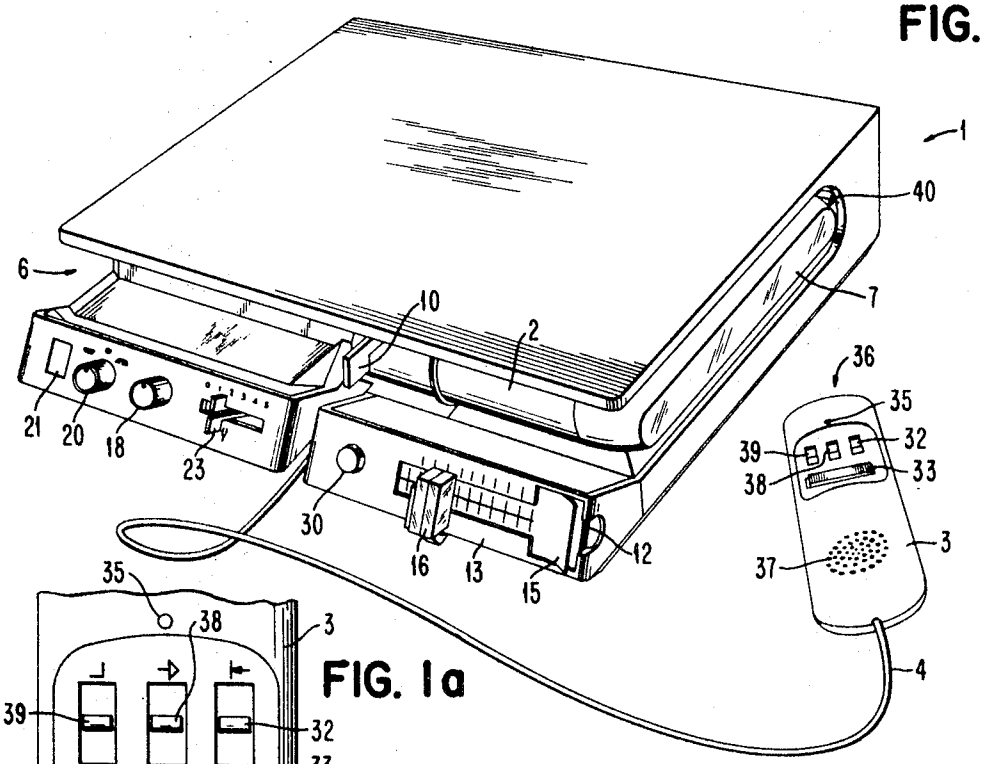


FIG. 1a

FIG. 2

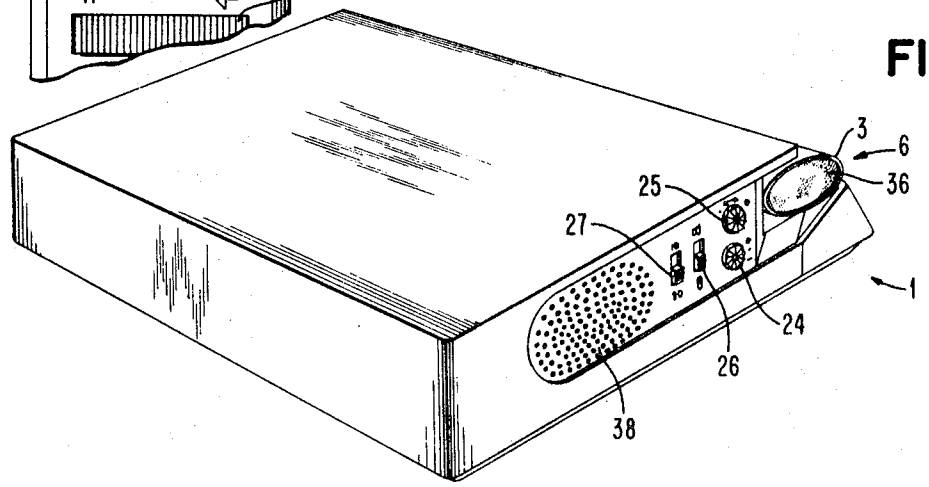
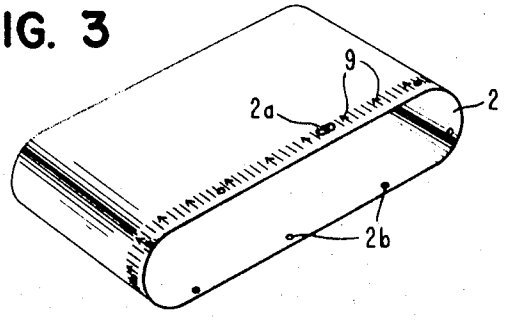


FIG. 3



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BY D. Kendall Cooper
ATTORNEY

