

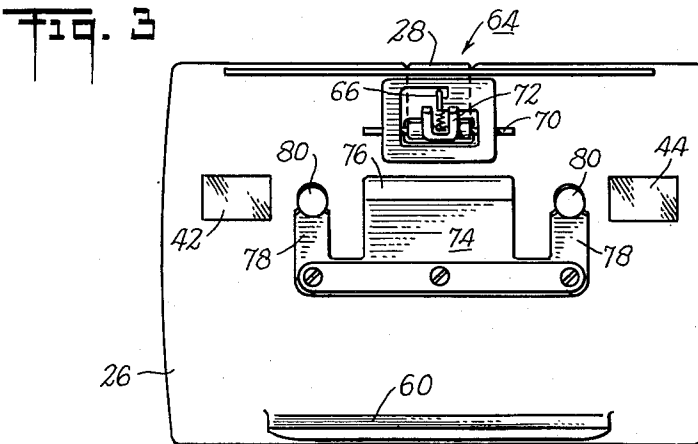
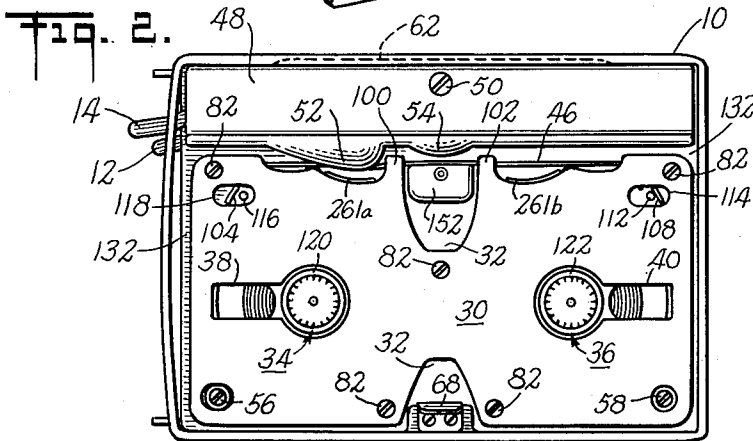
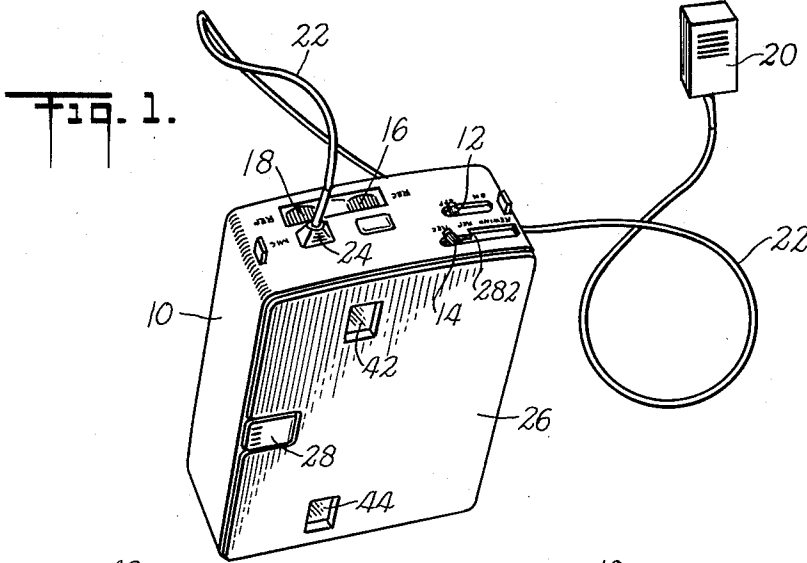
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E. S. GILLETTE ET AL
PORTABLE DICTATION APPARATUS

2,989,261

Filed April 30, 1956

3 Sheets-Sheet 1



INVENTORS
Edward S. Gillette
Ralph H. Sherman, Jr.
BY
Curtis Morris & Safford
ATTORNEYS