FIG. 4

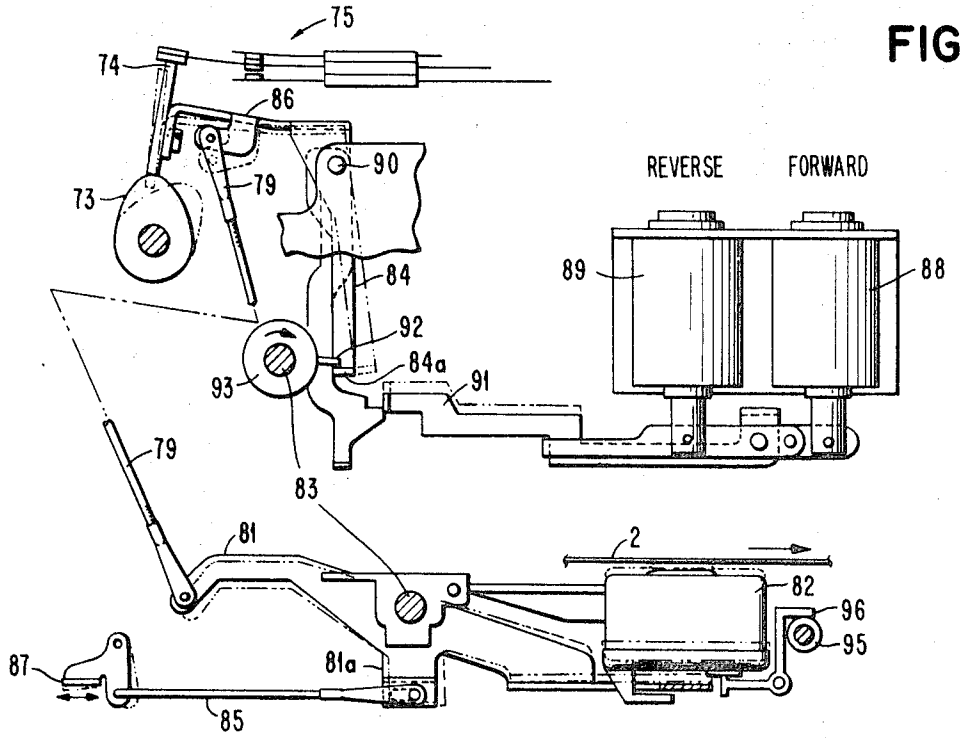

75
74
86
90
73
79
REVERSE
FORWARD
89
88
84
92
84a
93
91
79
83
81
2
82
96
95
87
81a
85

FIG. 5

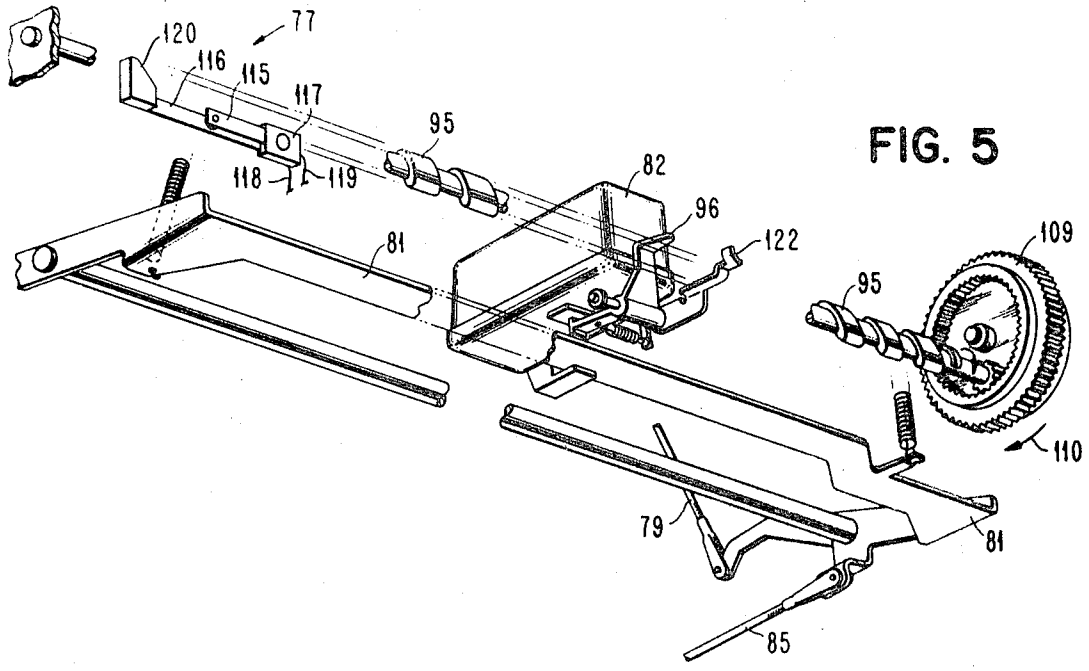

120
77
116
115
117
95
118
119
82
96
122
81
109
95
110
79
81
85

FIG. 6

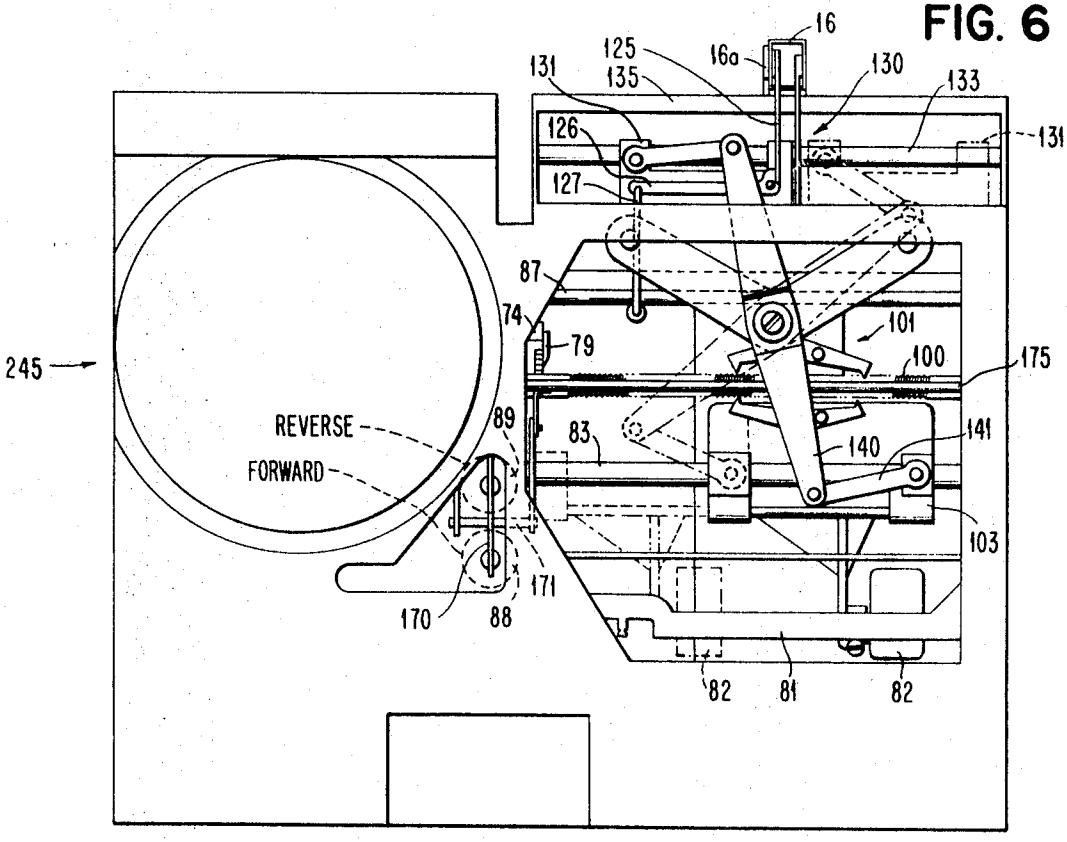

16
125
16a
131
135
130
133
131
126
127
87
74
79
101
100
175
245
REVERSE
FORWARD
89
83
140
141
103
171
170
88
82
81
82

FIG. 7

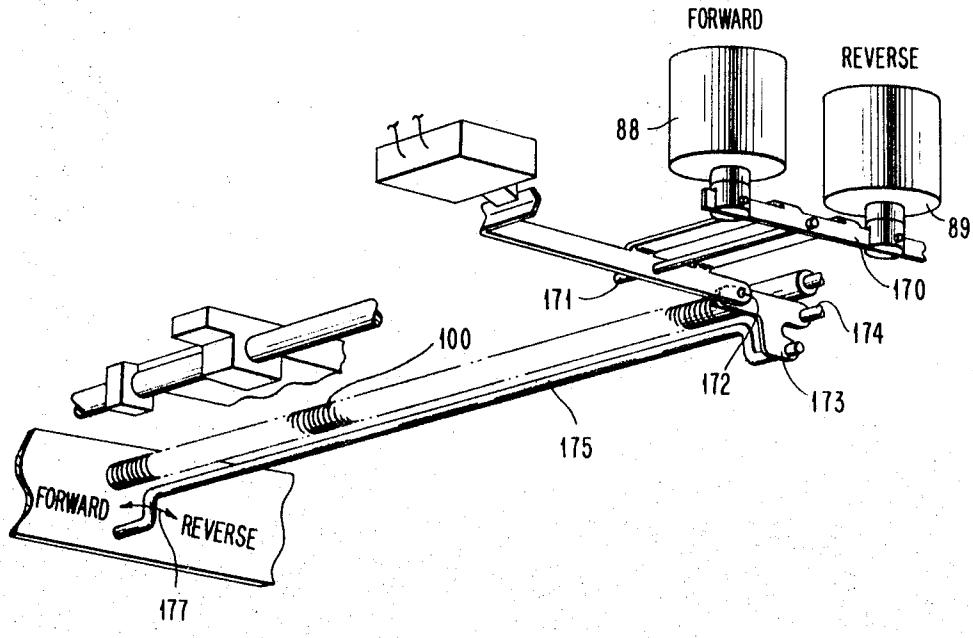

FORWARD
REVERSE
88
89
171
170
174
100
172
173
175
FORWARD
REVERSE
177

FIG. 8a

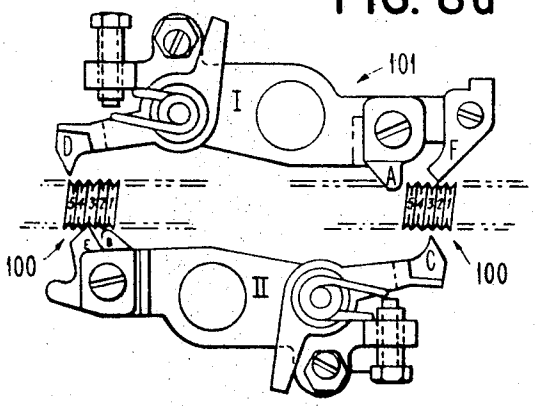
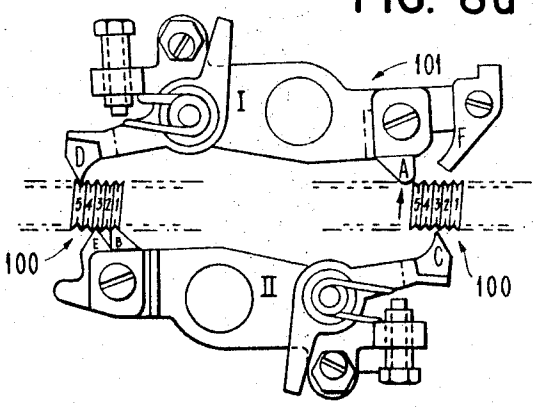
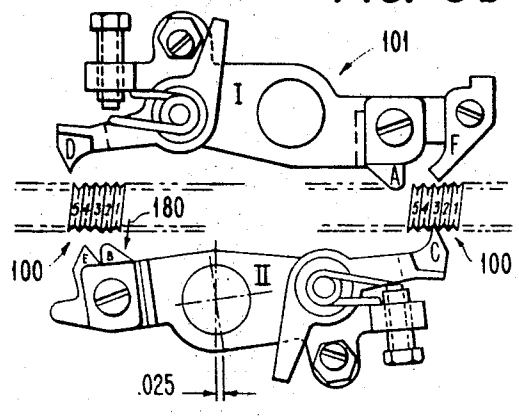


FIG. 8d



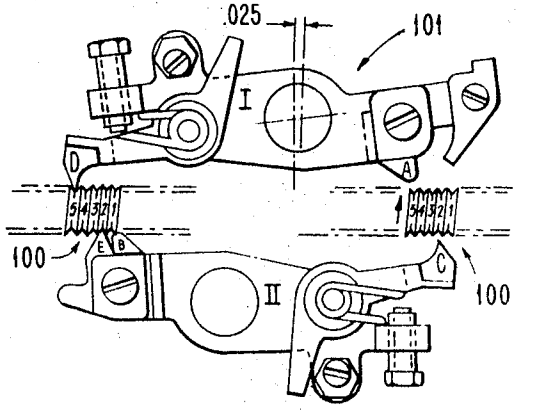
DIRECTION OF INDEXING

FIG. 8b



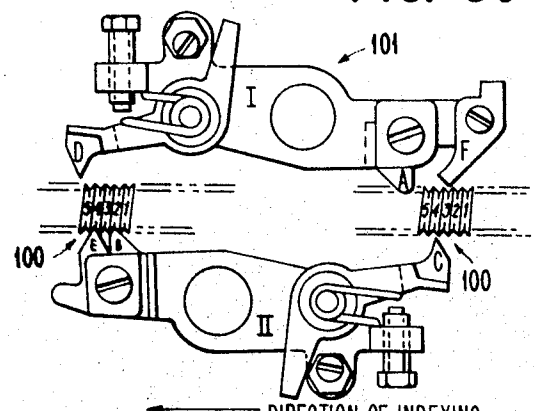
DIRECTION OF INDEXING

FIG. 8e



DIRECTION OF INDEXING

FIG. 8c



DIRECTION OF INDEXING

FIG. 8f

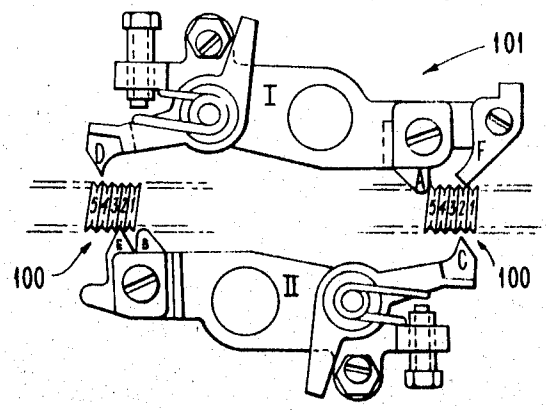


FIG. 9

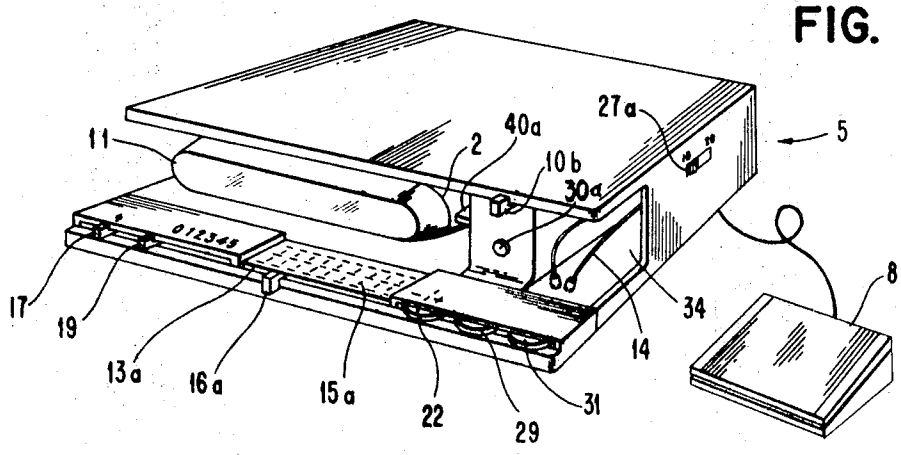


FIG. 10

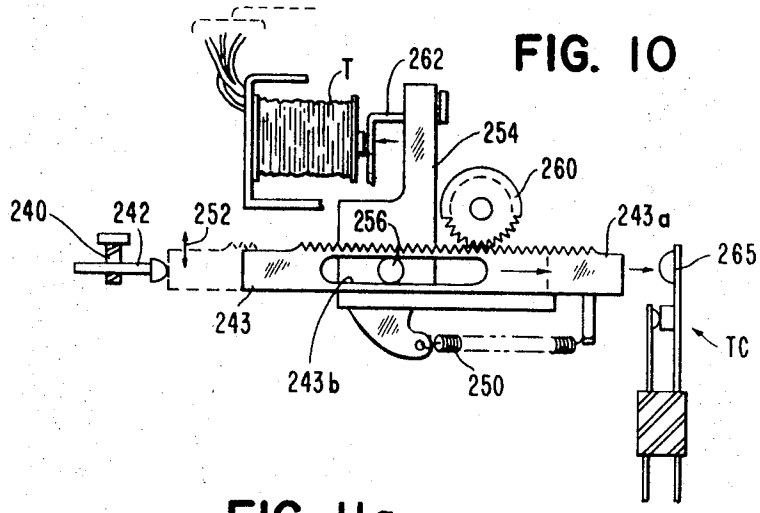


FIG. 11a

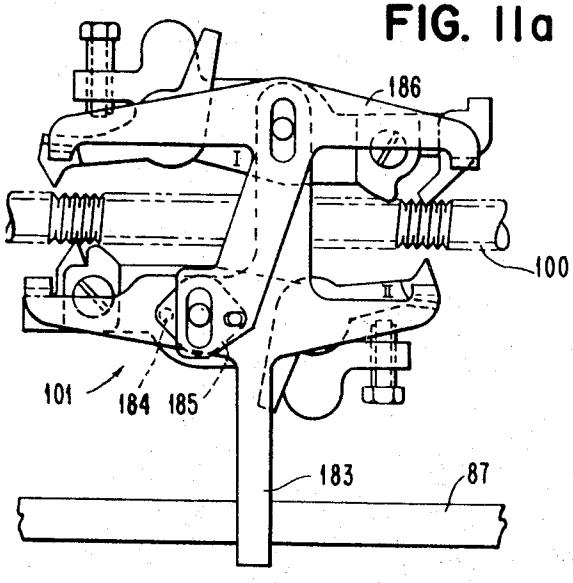


FIG. 11b

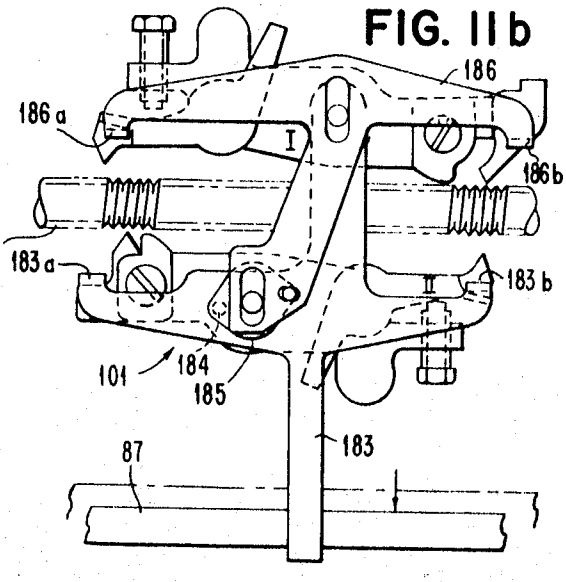


FIG. 12

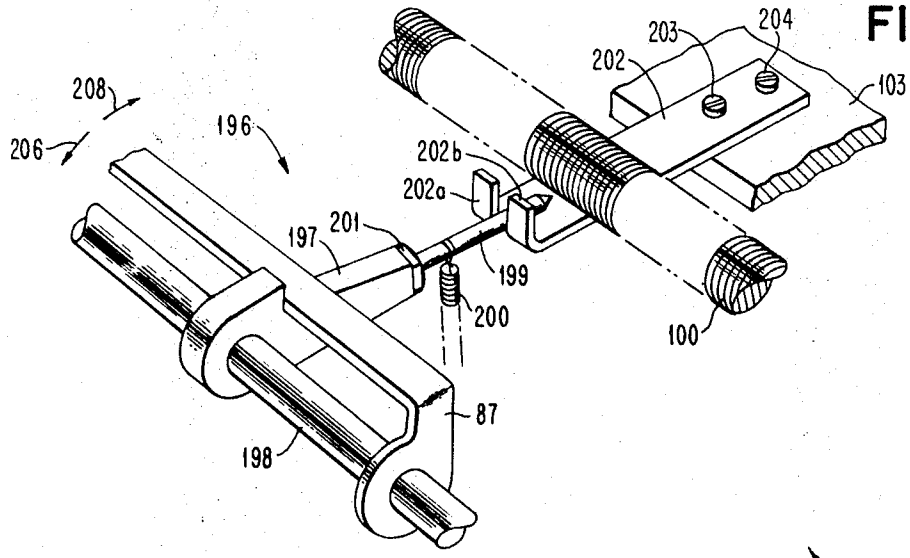


FIG. 13a

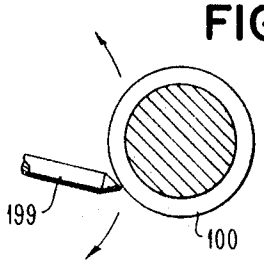


FIG. 13b

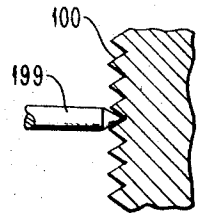


FIG. 14

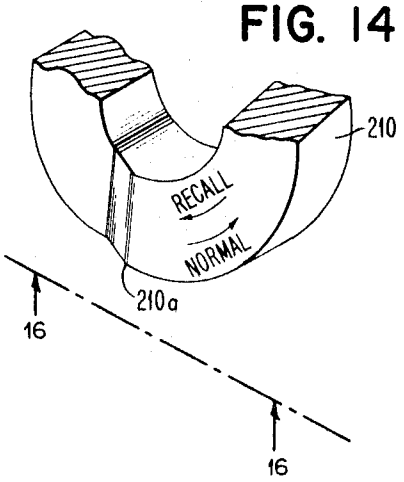
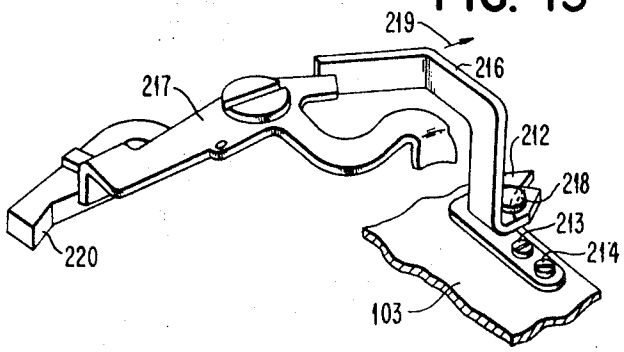