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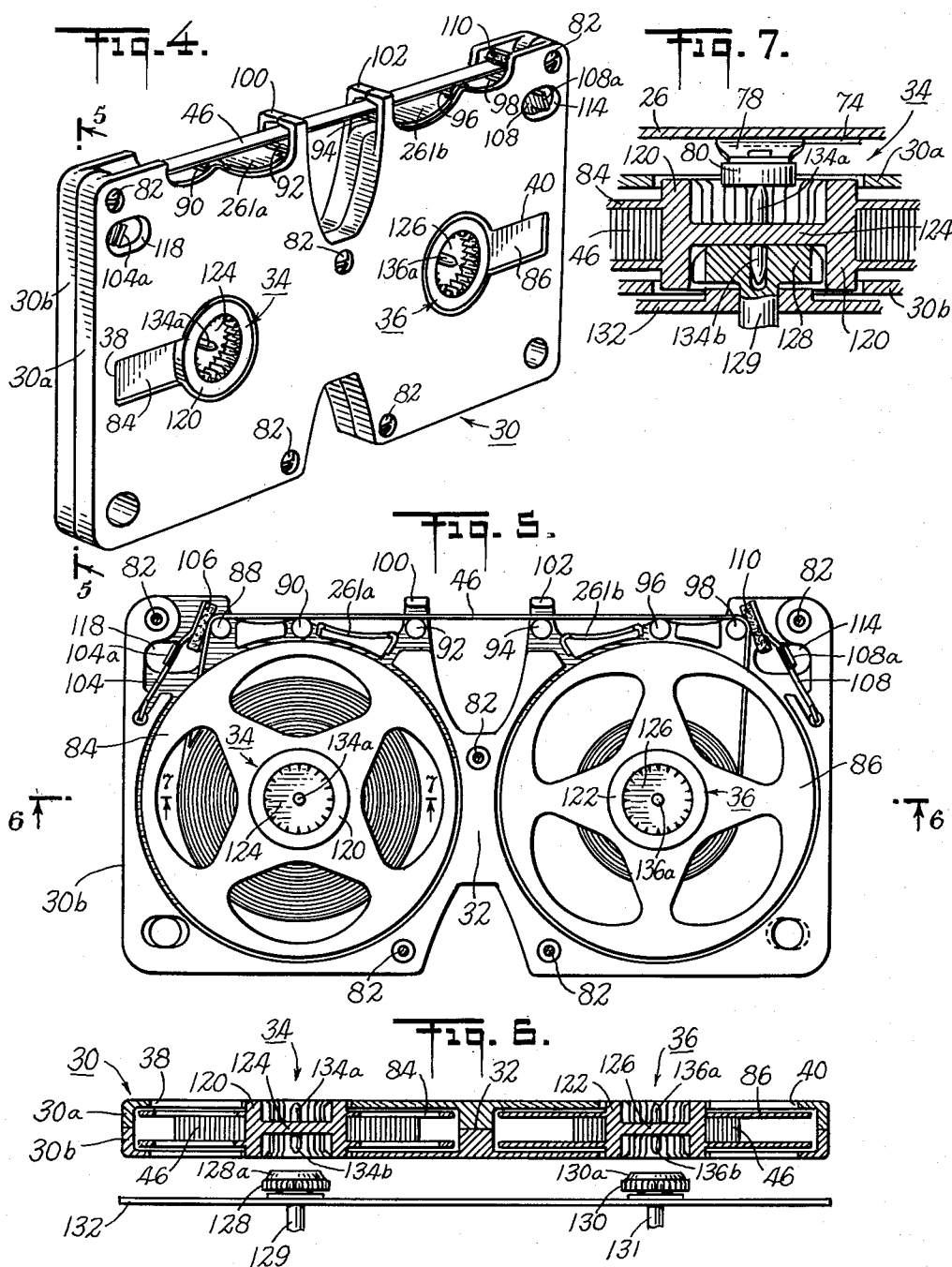
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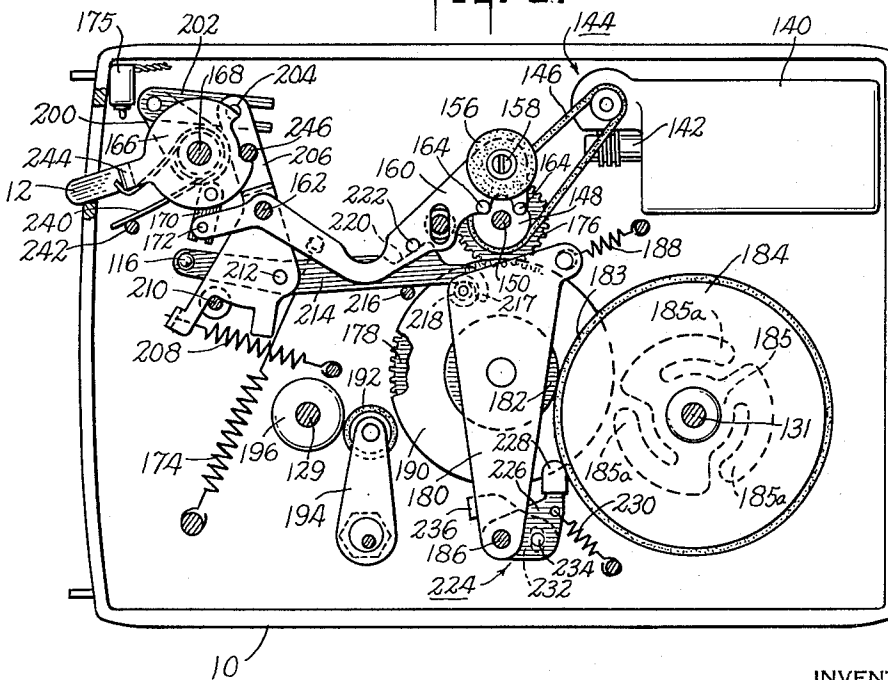
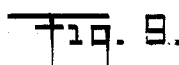
3 Sheets-Sheet 2



INVENTORS
Edward S. Gillette
Ralph H. Sherman, Jr.
BY
Lurtis Morris & Safford
ATTORNEYS

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INVENTORS
Edward S. Gillette
Ralph H. Sherman, Jr.
BY
Curtis Morris & Safford
ATTORNEYS

1

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PORTABLE DICTATION APPARATUS

Edward S. Gillette and Ralph H. Sherman, Jr., Bridgeport, Conn., assignors to Dictaphone Corporation, Bridgeport, Conn., a corporation of New York
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16 Claims. (Cl. 242—55.13)

This invention relates to recording machines. More particularly, this invention concerns recording machines sufficiently small in size and light in weight to be carried easily in one hand, and which include a self-contained source of power for portable operation. Such machines are especially suited for use while travelling, but also find application in a variety of other situations where conventional recording machines are inappropriate.

Although a number of "miniature" recording machine constructions have been proposed heretofore, all of these have had certain disadvantages which limited their usefulness commercially. An effective machine of this general type must meet certain requirements, and yet be compact, light-weight and relatively inexpensive to manufacture. For example, provision must be made for rapid and easy replacement of recorded media with fresh media, and the machine should be designed for substantial recording time between such replacements. Also, the recording media should be in a form such that replacement media may readily be carried, e.g. along with the recording machine, without being subject to damage from ordinary abuse typically encountered during travel. Appropriate controls must, of course, be provided for turning the machine off and on, as well as for playing back portions of previously recorded material, and such controls should be arranged for convenient access and simple operation.

Accordingly, it is an object of the present invention to provide a small-sized recording machine especially adapted for portable operation that is superior to such machines provided heretofore. It is a further object of this invention to provide such a machine that meets the general requirements outlined above, and yet is sufficiently light and compact that it may readily be carried, e.g. in the pocket of a coat. Other objects, advantages, and aspects of this invention will be in part apparent from, and in part pointed out in, the following description of a preferred embodiment thereof considered together with the accompanying drawings, in which:

FIGURE 1 is a perspective view of a recording machine constructed in accordance with the present invention, particularly showing the outer casing and operating controls;

FIGURE 2 is a plan view of the machine of FIGURE 1 with the cover removed;

FIGURE 3 is a plan view of the interior of the cover;

FIGURE 4 is a perspective view of the tape magazine, shown standing in upright position;

FIGURE 5 is a vertical section of the tape magazine taken along line 5—5 of FIGURE 4;

FIGURE 6 is a horizontal section of the tape magazine taken along line 6—6 of FIGURE 5, and also showing the drive hubs which cooperate therewith;

FIGURE 7 is a detail section view, taken along line 7—7 of FIGURE 5, showing the central portion of one of the magazine tape reels held in place on the corresponding drive hub;

FIGURE 8 is a plan view of the recording machine of FIGURE 1 with the tape magazine and protective guide shield removed; and

FIGURE 9 is a sectional view of the recording machine of FIGURE 8, particularly showing the drive and control linkage mechanisms located beneath the main support plate.