FIG. 15



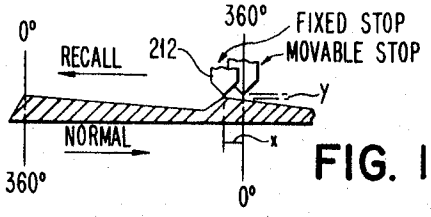


FIG. 16

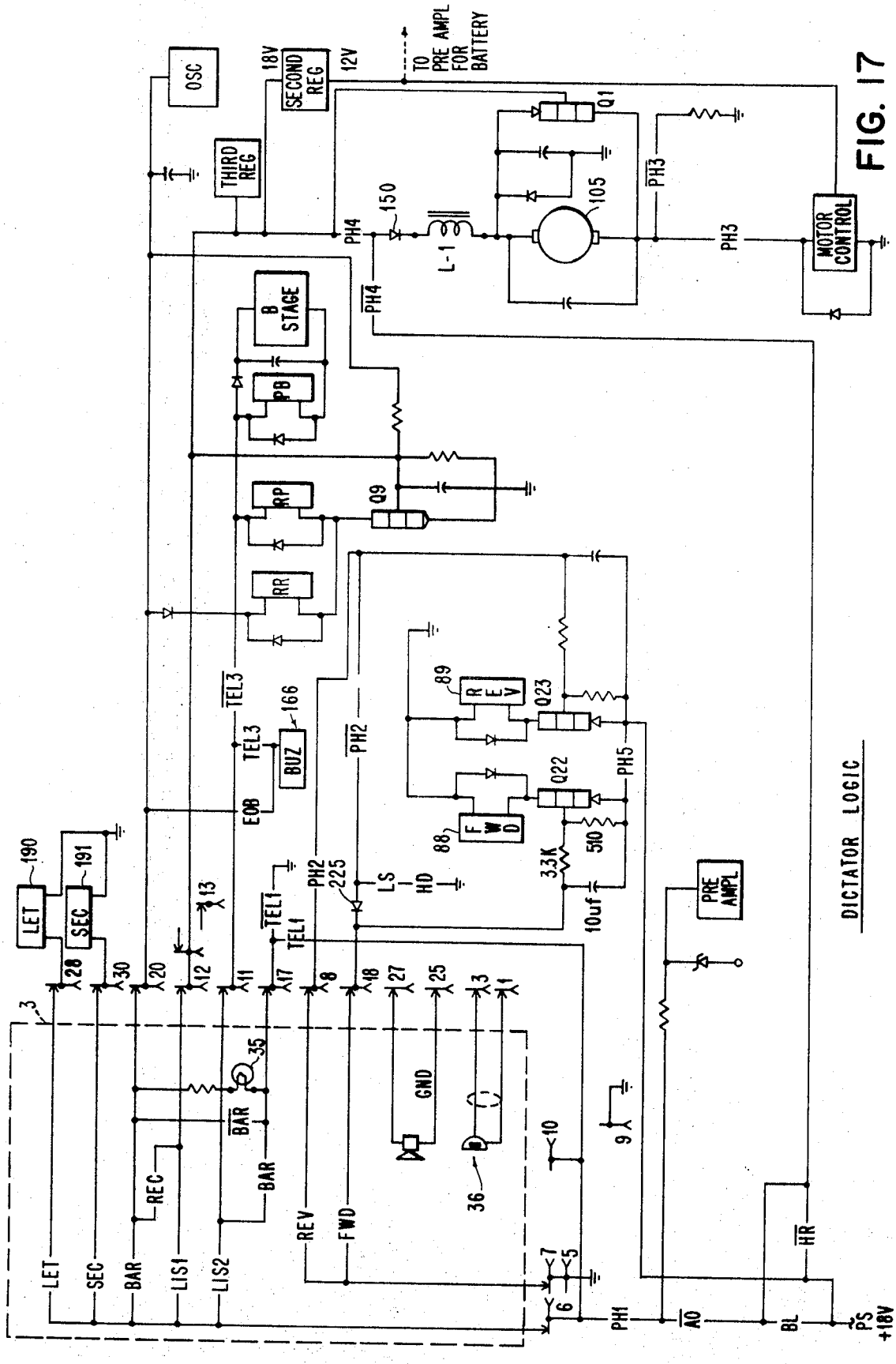

OSC
THIRD REG
SECOND REG
18V
12V
TO PRE AMPL FOR BATTERY
Q1
105
150
L-1
PH4
PH3
MOTOR CONTROL
B STAGE
PB
RP
RR
Q9
TEL3
166
BUZ
EOB
PH2
89
REV
Q23
PH5
Q22
88
FWD
3.3K
500
10uf
LS
HD
225
TEL1
190
191
LET
SEC
PRE AMPL
DICTATOR LOGIC
BAR
REC
LIS1
LIS2
REV
FWD
GND
36
35
HR
AO
BL
PS
+18V

FIG. 17

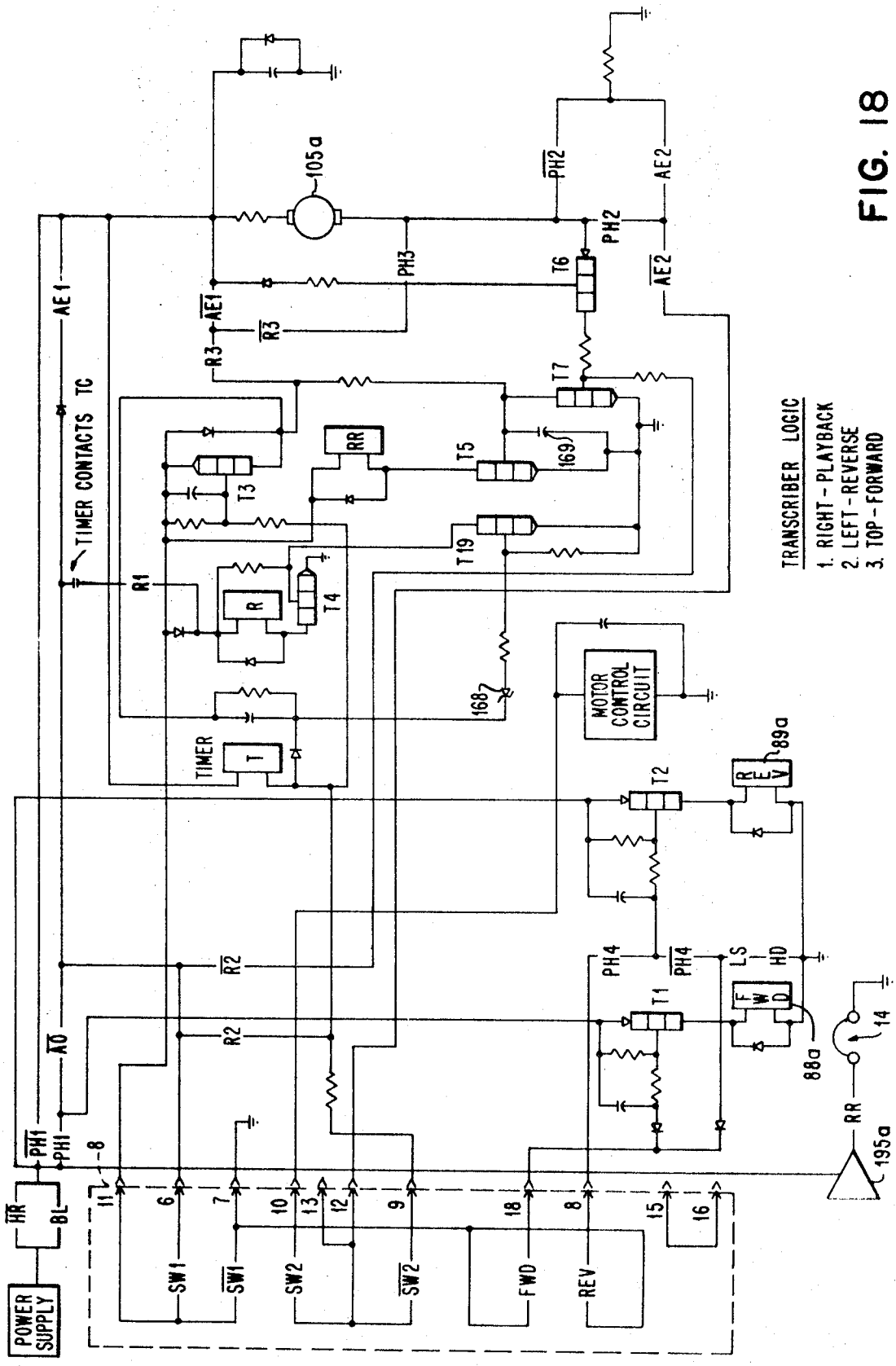

TRANSCRIBER LOGIC
1. RIGHT - PLAYBACK
2. LEFT - REVERSE
3. TOP - FORWARD
POWER SUPPLY
HR
BL
PH1
AO
AE1
TIMER CONTACTS TC
R1
R2
R3
TIMER
MOTOR CONTROL CIRCUIT
SW1
SW2
FWD
REV
RR
LS
HD
105a
195a
88a
89a
168
169

FIG. 18

DICTATING AND TRANSCRIBING APPARATUS WITH RAPID TRANSCRIBER ALIGNMENT AND MOVEMENT FACILITIES

CROSS REFERENCES TO RELATED PATENTS AND APPLICATIONS

U.S. Pat. No. 3,203,000, W. L. Dollenmayer, inventor; entitled "Marking Device for Dictating Machine."

U.S. Pat. No. 3,222,460, N. J. Albanes, et al., inventors; entitled "Multiple Station Selection System."

U.S. application Ser. No. 699,259, filed Jan. 19, 1968; inventors: C. M. Fackler, et al.; entitled "Dictating and Transcribing Apparatus with Automatic and Semiautomatic Operator-Controlled Facilities."

U.S. application Ser. No. 699,253, filed Jan. 19, 1968; inventors: C. L. Ridings, et al; entitled "Transcribing Apparatus with Variable Automatic Recall Facilities."

U.S. application Ser. No. 691,840, filed Dec. 19, 1967; inventors: J. Richard Dyar, et al., entitled "Headset Featuring Collapsibility for Storage and Expandibility for use."

OTHER REFERENCES

The following additional references are of interest:

IBM Technical Disclosure Bulletin, June 1963, Pp. 22 and 23, authored by B. F. Wehmer, entitled "Backspacer for Portable Dictator."

IBM Technical Disclosure Bulletin, May, 1967, Pp. 1,776 and 1,777, authored by W. F. Wing, entitled "Retractable Cord Takeup Reel with Auto-Reset Cord Stop."

Customer Engineering Instruction Manual, Dictation Equipment, IBM Models 211, 212, and 213, form No. 241-5071, dated Oct. 5, 1962.

Reference Manual, Dictation Equipment, IBM Models 211, 212, 213, and 214, form No. 241-5132, dated Oct. 22, 1962.

BRIEF BACKGROUND OF INVENTION, INCLUDING FIELD AND PRIOR ART

General

The field of the invention encompasses dictating and transcribing apparatus, particularly those having provision for recording and reproducing sound on a magnetic record media, such as a magnetic belt. Devices of this nature generally have means for operator control of the equipment. Thus, a dictating unit generally has an associated microphone with control buttons and a transcribing unit generally has a head set and a foot control. In addition, assorted warning devices, both audio and visual are provided. Prior art of interest is indicated in the several sections below.

The Albanes, et al., patent noted in the Cross References section describes a magnetic belt-dictating machine that is also representative of a prior art device of this nature. Comparable apparatus is also described in the Customer Engineering Instruction Manual and Reference Manual listed in the "Other References" section above.