Referring now to FIGURE 1, the operating elements of

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the recording machine (to be described hereinbelow in more detail) are contained within an attractive rectangular casing 10 having a length of about 6¼", a width of about 4½", and a depth of about 2". The particular machine described herein is of the type which makes a magnetic sound record on a flat ribbon-like tape of magnetizable material, i.e. it utilizes one form of "linear" recording medium (the term "linear" is used here to designate long, thin media as distinguished from "area" media such as a disc). It is desired to point out, however, that the present invention in its broader aspects is applicable to all types of recording machines using any form of linear recording medium, e.g. wire-like material, etc.

Extending out through the upper side of the case 10 are the operating controls, including an on-off lever 12, a tape movement control lever 14, a recording volume control 16, and a reproducing volume control 18. The tape movement control lever has three positions: "record," "reproduce," and "rewind." A microphone 20 (serving also as a sound receiver when the machine is conditioned for play-back operation) is connected to the machine through a cable 22 having a plug 24 at its other end which is engageable with a corresponding socket in the machine. A removable cover 26 forms one side of the casing 10, and is releasable from the casing by means of a catch lever 28.

Before proceeding with a detailed description of the internal structure of the machine, a brief review of its operation will first be presented: Within the casing 10, conventional means are provided for amplifying the electrical signals developed by the microphone 20 and for recording on the magnetizable tape in accordance with these amplified signals. When the control lever 14 is in "record" position and the on-off lever is moved to "on," the tape is driven past the magnetic recording head by a governor-controlled electric motor powered by two small batteries in the casing; another small battery supplies power for the sound amplifier. When the control lever is moved to "rewind" position, the motor drives the tape in reverse direction at a relatively high speed, and the amplifier circuitry is switched so that no magnetic impressions are placed on the tape. Shifting the control lever to "reproduce" position causes the tape to be driven at normal speed in a forward direction (as in "record"), and the amplifier circuitry is conditioned to deliver amplified electrical signals to the microphone (serving as a receiver) in accordance with the magnetic impressions sensed by the recording head serving as a reproducing head. The volume controls 16 and 18 operate to vary resistances in the amplifier circuitry so as to set the desired volume when in "record" and "reproduce" conditions.

Referring now to FIGURE 2, which is a view looking down into the recording machine with the cover 26 removed, the magnetic tape is contained within a thin, generally rectangular magazine 30 extending substantially the full length of the casing 10 and which may be lifted up out of the casing in a simple manner manually, e.g. by gripping the inset waist portion 32 between the thumb and forefinger. The tape is carried within the magazine on two reels, the centers 34 and 36 of which protrude through corresponding apertures in the flat faces of the magazine. These apertures include slots 38 and 40 to permit a view of the amount of tape on each reel, and these slots in turn are aligned with small windows 42 and 44 (FIGURE 1) formed in the cover 26 so that the user may readily estimate the amount of recording time remaining.

The tape 46 moves horizontally (referring to FIGURE 2) along the upper edge of the magazine 30 in traveling from one reel to the other, and passes by various magnetic recording elements and drive mechanisms located be-

neath a protective guide shield 48 which is secured to the machine by means of a screw 50. This shield is formed along its lower edge with two curved extensions 52 and 54 which serve to assure that the tape 46 is guided into its proper position relative to the recording and drive elements when the magazine is inserted into the casing. The magazine is anchored in position with respect to movement parallel to its flat faces by two conical studs 56 and 58 which extend upwardly from beneath the magazine through corresponding holes in the lower corners of the magazine; one of these holes is circular to precisely position the magazine, and the other is oval-shaped in order to avoid frictional binding due to adverse build-up of manufacturing tolerances.