MACHINE CONTROLS AND CIRCUITS

Considering the dictating unit, the operator controls permit the establishment of a Record and a Listen mode of operation, together with forward spacing and backspacing in order to review previously dictated material. The transcribing unit generally operates in a Listen mode but also has provision for reviewing various portions of a previously dictated belt.

MEASURED REVIEW

Various devices have been proposed in the prior art for effecting an incremental stepping of the transducer in relation to a magnetic belt either in a forward or reverse direction, and in some cases together with a repeat action effective, for example, upon continued depression of a control button. Also, some means is generally provided to enable the operator of the equipment to disengage the magnetic head from the belt and move it a considerable extent in the forward or reverse direction, thereupon reengaging the head with the driving means. The Wehmer publication ("Other References") is typical of a prior backspacing mechanism, together with a left margin control mechanism. The Wehmer mechanism is characterized by an "inch worm" action. The present apparatus features a symmetrical forward and backspacing mechanism for incremental stepping of the transducer in relation to the belt that operates on an "inch worm" basis, but that incorporates a number of other features for more efficient control. Typical prior art in this area is Brown U.S. Pat. No. 2,016,887 who describes a backspacing mechanism for a phonograph and having a switch for establishing either a single operation or repeated operations, as desired. Clausen U.S. Pat. No. 2,366,956 describes a dictating machine with repeated backstepping or forward stepping. Logan U.S. Pat. No. 2,816,177 describes forward spacing, backspacing, and advanced marking.

SUMMARY

The invention concerns dictating and transcribing apparatus with increased efficiency of operation and improved compatibility. Both units have circuitry and mechanisms for effecting forward and reverse movement of the transducer in relation to the belt media including a measured review (incremental stepping) as well as a continuous spiral driving relationship in both the forward and reverse directions. The incremental stepping action may be repeatable, at the option of the operator. Other features of the invention include a symmetrical forward and backspacing mechanism for effecting incremental stepping of the transducer in relation to the belt; initial margin control; manual scan with rapid transducer alignment; and sound head restore by a separate lead screw.

OBJECTS

An object of the invention is to provide dictating and transcribing apparatus with greater flexibility of operation while maintaining effective operator control.

Still another object of the present invention is to provide for sound head restoration in connection with belt unloading to insure a proper initial position of the sound head in relation to the media during a subsequent loading operation.

An additional object of the invention is to provide a more effective mechanism for performing forward and reverse backspacing by increments, with an automatic repeat operation, at the option of the operator.

In addition, an object of the invention is to provide a variety of warning signals and condition indicators for dictation and transcription apparatus.

In addition to the foregoing objects, another object of the invention is to provide for a high-speed searching operation, as well as a variable incremental scanning operation that is adjustable to accommodate recording time intervals that differ, such as 10 minutes and 20 minutes.

An additional object of the invention is to provide for improved control of the transducer adjacent the initial belt margin to insure that all previously recorded sound is picked up during a playback operation.

Besides the foregoing objects, another object of the invention is to provide for a predominantly electrical repeat action of forward and reverse stepping in contrast with primarily mechanical actions heretofore used.

The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description of the preferred embodiments of the invention as illustrated in the accompanied drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view of a dictating unit with associated microphone incorporating a variety of features according to the present invention. FIG. 1*a* illustrates a number of operator controls on the microphone.

FIG. 2 is a rear perspective view of the dictating unit of FIG 1.

FIG. 3 illustrates a magnetic recording belt media for use in the dictating unit of FIG. 1. The belt media may also be used in a transcribing unit.

FIG. 4 represents a number of solenoid, contact, and linkage members used particularly during belt loading and phasing operations.

FIG. 5 represents a head-restoring mechanism and retract mechanism.

FIG. 6 is a bottom elevation of the dictating unit of FIG. 1.

FIG. 7 shows solenoids, pawls and other mechanisms associated with forward and backspacing incrementing.

FIGS. 8*a*–8*f* illustrate operation of forward and backspacing (reverse) pawls shown in FIG. 6.

FIG. 9 illustrates a transcribing unit having an associated head set and foot control.

FIG. 10 shows an automatic recall rack and associated components for the transcribing unit of FIG. 9.

FIGS. 11*a* and 11*b* represent engaged and disengaged conditions of the forward and reverse pawls shown in FIGS. 6 and 8*a*–8*f* in connection with a manual scanning operation.

FIGS. 12, 13*a*, and 13*b* illustrate mechanisms concerned with rapidly aligning the sound head in relation to the driving lead screw in either the dictating unit of FIG. 1 or the transcribing unit of FIG. 9 following a reverse scanning operation.

FIGS. 14, 15, and 16 illustrate various mechanisms associated with a margin control to insure that the transcriber can hear all of the dictated material, particularly near the initial home margin of the magnetic belt of FIG. 3.

FIG. 17 is a simplified logic diagram of circuit actions in the dictating unit of FIG. 1.

FIG. 18 is a logic diagram for the circuit actions in the transcribing unit of FIG. 9.

Terminology and Abbreviations

The followlng terminology and abbreviations are used in several places n the diagrams of the present case:

AE	Automatic erase.
Auto Off (AO)	Automatic power shut off.
B Stage	Power Amplifier Stage.
BAR	Dictate (Record) bar on microphone.
BL	Belt is loaded, Belt Load contacts.
BUZ	Buzzer.
CON	Conference.
DIC	Dictate.
EOB	End of Belt.
FWD, F	Forward.
HOLE	Initial phasing aperture in belt.
HD	Hole Detect.
HH	Head is in home position ("0" index).
HR	Head Restore.
LS	Lead screw contact.
LET, END LTR, or LTR	Letter indication (Index slip).
LIS 1, LIS 2	Listen (Playback) contacts No. 1, No. 2.
OSC	Oscillator.
PB	Playback relay.
PH1, PH2, etc	Phase contacts No. 1, No. 2, etc., transferred; also ϕ1, etc.
$\overline{\text{PH1}}$, etc	Phase contacts No. 1, etc., not transferred; also $\overline{\phi 1}$, etc.
PS	Power Supply.
R	Relay in transcriber unit.
RP	Relay in dictator unit.
RR	Relay in dictator unit (also transcriber unit).
RRP	Dictator Foot Control Relay.
REC	Record mode.
REG	Regulator.
REV, R	Reverse (Backstep) or Review.
SEC	Secretary Indication (index slip).
Second Regulator	Circuit associated with transistor Q7.
SPKR	Speaker.
STP CONT	Stepping Control.
SW1 and SW2	Switches in foot pedal.
T	Transcriber Relay.
TACH	Tachometer.
TEL	Telephone.
$\overline{\text{TEL}}$	Conference or Dictate.
TRA	Telephone Recording Attachment.
X and Y	Wiring connections (P. 2 of 2).
ϕ	Phase.

DICTATING UNIT

General Description, Features, Operating Instructions, and Indexing

The dictating unit 1 according to the present invention is shown in FIGS. 1 and 2, which are external views of the unit, and FIGS. 4–8*f* and 11*a* and 11*b* that illustrate various internal mechanisms in the unit. The unit makes use of a magnetic belt record media 2 shown in FIG. 3.

Dictating unit 1, has an associated microphone 3 attached thereto by a cord 4. The cord is retractable by mechanisms to be described. Microphone 3, when not in use, is positioned in a microphone well 6, FIGS. 1 and 2.

Dictating Unit Operating Instructions

For convenience, typical operating instructions for dictating unit 1 are presented below:

Loading the Belt

1. Belt 2 is placed on the machine by sliding it over mandrel 7. The arrows 9 on the belt should point toward the machine. The belt is inserted as far as it will go without forcing it.
2. Belt release lever 10 is moved to the left to complete belt loading.

Removing Belt

Belt release lever 10 is moved to the right to partially extend the belt from the machine for easy removal.

Index Slip Loading and Removal

For loading purposes, a complete pad 12 (25 slips) is inserted in holder 13 by sliding the slips to the left. An individual slip 15 is removed by grasping the right end and sliding it out.

Unit Operating Controls

1. Scanning Lever 16. This lever is used to manually locate sound head to any position on the recording belt.
2. Volume Control 18. Controls range of sound volume during playback.
3. Input Selector Switch 20. This switch is placed in the center position for Dictation. It also has a Telephone position (right) and Conference position (left).
4. Voice Modulation Indicator 21. The indicator shows voice or record level. It also serves as a battery indicator for those units equipped with battery.
5. Tuning Lever 23. This lever is normally used for transcribing to adjust the sound head position for proper tracking of sound track.
6. Speed Control 24. This control is used by the transcriber to adjust belt reproducing speed slower (−) or faster (+). It is an optional feature.
7. Input Volume Control 25. Rotating this control clockwise (toward large dot) increases the recording level. Rotating the control counterclockwise (toward small dot) decreases recording level. This is adjusted to give satisfactory record volume with volume control set at the mid-position dot on volume knob at 12 o'clock.
8. Speaker Selector Switch 26. This switch selects microphone playback (upper position) or speaker playback (lower position).
9. Recording Time Selector 27. This switch gives the dictator the choice of 10 (upper) or 20 (lower) minutes of recording time. Normally this switch will be in the 10 minute position.

MICROPHONE

Removing

The microphone 3 is removed by lifting it from the machine and extending the cord 4 by pulling the cord from the machine.

Replacing

The microphone is replaced by depressing the retract button 30 and guiding the microphone into its rest position in microphone well 6.

Operating Controls

1. Dictating. Dictating is begun by placing the record-listen selector button 32 in the Record (upper) position, ←, FIG. 1*a*. Dictate bar 33 is depressed and the dictator begins speaking across the pickup element 36. When speaking continuously for long periods, dictate bar 33 can be locked into position by depressing and sliding it to the left, FIGS. 1 and 1*a*. It is unlocked by sliding to the right or moving selector button 32 to the Playback (middle) position. An amber lamp 35 on the microphone glows

when recording to indicate that the machine is in the record mode.

2. Reviewing. Dictation is reviewed by moving selector button **32** to the Review position ←, and releasing. The selector is spring loaded to return to a position midway between Record and Review, which is the Playback position. When the speaker selector switch **26** is in the Microphone position (lower), playback is from a speaker **37** located in microphone **3**. Otherwise, it is from a speaker **38** in the dictating unit. Each time selector button **32** is moved to the Review position ←, the sound head in unit **1**, moves back into the recorded material on belt **2** approximately **10** words or six seconds. With an optional feature, holding selector button **32** in the Review position causes the sound head to move continuously back in 6 second increments. If the recording time selector **27** is in the 20 minute position, each increment is 12 seconds.
3. Forward Spacing. The sound head is advanced by moving the Forward spacing selector button **38** away from the dictate bar. The sound head then moves forward approximately 10 words or 6 seconds. As an option, holding the forward selector up causes the sound head to move forward continuously in 6 second increments. When the Forward selector is operated, the record selector button **32** reverts to the playback mode. If the recording time selector **27** is in the 20 minute position, each increment will be 12 seconds.
4. Index Marking. Moving the secretarial selector button **39** away from the dictate bar to the ⌊ position places a red dot, indicating End of Letter, on the top half of index slip **15**. Moving the selector toward the dictate bar to the ++ position places a red dot on the lower half of slip **15** indicating to the transcriptionist that special instructions are recorded on the belt at that location.

Erasing The Belt

The erase bar **40** is not normally used by the dictator. However, occasionally it may be desirable to completely erase the entire belt. To do this, the erase bar is manually depressed. Since it locks into position, it is not necessary to hold it down. The microphone Record-Listen selector button **32** is placed in the Record (or Listen) position.

Warning Tone

A warning tone may be generated at various times, any one of which requires some action on the part of the user. These are:

1. Attempting to dictate with the input selector switch **20** in the Telephone mode results in a warning signal. Moving selector switch **20** to the individual Dictate position, ⌣, restores the machine to normal.
2. A short-warning tone is generated 1 minute from the end of the belt. At this time, if dictation is to be continued, the user identifies himself, indicates he is continuing on another belt and places another unused or erased belt on the machine.
3. An end of belt warning signal is generated 15 seconds before the end of the belt. If the dictator continues to record through this signal, the machine automatically shuts off. If this occurs, the belt must be changed or the scanning lever **16** manually moved to the left.

Belt Loading and Initial Phasing

A significant feature of the dictating and transcribing apparatus is the belt loading and initial phasing operation set forth in the Fackler, et al. application 699,259. The apparatus includes mechanisms and circuitry that are operable upon insertion of a magnetic belt on mandrel **7**, FIG. **1**, to rotate the belt to a predetermined initial position. This insures that the sound head transducer will track a helical path on the belt beginning at an identical position each time the belt is inserted. Belt **2**, FIG. **3**, has an elongated aperture **2***a* that is sensed in the machine during the loading and phasing operation to establish the initial starting position on the belt.

Reference is made to FIGS. **1—6** for the dictating mechanisms and to FIG. **17** for various logic involved for the dictating unit. The transcribing unit belt-loading and -phasing mechanisms are similar. Reference is made to the Fackler case 699,259 for further structures and detailed circuits.

The functions of the belt-loading and -unloading mechanisms are:

1. Draw the belt into the machine from a partially inserted position.
2. Accurately position the belt in its running position.
3. Prevent partial loading of belt.
4. Partially eject the belt for easy removal.
5. Retract the idler tension roller and drop the sound head for ease of inserting and removing belt.

In order to load a belt **2** in the dictating unit, belt lever **10** is moved to the right, FIG. **1**. This moves a gripper assembly to the right in readiness to receive a belt inserted in the unit. It also moves a front idler roller to the rear toward a rear drive roller to enable the insertion of a belt on the rollers.

A contact operating cam **73** mounted under an operating member **74** is moved to transfer various contacts in a contact assembly **75**. Member **74** is shown in FIG. **4** along with various other linkages and mechanisms having to do with restoration of the head to a left margin position in readiness for insertion of a new belt. A set of belt load contacts **75***a* (part of assembly **75**) is opened with movement of lever **10** to the right. A set of Phase contacts **75***b* is transferred to a not phased ($\overline{\text{Phase}}$) condition.

Attached to operating member **74** is link **79** shown in FIG. **4**, that is connected to a head bail **81** for moving magnetic head **82** into and out of engagement with belt **2**. At this time, head **82** is moved out of engagement. Bail **81** is pivotally and concentrically mounted about a shaft **83**. Attached to extension **81***a* of bail **81** is a link **85**. The other end of link **85** is connected to an operating portion of a pawl retract bail **87**. Certain of these mechanisms can be seen to advantage in FIG. **4**, as well as FIGS. **11***a*–**11***b*.

When belt lever **10** is to the left, that is, the loaded position, all of the mechanisms in FIG. **4** assume the dashed positions. Upon movement of lever **10** to the right, cam **73** rotates, lifts operating member **74** in particular, and the various elements shown are moved to the full-line condition. Extending as a part of the operating member **74** is a bell crank **86** that is pivotally mounted at **90** and a link **84** having an extension **84***a* movable to the left in FIG. **4** for engagement with a pin **92** on a clutch member **93**.

The various mechanisms just described move head **82** out of the way for insertion of a new belt and into engagement with a head restore lead screw **95**, FIG. **5**, by way of a drive-engaging member **96**. Concurrently with this action, link **85** moves pawl retract bail **87** from the engaged condition shown in FIG. **11***a* to the disengaged condition shown in FIG. **11***b*. This action disengages various pawls from a driving lead screw **100** which frees head **82** for driving movement to home position which is the right margin of the belt. The operation of the pawl mechanisms shown in FIGS. **8***a*–**8***f* and **11***a* and **11***b*, which incidentally, serve for incremental Forward spacing and Reverse spacing, is discussed in a later section. The belt-loading mechanisms in the transcriber unit of FIG. **9** are quite similar to the mechanisms just discussed in FIGS. **4—6**. Corresponding elements are similarly designated. Reference is also made to FIG. **7** which shows the Forward and Reverse solenoids from the rear and underneath the dictating unit. To insure proper orientation among the various views of the stepping solenoids, the terms "Forward" and "Reverse" have been included in the drawings wherever appropriate.

Head Restoring Action

With disengagement of head **82** from belt **2** and the pawls in assembly **101**, FIGS. **11***a* and **11***b*, conditions are established for driving head **82** to the home position. This involves movement of the index assembly **16** to the left in relation to an inserted belt and movement of head **82** to the right in relation to the belt. See FIG. **6**. Since the belt loading and unloading mechanisms are positioned at a 90° angle in the transcriber from the position shown in the dictating unit, the direction of head restoring is to the front of the transcribing unit as viewed in FIG. **9**.

When a belt is unloaded from the machine by movement of lever **10** to the right as previously discussed, the belt load contacts **75***a* are transferred to their normally open condition. However, an additional set of contacts **77**, FIG. **5**, remains closed and serves to provide a parallel circuit to operate the drive motor for restoring the head to home position. The Auto Phase contacts **75***b* are also transferred to their not-phased condition.

Ordinarily, when a belt is in the dictating unit (or the transcribing unit, for that matter), the belt load contacts **75***a* in the units are closed. The various driven devices in the unit derive their source of power from a motor **105**, particularly shown in FIG. **17**. The motor output is reduced by a speed reducer assembly which drives an output gear that is engaged with a large gear **109**. Gear **109** rotates in a direction indicated by arrow **110**, FIG. **5**. As stated, when a belt is in position, motor **105** is rotating to drive gear **109** constantly. The belt load contacts **75***a* and the head restore contacts **77** are connected in parallel in the circuit for this purpose. Upon movement of belt lever **10** to the right during an unloading operation, the belt load contacts are opened so that the circuit to motor **105** now is primarily controlled by the head restore contacts **77**. These contacts comprise a pair of contact straps **115** and **116**, FIG. **5**, mounted in a mounting block **117** with connecting leads **118** and **119**. Attached to strap **116** is an operating shoe **120** that is positioned in the path of movement of an operating lever **122** associated with magnetic head **82**.

Restore lead screw **95** is driven at a relatively high rate of speed by rotation of gear **109**, FIG. **5**, and due to the engagement of follower **96** with it, drives head **82** toward the head restore contact assembly **77**. As soon as operating element **122** associated with head **82** encounters shoe **120**, contacts **77** open, thereby opening the parallel circuit through contacts **77** to deenergize the motor. Thus motor drive ceases with head **82** positioned all the way to the right as shown in FIG. **6**, which is the home or restored position of head **82**.

With the foregoing action, the equipment is now in readiness to receive an inserted belt.

BELT LOADING AND INITIAL PHASING

Belt Loading Action

In order to load belt **2**, FIG. **3**, in dictating unit **1**, the operator grasps belt **2** with arrows **9** pointing in toward the unit and slips the belt over mandrel **7**. The belt is inserted as far as it will go without forcing it. As is usual, the placement of belt **2** on mandrel **7** may be at any location with respect to timing aperture **2***a*, FIG. **3**. The positioning of aperture **2***a* is immaterial at this time, since in accordance with the Fackler, et al. invention in 699,259, means is provided for rotating belt **2** under control of aperture **2***a* to a predetermined initial position with respect to magnetic head **82**. This applies to any belt that may be inserted in dictating unit **1**. It also applies to any belt that is inserted in the transcribing unit in FIG. **9**.

Following insertion of belt **2** on mandrel **7**, the operator moves belt lever **10** to the left, FIG. **1**.

Prior to and during such movement of belt lever **10** to the left, the gripper assembly is operated to pull the belt into the machine.

The movement of belt lever **10** to the extreme left or belt loaded condition, reverses the movement of all of the various mechanisms associated therewith including the gripper operating assembly, various links and cranks, and cam member **73**. Rotation of the cranks moves the idler roller further away from the drive roller and applies tension to belt **2** in the unit.

In FIG. **4**, all of the elements shown assume the dashed line condition, with the exception of switch-operating member **74** that is held in the solid line condition due to engagement of bellcrank **86** with an AutoPhase latch member **91**.

Phasing

Movement of cam **73** also closes belt load contacts **75***a* to supply power to energize motor **105** which thereafter operates clutch assembly **93**, FIG. **10**. The activation of clutch assembly **93** drives shaft **83** which also supports lead screw **100**. Associated with clutch assembly **93** is a lead screw phase cam **94** which operates against a lead screw zero phase-operating member. Engagement of clutch assembly **93** and driving of lead screw **100** from motor **105** rotates a lead screw cam, not shown, which is fixed on shaft **83** in a predetermined condition to indicate a zero phase condition of lead screw **100**. As soon as lead screw **100** reaches a zero phase condition, this cam operates to transfer zero phase or lead screw (LS) contacts **75***c* in contact assembly **75**, FIG. **17**. The structure is so arranged that pin **92** simultaneously encounters extension **84***a* of link **84**, FIG. **4**.

The engagement of pin **92** with extension **84***a* disengages clutch assembly **93** and the rotation of lead screw **100** stops when it is in the zero phase condition. As stated, the lead screw contacts **75***c* are closed to indicate such condition.

Following zero phasing of the lead screw, motor **105** continues to run and rotates belt **2** through a connection to the drive roller. Belt **2** has been rotating all during the time of rotation of lead screw **100** prior to lead screw **100** reaching the zero phase condition.

Positioned in unit **1** in line with aperture **2***a* of any inserted belt **2** is a set of aperture sensing or Hole Detect (HD) contacts, FIG. **17**. As soon as aperture **2***a* is detected during rotation of belt **2**, this contact assembly closes and completes a circuit to ground through the previously closed lead screw contacts **75***c*. The completion of the foregoing circuit biases transistor Q23 to energize Reverse magnet **89**, FIG. **17**. The energization of magnet **89** moves latch **91** to the dashed line position, FIG. **4**, and releases link **84** which permits bellcrank **86** and contact-operating member **74** to rotate counterclockwise, thereby transferring contact assembly **75** to the "phased" condition. Up until this time, driving of the motor, FIG. **17**, has been through the phase contacts **3**, transferred.

The dropping of bellcrank **86** also moves bail **81'** counterclockwise through link **79** to move head **82** into engagement with belt **2** and to reengage the lead screw-driving pawls due to movement of retract bail **87**, FIG. **11***a*.

By the foregoing action, belt **2** has been moved into operating position on the belt rollers, lead screw **100** has been phased to a zero condition, and belt **2** has been rotated to an initial phase condition with respect to sound head **82**. This action occurs in dictating unit **1** or transcribing unit **5** each and every time that a belt **2** is inserted in one of the respective units. In this fashion, each belt, when initially inserted in position for operation is accurately phased with respect to the sound head **82** and tracking during recording and playback, or during subsequent transcription of a belt proceeds in a precise manner. The parameters of the system are such that the tracking is accurately maintained within desired limits throughout the remainder of the recording area on an inserted belt. Essentially, this eliminates the necessity for resynchronizing or phasing the belt with respect to the transducer on each and every cycle of rotation of the belt, as in some prior art devices.

Belt Unloading

Upon termination of dictation, or end of belt, belt **2** is ejected from dictating unit **1** by operation of belt lever **10** to the right, FIG. **1**, in a manner comparable to that described under the section concerning initial belt loading conditions. Such operation moves the idler roller closer to the drive roller, operates cam **73**, moves head **82** away from the belt record media and retracts the pawl assembly **101** in preparation for insertion of another belt record media.

In the case of the transcriber, the belt eject and unloading operation proceeds in a comparable manner to that for the dictating unit. The difference lies primarily in the direction of belt ejection, which in the case of the transcriber, is from the front of the unit, FIG. **9**.

OPERATION OF DICTATING UNIT

Preparation for Dictation

It is assumed that the mode control knob **20** has been positioned to the center, or Dictate position. Volume control **18** is set to a midrange position. Following insertion of belt **2** and the automatic initial phasing just described, the unit is essentially ready for dictation. The operator inserts a pad of index slips **12** in housing **13**. Head **82** is now located at the home position on belt **2** as reflected by the relative location of scanning lever **16** with respect to the top index slip **15**. As seen in FIG. **1**, scanning lever **16** is somewhat displaced to the right from the home position. At any time during the course of dictation, head **82** may be manually moved to a desired location on belt **2** by operation of scanning lever **16**. Reference is made to FIG. **6** for the action involved. FIG. **6** represents a bottom elevation of the dictating unit with the front of the unit at the top of the figure. Scanning lever **16** has a depressable control element **16***a* that operates through a link **125** and additional members **126** and **127** to move bail **87** between the two conditions shown in FIGS. **11***a* and **11***b* to engage and disengage the pawl assembly **101**. Depression of button **16***a*, therefore, disengages pawl assembly **101** enabling ready movement of sound head **82** back and forth in relation to an inserted belt **2**.

Scanning lever **16** forms part of a scanning assembly **13** that includes a member **130** mounted for movement from the full line condition shown in FIG. **6** to the dashed line condition on a guide rod **133**. Pivotally attached to member **131** is a link **135** that operates a lever **140** having another link **141** attached to its rearmost extremity. Link **141** is attached to sound head carriage **103** that mounts sound head **82**. With the structural arrangements shown movement of scanning lever **16** from left to right in FIG. **6** moves carriage **103** from right to left, thereby moving sound head **82** from right to left in relation to an inserted magnetic belt **2**. Conversely, movement of scanning lever **16** from right to left moves sound head **82** from left to right in relation to the belt record media **2**.

Prior to commencement of dictation, the dictator will also have selected a 10 minute or 20 minute recording time by operation of button **27**, FIG. **2**. He will also have moved button **26** to select speaker **38** in unit **1** or speaker **37** in microphone **3** for use during playback of dictated material.

Following preparation for dictation as discussed, the dictator grasps microphone **3**, which is assumed to be stored in microphone well **6**, FIGS. **1** and **2**, and pulls it toward him a convenient distance for use during dictation. Microphone **3** is interconnected with the machine circuits through cord **4** and when microphone **3** is stored in well **6**, cord **4** is wound on a cord reel assembly **245**, that is better seen in FIG. **6**. Cord reel assembly **245** maintains a spring tension on cord **4** that tends to pull the cord into the unit. When microphone **3** is in use, cord **4** is maintained at a length determined by the dictator. When dictation is finished, the dictator may retract cord **4** by depressing button **30**, FIG. **1**, whereupon cord reel assembly **245** pulls cord **4** into the unit. Microphone **3** is permitted to follow the cord as it winds into the unit and is again placed in storage well **6**.

Reference is made to the Wing publication in the May, 1967 IBM Technical Disclosure Bulletin in the "Other References" section for a description of a typical cord reel assembly that will fulfill the functions required by cord reel assembly **245**.

Dictation (Record) Mode

In order to begin dictating, the dictator moves mode control button **32**, FIGS. **1** and **1***a*, to the upper (Dictate) position. This establishes a recording mode of operation wherein a Playback (PB) relay is deenergized. The Playback relay is energized only during a Listen (Playback) mode, to be discussed. With the Dictate mode established by appropriate positioning of mode control button **32** on microphone **3**, the circuits in the unit are completed for recording of dictation whenever the record bar **33**, FIGS. **1** and **1***a*, is moved to an operating position.

The relative transverse movement of sound head **82** and belt **2** records a helical sound track on belt **2**.

Warning Signals

As indicated in the outline of Dictating Operating Instructions above, a warning tone may be generated at various times. As an example, closure of the "End of Belt" contacts, completes a circuit to operate a buzzer.

If the dictator continues through the "End of Belt" signal location on belt **2**, the "Auto-Off" contacts, are opened by approach of head **82** to the limit of the belt and open the path through the Phase **1** contacts and terminal **6** of the accessory connector to prevent further operation until a new belt is inserted, or the sound head is moved away from the end of the belt.

Forward Spacing and Backspacing

According to the present invention, the dictating and transcribing apparatus are provided with unique facilities in the form of a symmetrical Forward and Backspacing mechanism operated by energization of Forward and Reverse solenoids, when desired. In the case of the dictating unit, the Reverse solenoid **89**, FIG. **17** is energized by movement of the Record-Listen-Review button **32** to the lowest position in FIG. **1**. With the structures and circuits provided herein, it is possible for the dictator to review material in the reverse direction, that is, toward the beginning of the dictated material, or in the forward direction, that is, toward the end of dictated material.

Ordinarily, during the course of dictation, the dictator desires to backspace head **82** in relation to belt **2** in order to listen to previously dictated material.

Mechanical Structures for Forward Spacing and Backspacing

The reader is referred to the various drawings, including FIGS. **4**, **5**, **10**, **6**, **7**, **8***a*–**8***f*, and **11***a* and **11***b* in particular which illustrate various structural components of the Forward and Reverse (Backspacing) structures provided in the equipment.

The incrementing or measured review structures include a pawl assembly **101** illustrated especially in FIGS. **6**, **7**, **8***a*–**8***f*, and **11***a* and **11***b*. The pawl assembly is essentially symmetrical in nature with an upper set of pawls and a lower set of pawls. The activation of the upper and lower sets of pawls is under control of Forward solenoid **88** and Reverse solenoid **89**.

The mechanical structures will be first discussed followed by the electrical circuit action to energize the respective solenoids.

In FIGS. **6** and **7** solenoids **88** and **89** are connected to operate a bail member **170** mounted for pivoting action on rod **171**. Bail member **170** is connected by pin **172** to an operating member **173** mounted for reciprocating movement about fixed pin **174**. Operation of Reverse solenoid **89** moves bail **170** in a counterclockwise direction about rod **171**, FIG. **7**, and by the connection at **172** rotates operating member **173** in a clockwise direction about rod **174**. Connected to operating member **173** is a stepping bail **175** mounted for reciprocating movement indicated by arrow **177**, FIG. **7**. As shown in FIG. **6**, stepping bail **175** is arranged to pass between the upper and lower sets of escapement pawls in assembly **101**.

With the arrangement shown in FIG. **7**, energization of Reverse solenoid **89** operates bail **170** to move stepping bail **175** in such a manner that pawl assembly **101** is operated to effect stepping of magnetic head **82** in a reverse direction with respect to an inserted belt, while energization of Forward solenoid **88** operates bail **170** and stepping bail **175** to control operation of pawl assembly **101** for effecting movement of magnetic head **82** in a Forward direction with respect to an inserted belt. From previous discussion it will be recalled that home position of head **82** is to the right of FIG. **6**, thereby establishing movement of head **82** to the left as a Forward scanning movement. Pawl assembly **101** is thereby operated to move the carriage assembly **103** to the left along lead screw **100** for a Forward stepping operation and to the right for a Reverse stepping operation.

Referring to FIGS. **8***a*–**8***f*, stepping bail **175** is arranged to operate during its reciprocating action, under control of either Forward solenoid **88** or Reverse solenoid **89** against tabs A and B. The normal engaged condition of the pawl assembly **101** is illustrated in FIG. **8***a* where pawl E is engaged with

groove 3 in lead screw 100. The sequence of FIGS. 8a–8c illustrates an indexing or stepping operation of carriage assembly 103 to the left. This requires operation of stepping bail 175 against tab B in pawl assembly 101. Pressure exerted by stepping bail 175 is in a direction indicated by arrow 180, FIG. 8b. This pivots assembly II counterclockwise engaging pawl C in groove 3 in the right set of teeth shown for lead screw 100. The rotation of assembly II in such fashion moves the center point of the assembly a distance of 0.025 inches to the left. When stepping bail 175 returns to its normal central position, assembly 101 is moved to the left carrying carriage assembly 103 with it with the interaction of pawl C and lead screw 100 reengaging pawl E with groove 4 of the left set of teeth in lead screw 100.

Movement of the pawl assembly 101 and attached carriage 103 to the right is illustrated by the sequence in FIGS. 8d–8f. Stepping bail 175 is operated in the opposite direction by energization of the appropriate solenoid. Bail 175 acts on tab A, FIG. 8d and rotates assembly I to engage pawl D with tooth 5 in the leftmost set on lead screw 100. The normal condition of the stepping assembly is as shown in FIG. 8a, as described previously. In FIG. 8d, pawl E is engaged with groove 3 in the left portion of lead screw 100. Rotation of assembly I to the position in FIG. 8c moves pawl E to the right into engagement with groove 2 of the left set of teeth in lead screw 100. This is due to interconnection of assembly I with carrier 103 which in turn acts to move assembly II.

When stepping bail 175 is returned to its normal central location with respect to the pawl assembly 101, pawl E remains engaged with groove 2 in lead screw 100. Tab A and associated assembly I returns to the rest position in readiness for another indexing operation in the direction indicated.

Manual Retraction of Pawl Assembly 101

The manual retraction of pawl 101 was previously alluded to in connection with operation of scanning knob 16, FIGS. 1 and 6. More specifically, operation of scanning knob 16 moves pawl retract bail 87 and by interconnection shown in FIGS. 11a and 11b operates retractor 183 in a downward direction. Retractor 183 is connected at 184 with a retractor driver 185 that is rotated from the condition shown in FIG. 11a to that shown in FIG. 11b. Such rotation of retractor driver 185 moves retractor 186 upwardly to retract assembly I from lead screw 100.

To summarize, movement of pawl retract bail 87 from the normal position in FIG. 11a to the activated position in FIG. 11b moves retractor 183 downwardly and retractor 186 upwardly to disengage all pawls from lead screw 100. The actual disengagement is effected by extensions 183a and 183b of retractor 183 and 186a and 186b of retractor 186.

Action for Reverse and Forward Stepping

When he desires to listen to previously dictated material, the dictator normally moves Record-Listen-Review button 32 on microphone 3 downwardly to the Review position. Button 32 is movable to any of the three positions (upper, center, or lower), will assume an upper or center position if so placed, but is biased in such a manner that it must be held in the lower position, for the length of time desired. A momentary movement of button 32 to the lower position will result in a single actuation of Reverse solenoid 89. An option may provide for continued pressure of button 32 to the lower position, a repeated energization of Reverse solenoid 89, and a repeated measured review or indexing action in the reverse direction. As an option and as indicated in the cross-referenced Fackler et al. application, a charging-discharging circuit may be provided for transistor Q23, FIG. 17, which operates according to a predetermined timing cycle. Accordingly, even though button 32 on microphone 3 remains depressed to the lower position, the timing circuit turns transistor Q23 on and off to operate Reverse solenoid 89 in a repeated cyclical fashion. The dictator is also able to review material in the forward direction by movement of button 38 upwardly. Such movement activates transistor Q22, FIG. 17, that is connected for operating Forward solenoid 88. An optional capacitor charging-discharging circuit, not shown, may also be provided for transistor Q22. Then, a single actuation of button 38 upwardly will energize Forward solenoid once. Holding button 38 will result in a repeated energization of Forward solenoid 88 and a repeated stepping of the carriage in the forward direction. A spring bias is also maintained on button 38 to return it to the normal inactive or center location shown in FIG. 1a.

Additional Features, Including Rapid Sound Head Alignment and Left Margin Control

Provision is made for incorporating several optional features in the apparatus that, under some circumstances, insure a greater degree of accuracy with respect to sound head alignment in relation to the belt and operation of the sound head in the initial margin area, that is, the home position of sound head 82.

Rapid Sound Head Alignment

During a manual scan operation, wherein pawl retract bail 87, FIG. 11b, is retracted to disengage pawl assembly 101 from lead screw 100, it is sometimes difficult to reengage the pawls in exact alignment with the teeth in lead screw 100, upon assuming a new position of sound head 82 in relation to belt 2. The structures shown in FIGS. 12, 13a, and 13b provide for a rapid alignment of sound head 82 in relation to belt 2 following such an operation.

Until the carriage repositions itself, the helical path recorded on belt 2 during the recording operation may not be perfectly followed, resulting in cross-talk and less desirable reproduction of the recording.

In FIG. 12, pawl retract bail 87 operates an alignment assembly 196 that includes a support member 197 mounted for rotation on shaft 198. Support member 197 carries a rapid alignment pointer or prove 199 that is spring loaded by spring 200, with considerable tension. Probe 199 is adjusted by adjusting screw 201 to a predetermined relationship with respect to lead screw 100, FIG. 13b. Sound head carriage 103 carries a bracket or comb assembly 202 that is adjustable by screws 203 and 204 in relation to pointer 199. Comb assembly 202 has extensions 202a and 202b that form a groove for reciprocation of probe 199.

In operation, pawl retract bail 87 is moved in a direction indicated by arrow 206 to disengage pawl assembly 101 from lead screw 100. This action rotates support member 197 counterclockwise in FIG. 12 and moves probe 199 up above lead screw 100. When scanning lever 16 is released so that retract bail 87 can restore in a direction indicated by arrow 208 and reengage pawl assembly 101 in lead screw 100, probe 199 is rapidly pulled downwardly by action of spring 200 into and through a tooth in lead screw 100, FIG. 13a. Due to the coaction of the pointer portion of probe 199 with the groove in lead screw 100, probe 199 reacts against extensions 202a or 202b and through the interconnection of comb 202 with carriage 103 moves carriage 103 slightly, as required, into accurate alignment with respect to lead screw 100.

Margin Control

Another feature for sue with the dictation or transcribing apparatus according to the present invention concerns margin control structures illustrated in FIGS. 14, 15, and 16. Lead screw 100 carries a margin cam 210 having a helical face with a lead equal to the lead screw. Cam 210 is positioned radially so that its high point at 210a is just beyond zero degrees of the lead screw as required by the initial phasing operation, previously described.

The objective of the structures in FIGS. 14, 15, and 16 is to enable the restoration of sound head 82 at a point slightly past the original initial margin area on belt 2 to insure that previously recorded material is picked up in its entirety. Cam member 210 prevents unintended recording prior to the predetermined margin location, but does permit backspacing or recall operation into this area for the purpose of playback.

In FIG. 15, the device includes an adjustable stop element 212 that is fixed to sound head carriage 103 by screws 213 and 214. Prior to a belt loading operation, head 182 is restored to the margin until the fixed adjustable stop 212 contacts margin cam 210. The stop 212 is adjusted so that the stepping pawls in assembly 101, FIGS. 8a–8f are aligned with the lead screw.

During operation of the initial phasing system, lead screw **100** is rotated to 0° and cam **210** positions head carrier **103** to the predetermined margin location. The stepping pawls in pawl assembly **101** are disengaged until the phasing operation has been terminated.

To enable sound head **82** to be positioned prior to the normal left margin used during recording, cam **210** is rotated to present a lower dwell to the fixed stop **212** thereby enabling movement of sound head **82** beyond the normal margin to insure reproduction of all of the previously dictated material, FIGS. **14** and **16**.

Under some conditions, such as a recall operation, to be described, a recall pawl lift **216** is operated by another pawl element **217** to rotate about stud **218** in a direction indicated by arrow **219** and encounters cam **210** instead of the fixed stop **212**. This prevents the fixed stop **212** from being driven into margin cam **210** as when the lead screw is reversed during a recall operation. Pawl **217** is rotated by movement of backspace pawl **220** that is also used for a reverse scan operation. As pictured in the drawings, carriage **103** with stop **212**, FIG. **15**, moves toward margin cam **210** in FIG. **14**.

The relationships of the structures are such that fixed stop **212** encounters cam **210** at the high point of the cam face under normal circumstances. During a playback operation when it is desired to begin reproduction past or prior to the margin used during recording, cam **210** is rotated in a direction indicated by the "Recall" arrows thereby positioning a different portion of face cam **210** for cooperation with stop **212** and enabling stop **212** together with associated carriage **103** to move further and prior to the recorded margin.

Operation of Indexing Mechanisms for Supplying End of Letter and Secretary Instruction Indications

Scanning lever **16** houses a printing index marking assembly such as that described in U. S. Pat. No. 3,203,000, noted in the "Cross Reference" section. Due to the mechanical interconnections shown in FIG. **6**, scanning lever **16** is moved adjacent an uppermost index slip **15**, FIG. **1**, in synchronism with the movement of magnetic head **82** adjacent an inserted belt **2**. The relative location of scanning assembly **16** with respect to index slip **15** is taken advantage of to provide End of Letter and Secretary Instruction indications by operation of the marking device contained therein.

Playback (Listen) Mode

The Playback (Listen) mode is established by positioning of the Record-Listen-Review button **32** to the center position on microphone **3**.

Movement of button **32** to the center position operates the Playback (PB) relay and the associated RP relay, FIG. **17**.

Dictator Logic

The detailed circuits for the dictating unit that are fully described in the Fackler, et al. case 699,259 are somewhat simplified in the logic diagram of FIG. **17**. Only the major components involved in operation of the dictator unit are shown in FIG. **17**. These include microphone **3** shown in the dashed box so designated and various interconnecting terminals that correspond to the accessory connector shown in FIG. **25***b*. A complete sequence of operations of the dictator unit will clarify the logic involved.

In FIG. **17**, loading of a magnetic belt in the unit closes the belt load contacts (BL). This completes a circuit from the Power Source (PS) through the Not Head Restore ($\overline{HR}$) and Not Phase 4 ($\overline{PH4}$) contacts to drive motor **105**. Mechanisms associated with belt loading are latched to prevent dictation until the lead screw has reached a zero phased condition and the aperture **2***a*, FIG. **2**, in belt **2** is sensed by the apparatus. The latching mechanism is released by operation of Reverse solenoid **89** that is driven by transistor Q23. Rotation of lead screw **100** to a zero condition closes Lead Screw contacts (LS). Sensing of aperture **2***a* in belt **2** closes the Hole Detect (HD) contacts. A circuit to ground is thereby completed through the LS and HD contacts, through Not Phase **2** to transistor Q23 to saturate it and energize Reverse solenoid **89** to release the latching mechanism and indicate that the phasing operation has been completed.

A Dictate mode is established by positioning of mode knob and switch assembly **20** to the center or Dictate position which prepares the logic for recognition of the Record (REC) status. Mode control button **32** on microphone **3** is also moved to the upper or Record position to prepare the machine circuits for recording of dictation. When the operator of the unit desires to dictate, he depresses dictate bar **33** that completes a number of circuits as follows. A circuit exists from Power Supply (PS) through Belt Load (BL) contacts Not Auto-Off ($\overline{AO}$), through Phase 1 (PH1), Connector **6**, Dictate Bar (BAR), and thence to several circuits in FIG. **29**.

Power is applied through connector **20** to pick relay RR that completes a circuit to the magnetic head for recording signals. This also activates the oscillator for bias and erase signals.

A parallel circuit exists through the Record (REC) logic, connector **12** to the base of transistor Q9 in connection with energizing relay RR and also to the top of motor **105** through Phase 4 (PH4) contacts, diode **150**, and coil L-1 for driving belt and head mechanisms to trace a helical path on belt **2**.

During dictation, movement of the Letter-Secretary button **39** to the Letter position (LET), energizes the Letter solenoid **190** to mark a letter indication on index slip **15**. Movement of button **39** to the lower position closes Secretary (SEC) contacts to operate the Secretary solenoid **191**, thereby making a Secretary Instruction mark on index slip **15**.

During dictation, the fact that the equipment is in a Record mode is indicated by the energization of lamp **35** on microphone **3**.

If it is desired to review material previously dictated, the dictator moves mode button **32**, FIG. **1***a*, to the lowest position against the spring bias which closes a connected to ground through connectors **5** and **7**, the Review switches (REV), connector **8**, Phase **2** contacts (PH2) to transistor Q23 to energize the Reverse solenoid **89** and backstep head **82** in relation to belt **2**. Optionally, a repeated backstepping is obtained by holding button **32** in the Review position.

Stepping of head **82** forwardly in relation to belt **2** is accomplished by movement of button **38** on microphone **3** to the upper position. This completes logic through the Forward (FWD) contacts, connection **18**, to the base of transistor Q22 for energizing Forward solenoid **88**.

The signals during recording are provided from microphone transducer **36** to the machine amplifier circuits from terminals **1** and **3**.

In order to listen to previously dictated material, the dictator moves mode button **32** to the center position which operates Listen (LIS) logic. Closure of the Listen contacts (LIS **1** and LIS **2**) completes several circuits. The circuit from LIS **1** through connector **12** biases transistor Q9 on to activate motor circuit transistors Q2–Q8, the second regulator, and energize motor **105**. Another circuit activates Playback relay PB, relay RP, the power amplifier (B stage) through Not Telephone **3** (TEL 3), connector **11**, and Listen **2** (LIS 2).

With battery, power for the preamplifier is derived from the third regulator stage and controlled by switch LIS **1**. With AC, power comes from the AO contact.

During the operation of motor **105**, regulation is provided by the motor control block under control of the second regulator block. A third regulator circuit is also provided.

Dynamic braking is provided by transistor Q1 which conducts upon termination of dictation and listening and that serves as an effective short circuit across motor **105** to bring motor **105** rapidly to a standby condition. During dictation, the preamplifier stages (PRE-AMPL) are activated from the Not Automatic Off connection (AO). During a Listen mode, the connection to the oscillator is effectively open since Dictate bar **33** is not depressed.

The logic includes buzzer **106** that is operated as an example by the End of Belt (EOB) contact.

TRANSCRIBING UNIT

General Description

In accordance with the present invention, a transcribing unit is provided that makes use of essentially the same mechanisms as are used in the dictating unit with the exception that the mechanisms are oriented to face the transcriber during normal operation. The transcriber unit is pictured in FIG. 9. Various mechanisms concerned with belt loading and unloading, phasing, reverse and forward scanning and other mechanisms are shown in FIGS. 10, 11*a* and 11*b*. Additional mechanisms concerned with a Word Recall operation are specifically shown in FIG. 16.

As with transcribing units in the prior art, the primary objective of the transcribing unit according to the present invention is to facilitate the transcription of previously recorded media. Operating instructions for the unit are set forth below.

TRANSCRIBING UNIT OPERATING INSTRUCTIONS

Loading Belt

1. The belt 2 is placed on the machine by sliding it over the mandrel 11 with the arrows pointing toward the machine. The belt is inserted into the machine as far as it will go without forcing it.
2. The belt release lever 10*b* is moved to the left to load the belt. Thereafter, the belt rotates at high speed. When it stops it is automatically phased.

Removing Belt

1. Belt release lever 10*b* is moved to the right. The belt will partially extend from the machine at this time.
2. The belt is then manually removed from the machine. Scanner lever 16*a* automatically returns to the left margin.

Index Slip Loading and Removal

1. The index slip 15*a* is inserted into the holder 13*a*.
2. The slip is slid out of the holder for removal.

HEADSET

Removing

1. The operator grasps and pulls headset 14 out of the unit a convenient distance. Tension is released on the headset cable allowing the cord to lock into position. (Note the Wing publication.)
2. The earpieces are twisted sideways until they snap into an expanded condition. (Note the Dyar, et al., patent application.)
3. The earpieces are spread apart to put the headset on.

Replacing

1. The earpieces are pushed together.
2. The earpieces are twisted until they snap into their rest position or until they lie side by side.
3. The headset is held securely in one hand. The rewind button 30*a* is depressed to retract the headset cable.
4. The headset is guided into the storage compartment.
5. The rewind button 30*a* is released.

FOOT CONTROL

Operating

1. Start-Stop. The right side of the foot control 8 starts the machine when depressed. The machine stops when the right side is released.
2. Review. When the left side of foot control 8 is depressed, the sound head is moved back approximately 10 words or 6 seconds of recording time when the recording time selector 27*a* is in the 10 minute position. As an option, holding the left side depressed moves the sound head back continuously in 6 second increments, thus giving an extended review. If the recording time selector 27*a* is in the 20 minute position, the measured review will be 12 seconds or approximately 20 words. For most dictating and transcribing, the switch is in the 10 minute position.
3. Forward Review. Depression of the top of foot control 8 moves the sound head forward approximately 10 words or 6 seconds. As an option, keeping the foot control depressed causes the sound head to advance continuously in 6 second increments. If recording time selector 27*a* is in the 20 minute position, the forward movement will be in 12 second increments or approximately 20 words.

Unit Operating Controls

1. Tuning Control. Tuning control 17 is not normally used. This control is provided so that belts recorded on other dictating equipment can be transcribed on the present transcriber. If a belt without an initial phasing aperture is placed in the transcriber, the automatic initial tuning feature is not operative. The belt will continue to rotate, but is stopped by tapping the forward review (top) portion of the foot control. Manual tuning can now be accomplished by moving tuning control 17 left or right.
2. Automatic Word Recall. Releasing the right side of foot control 8 activates the auto recall mechanism. This allows the last few words of dictation to be repeated the next time the right side of the foot control is depressed. The amount of recall is adjustable from: No recall to about five words. This feature is adjusted to the amount of recall desired by moving recall lever 19 left or right. The panel is marked in seconds from 0—5 seconds.
3. Scanner Lever. Scanner lever 16*a* is provided to allow manual location of the sound head to any position on the belt. Any portion of the recorded information can be reached by pushing the lever toward the machine and sliding left or right. If the right side of foot control 8 is depressed when moving the scanner lever, the transcriber can at the same time listen to what is recorded on the belt. If scanner lever 16*a* is moved, either manually or be depressing the forward review position of the foot control, to the far right of the index slip area, the transcriber will automatically shut off. The unit is turned back on by manually moving the scanner lever to the left.
4. Speed Control. The playback speed is adjusted by speed control knob 22, which is rotated left or right for adjustment. The speed is decreased by turning it to the left and increased when turned to the right. The dot in the center of the control indicates the middle of the speed range.
5. Tone Control. The tone can be adjusted by control 29. The dot in the center of this control indicates the middle of the range.
6. Volume Control. Volume control 31 varies the loudness of the dictation heard through headset 14. The dot on the knob represents the middle of the volume range.

Erasing the Belt

The erase knob 40*a* is used to initiate complete erasure of the entire belt after it has been transcribed. This feature is semiautomatic. Once the knob has been depressed, it latches into position, and as soon as the belt has been completely erased, returns to its normal position. The machine stops to indicate the belt has been erased.

Headset

Headset 14 is positioned for storage in compartment 34 of transcribing unit 5. As described in the Dyar, et al., patent application indicated in the "Cross Reference" section above, headset 14 is collapsible for storage in unit 5 and when withdrawn from the unit is expandable for normal use by the transcriber.

Preparation for Belt Loading and Phasing

Following removal of a previous magnetic belt 2 from unit 5, the sound head in unit is restored to the home margin in a manner similar to that described in connection with the dictation unit.

Normally, the transcriber selects an index slip 15*a* that is related to the belt to be transcribed and positions it in the index retainer 13*a*, FIG. 15. Another belt 2 is then slipped onto mandrel 11 into the transcribing unit as far as it will go. Thereafter, belt lever 10*b* is moved to the left and belt 2 is pulled into unit 5 on the idler and drive rollers, by a gripper assembly such as that described in connection with the dictating unit. Movement of belt lever 10*b* to the left latches various belt loading and phasing mechanisms and applies power to the motor in the unit to rotate lead screw 100 and belt 2. Member 84 is

latched by latch member 91, FIG. 4, and clutch 93 is engaged to drive lead screw 100. As soon as lead screw 100 reaches a zero phase condition as reflected by pin 92 contacting member 84, clutch 93 is disconnected. Belt 2 continues to drive until aperture 2a is sensed by Hole Detect contacts. Rotation of lead screw 100 to the zero phase condition closes the lead screw contacts LS-1, while detection of aperture 2a closes the Hole Detect (HD) contacts, FIG. 18. A circuit is thereupon completed to energize transistor T2 and actuate Reverse magnet 89a to release the mechanisms previously latched which includes release of member 86 and transfer of the Phase contacts, thereby indicating that the lead screw and belt have been phased to a proper initial position. The unit is thereupon ready for use by the operator and control by appropriate movement of foot control 8.

As indicated in the operating instructions, compatibility of the unit for operation with magnetic belt media having no aperture is achieved by insertion of such media in the unit and depression of foot control 8 to close switches in order to activate Reverse solenoid 89a thereby unlatching the loading and phasing mechanisms and preparing the unit for use.

Typical Transcribing Operation

To transcribe an inserted belt in unit 5, the operator positions headset 14 for listening to signals derived during Playback and positions foot control 8 for appropriate depression in the various directions indicated. Depression of the right side of the foot control transfers switches 1 and 2 within the foot control to apply power to the various machine circuits.

Release of foot control 8 will disconnect the circuits just described and with control 19 set to a zero or "No Recall" position, FIG. 9, stops the motor and the Playback operation.

Manual Scan Operation

Pushing scanning lever 16a in toward the machine enables movement of the scanner mechanism and magnetic head to any desired position on index slip 15a and with respect to belt 2. The movement of scanning lever 16a operates pawl retract bail 87, FIG. 11a, to disengage pawl assembly 101 from lead screw 100 and permit easy movement of the sound head in the unit.

Forward Stepping

It is also possible for the operator to reach a desired portion of belt 2 in the Forward direction by depressing the top portion of foot control 8. This transfers switch contacts designated Forward (FWD) and provides a connection to activate the Forward solenoid 88a. This renders the escapement mechanism described previously effective to increment the sound head in relation to the magnetic belt by successive increments that is termed a measured review.

Movement of the sound head in transcribing unit 5 in the reverse direction in relation to magnetic belt 2 is effected by depressing the left portion of foot control 8 thereby transferring the Reverse switch contacts and completing a circuit to activate the Reverse solenoid 89.

With an option, continued incrementing of the sound head in either the selected forward or reverse directions is repeated continuously by continued depression of the foot control 8 in the required direction.

Automatic Recall Feature

The transcribing apparatus and the dictating apparatus, if desired, incorporates means as set forth in the Ridings, et al., application, for automatically repositioning the sound head in relation to the magnetic belt 2 each time that the foot control is released following a Playback operation in order to pick up the last several words of dictation when the equipment is started again. The recall is adjustable by means of the recall lever 19, FIG. 9, anywhere from a No Recall condition to approximately five words.

The recall feature includes structures shown particularly in FIG. 10 together with electrical circuits in FIG. 18. A lever 240 moves an adjustable stop 242 that is arranged for cooperation with a timer rack 243, the latter three items also being shown in FIGS. 10. Rack 243 is arranged for movement left to right and right to left in the figures with a spring member 250 maintaining rack 243 generally to the left against stop 242. Positioned adjacent extremity 243a of rack 243 is a set of timer contacts TC, shown also in the circuit of FIG. 18. Rack 243 is also movable slightly upwardly and downwardly as indicated by arrow 252, FIG. 16, under control of a timer magnet T. This is effected by movement of a timer arm 254 engaging rack 243 in slot 243b by pin 256. Rack 243 is positioned adjacent a driving gear 260 for driving from left to right during its operation.

Considering the structural aspects first, rack 243 normally rests against stop 242 and by energization of timer magnet T through armature 262 is moved upwardly under control of arm 254 and pin 256 into engagement with gear 260. Adjustment of recall lever 19 moves rack 243 closer or further away from contact assembly TC. Contact assembly TC is incorporated in a driving circuit for motor 105a to drive the motor and hence the sound head in relation to magnetic belt 2 a varying distance depending upon the time it takes rack 243 to encounter operating strap 265 of the timer contact assembly TC and open contacts TC.

Transcriber Logic

FIG. 18 illustrates the logic involved in operation of the transcriber circuits that are described in detail in the Fackler application 699,259. The logic is clarified by consideration of a typical transcribing operation. The logic includes the foot control 8 with switch 1 and 2 contacts (SW1 and SW2) that are movable by depression of foot control 8 on the right side. The foot control includes Forward (FWD) and Reverse (REV) contacts for operating Forward and Reverse solenoids 88a and 89a under control of associated transistors T1 and T2. The logic further includes timer T, timer contacts TC, an R relay and associated transistor T4 controlled by transistor T19, an RR relay controlled by transistor T5 that is in turn selectively controlled by transistors T6 and T7 and motor 105a together with a motor control circuit for regulating its speed in a selected speed range.

A typical sequence of operations involves unloading a belt and reloading a new belt to continue transcription. When a belt is ejected from transcribing unit 5, the sound head is usually away from the home margin position as reflected by Head Restore (HR) contacts being closed as indicated with the designation Not Head Restore ($\overline{HR}$). Such contacts being closed complete a circuit through Not Phase 1 contacts to drive motor 105a for restoring sound head to the initial margin location. When the transcriber inserts a belt into the unit, the belt load (BL) contacts close to further supply driving power to motor 105a through the Not Phase 1 contacts. This also conditions amplifier stage 195a for operation when the RR relay becomes energized later.

Immediately following insertion of a belt in the unit, the lead screw is phased to a zero condition and aperture 2a of belt 2 is sensed to establish a desired initial relationship between sound head 82 and belt 2 in the unit. The belt loading and phasing mechanisms are latch with all of the phase contacts in an inactive or logical Not condition and retained in such condition until the lead screw is phased and the belt aperture is sensed. The mechanisms are reset upon such occurrence under control of a latch member operated by the Reverse solenoid 89a. Closure of the lead screw (LS) contacts indicating a lead screw zero phase condition and the Hole Detect (HD) contact complete a circuit to ground for biasing transistor T2 on to energize the Reverse solenoid 89a, thereby unlatching the phasing mechanisms and indicating that the unit is ready for operation. This moves all of the Phase contacts to their phased condition.

To operate the unit, the transcriber depresses foot control 8 on the right side which transfers switch assemblies SW1 and SW2 to supply power to the various circuits of the machine. Power is from the power supply through the belt load (BL) contacts, Phase 1 (PH1) contacts, Automatic Off ($\overline{AO}$), terminal 6 of foot control 8, switch 1, and terminal 11 to the upper side of relays R and RR, rendering the latter relays ac-

tive and transferring the associated contacts. The relay RR contacts complete the amplifier circuits to head set **14**. Power is also supplied from terminal **8**, R3 and $\overline{AE1}$ to the upper side of motor **105***a*. The lower side of the motor circuit is completed through the automatic erase contacts $\overline{AE2}$ through switch SW2, connector **10**, to the motor control circuit. Motor **105***a* thereupon operates to drive sound head in unit **5** in relation to magnetic belt **2** in order to trace a helical path on the belt.

During operation, the transcriber may wish to scan the belt forwardly or reversely and does so by appropriate depression of foot control **8**. A Forward scan is initiated by depression of the top of foot control **8** closing the forward (FWD) contacts to terminal **18** and driving transistor T1 to energize Forward solenoid **88***a*. This operates the escapement pawl assemblies described elsewhere. Scanning of the sound head in a reverse direction with respect to magnetic belt **2** is effected by depression of the left side of foot control **8** which closes the reverse contacts and biases transistor T2 to operate the Reverse solenoid **89***a*.

The automatic recall feature is controlled by movement of automatic recall lever **19** on the front of the unit through a range from No recall zero to approximately five words of recall. While in a playback mode with switches SW1 and SW2 transferred, the circuits of the equipment are prepared to supply an automatic recall operation upon termination of the Playback.

Relay R is held through its own R1 contacts and timer contacts TC that are controlled by the timer rack **243**, FIG. **16**.

Assuming that the automatic recall lever **19** is set at a position other than the zero position, the operation of the automatic recall feature is as follows. Release of foot control **8** establishes the Not switch **1** and Not switch **2** conditions ($\overline{SW1}$ and $\overline{SW2}$) and reverses connections to motor **105***a* to reverse the direction of driving of motor **105***a* in order to drive belt **2** in a reverse direction in relation to the sound head. Also, this rotates gear **260**, FIG. **16**, to drive rack **243** toward strap **265** of contact assembly T-1 in order to open contact assembly TC and terminate the recall operation. This extent of recall is determined by the relative location of rack **243** in relation to strap **265** as determined by the setting of stop **242** that is directly controlled by movement of automatic recall lever **19**.

The circuit connections for reversing the rotation of motor **105***a* are from power supply, belt load (BL) contacts, Phase 1 (PH1), Not Automatic Off AO R2 contacts, Not Switch 2 ($\overline{SW2}$), connection **12**, Not Automatic Erase contact $\overline{AE2}$, Phase 2 contacts to the bottom of motor **105***a*. This supplies approximately 18.0 volts on this side of the motor for driving purposes. The opposite side of the motor is grounded through the automatic erase contacts ($\overline{AE1}$), the R3 contacts, transistor T3 connector **11**, Not Switch 1 ($\overline{SW1}$), connector **7** to ground. Ground is also applied to the timer coil which through the mechanisms shown in FIG. **16** moves rack **243** into engagement with gear **260**. Opening of the timer contacts TC drops relay R and timer T. In this manner a desired amount of recall is automatically obtained in the equipment.

If the operator wishes to terminate the timer operation prior to its normal completion, she again depresses foot control **8** to transfer the playback switch contacts SW1 and SW2 into a Playback mode. Such transfer of the SW1 and SW2 contacts opens the circuits for reverse driving of motor **105***a*, terminates the energizing circuit for the timer, and through transistor T19 drops relay R to permit the circuits to settle down. Relay R is then able after a predetermined length of time to become energized again as in a normal Playback mode of operation. Transistors T5, T6, and T7 are effective to control the relay RR that in turn controls muting of the audio circuits.

The margin control described in connection with FIGS. **14**, **15**, and **16** is useful during the recall operation for enabling the operator to listen prior to the initial location of recorded material.

While the invention has been particularly shown and described with reference to several embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention.

We claim:

1. An indexing arrangement for dictating and transcribing apparatus having a drive means including a lead screw for relatively driving a sound head and record media to scan a signal track, said lead screw having a plurality of teeth regularly spaced at predetermined indexing intervals along said lead screw, comprising:

a sound head carriage mounting said sound head and positioned in proximity to said lead screw;

a symmetrical pawl assembly mounted on said carriage and interconnecting said carriage with said lead screw, said assembly including a first pawl assembly mounted substantially in parallel with what for escapement connection on one side of said lead screw and a second pawl subassembly mounted substantially in parallel for escapement connection on the opposite side of said lead screw, each of said pawl subassemblies including at least oppositely extending first and second pawl elements pivotally mounted for relative expansion and contraction in relation to said lead screw, the first pawl element of each subassembly being further pivotally and drivingly connected to step said carriage;

means initially connecting a particular first pawl element of a selected pawl subassembly with a tooth of said lead screw; and

indexing control means arranged for indexing connection with each of said pawl subassemblies and operable by force exerted on said selected pawl subassembly in a first indexing mode to disengage said normally engaged pawl element of said selected pawl subassembly from said lead screw and to engage the related second pawl element, with said lead screw, to thereafter continue the force exerted on said selected pawl subassembly to expand the first and second pawl elements of said selected pawl subassembly and due to the pivotal interconnection of said first pawl element of said selected pawl subassembly to thereby step said carriage one tooth in a first indexing direction with respect to said lead screw and to thereafter remove the force exerted on said selected pawl subassembly, thereby enabling said particular first pawl element of said selected pawl subassembly to reengage said lead screw one tooth removed in said first indexing direction from its initial engagement and restoring said subassemblies to initial condition; and said escapement control means being operable in a second indexing mode by force exerted on said other pawl subassembly to engage the second pawl element of said other pawl subassembly with said lead screw, to thereafter continue the force exerted on said second pawl element of said other pawl subassembly to expand the first and second pawl elements of said other pawl subassembly and due to the pivotal interconnection of the first pawl element of said other pawl subassembly to thereby step said carriage one tooth in an opposite indexing direction with respect to said lead screw, the aforesaid action moving said particular first pawl element one tooth along said lead screw in said opposite direction, and to thereafter remove the force exerted on said other pawl subassembly, thereby restoring said subassemblies to initial condition.

2. The apparatus of claim **1**, further comprising: a common bail member mounted substantially in parallel with respect to said lead screw in actuating proximity to said pawl subassemblies and selectively movable in said first indexing mode in a first direction to operate said selected pawl subassembly and movable in said second indexing mode in a second direction to operate said other pawl subassembly; and

means for operating said bail member to initiate indexing operations in said first and opposite directions.

3. The apparatus of claim **2**, wherein:

a forward solenoid;

a reverse solenoid;

means in said control means connecting said solenoids for

operating movement to said ball member; and

circuit means for operating said solenoids, on a selective basis.

4. The apparatus of claim 3, further comprising:

means positioned for manual control by the operator of said apparatus to initiate operation of said circuit.

5. The apparatus of claim 4, wherein said manual control means is actuable (1) momentarily and (2) for an extended length of time at the option of the operator and further comprising:

means associated with said circuit means for establishing single independent operations upon momentary actuation of said manual control means and repeat operations of said indexing control means upon extended actuation of said manual control means.

6. The apparatus of claim 2, further comprising: scanning lever means for disengaging both said pawl subassemblies to enable free scanning movement of said sound head and carriage in relation to a record media.

7. Margin control apparatus for dictating transcribing apparatus to enable playback by a sound head of material prior to a predetermined initial recorded location on a record media, comprising:

means for relatively driving said sound head and said media to scan a signal path on said media;

margin control means including a face cam arranged for cooperation with said sound head driving means near said initial location and operable in one mode to establish a normal selected initial relative location on said media and in a second mode to establish a relative location of said sound head and said media that is prior to said initial location;

control means for conditioning said margin control means to said one mode when recording signals and to said second mode when playing back signals;

a fixed stop associated with said sound head and arranged for normal engagement with said cam member as said sound head approaches said initial location;

means further operable to establish a recall operation to relatively drive said sound head and said media at high speed;

a second stop mounted for movement to engage said cam member during high speed recall movement of said sound head toward said initial location; and

and means operable during a recall operation for moving said second stop into engaging condition with respect to said cam member and to move said fixed stop out of engaging condition with respect to said cam member.