The cover 26 shown in FIGURE 3 includes along its lower edge a raised lip 60 which is insertable within a corresponding slot 62 (FIGURE 2) formed in the upper side of the machine case 10. The other edge of the cover is held in place by a catch generally indicated at 64 which includes a fixed pawl 66 engageable with an aperture formed in a spring strip 68 on the machine. The catch lever 28 (FIGURE 1) is rotatably mounted upon an elongated pin 70 (FIGURE 3) secured to the cover 26 and carries with it a forked member 72 which, when the catch lever is moved outwardly away from the cover, presses against the spring strip 68 to release it from the pawl 66 and thereby permit the cover to be removed from the casing 10.

In the central portion of the cover 26 there is secured a rectangular spring plate 74 having a flattened end 76 which presses against the central region of the magazine 30 when the cover is properly in place, to hold the magazine securely in position. On each side of this spring plate there is secured to the cover a spring arm 78 and on the ends of these arms are mounted circular nylon pads 80 which engage the centers 34 and 36 of the tape reels in a manner to be explained below.

As shown in FIGURE 4, the magazine 30 comprises two mated shells 30a and 30b which are secured together by five screws 82. These shells comprise identical castings so that the magazine is symmetrical front-to-back. The magnetic recording elements in the machine are so arranged that only half of the width of the tape 46 is recorded on at a time. By virtue of the symmetry of the magazine, after the full length of the tape has been recorded upon (but only half-width), the magazine may be removed and then replaced upside-down in the case to record on the other half of the tape.

Turning now to FIGURE 5, the interior arrangement of the magazine 30 is there shown in detail. Within the magazine is a supply reel 84 and a take-up reel 86. During recording, the tape is pulled at a substantially constant lineal velocity from the supply reel, and the take-up reel is rotated (through a slipping-clutch arrangement shown in FIGURE 9) at a speed sufficiently great to prevent the build-up of any slack in the tape. In its passage from the supply reel to the take-up reel, the tape passes over a series of fixed guide pins 88, 90, 92, 94, 96 and 98 having smooth exteriors; these pins are permanently secured to one of the mated shells 30a or 30b. In the regions where the tape passes over the central pins 92 and 94, a pair of transverse arms 100 and 102 (see also FIGURE 4) are provided to hold the tape in proper position for insertion of the magazine into the casing.

To assure that the tape is held firmly in place when the magazine is outside of the case, an automatic brake structure is provided. This includes (referring now to the upper left-hand corner of FIGURE 5) a leaf-spring arm 104 secured at its lower end to the magazine and provided at its upper end with a felt pad 106 urged against the portion of the tape 46 passing over the guide pin 88. At the right-hand corner of the magazine there is a similar leaf-spring arm 108 with a felt pad 110 urged against the portion of the tape passing over the guide pin 98.

Referring now to FIGURE 2, when the magazine is in-

serted into the casing, a small fixed pin 112 secured to the recording machine proper, extends through an oval slot 114 (see also FIGURES 4 and 5) in the upper right-hand corner of the magazine and engages the spring arm 108 to move it to the right and thereby lift its felt pad 110 out of engagement with the tape 46. This action reduces the driving force required to pull the tape onto the take-up reel 86 during recording. As shown in FIGURE 4, the spring arm 108 is formed with small ears 108a which protrude laterally out through the oval slot 114 at a slight angle with respect to the axis of the pin 112 to insure positive engagement with this pin, the tip of which is pointed.

In the upper left-hand corner of the magazine, a similar small pin 116 extends through an oval slot 118, but when the machine is conditioned for recording this pin is out of engagement with the tipped ears 104a of the corresponding spring arm 104. This pin 116, however, is secured to an element of the control linkage mechanism (to be described) which is so arranged that when the control lever 14 is shifted to its "rewind" position, the pin moves in a left-hand direction to engage the spring arm 104 and lift its felt pad 106 out of engagement with the tape 46 passing over the guide pin 88. This reduces the driving force required when the tape is being rewound at relatively high speed onto the supply reel 84.

Referring now to FIGURE 6, it can be seen that each of the reel centers 34 and 36 includes a ring portion 120 and 122, respectively, having an axial length greater than the interior width of the magazine 30. These rings therefore protrude through the corresponding magazine apertures and the ends thereof are approximately flush with the outer side surfaces of the magazine. The protruding portions serve as flanges to prevent excessive lateral movement of the reels 84 and 86 when the magazine is outside of the casing 10.

Each of these ring portions 120 and 122 includes a central wall 124 and 126 extending transversely across the interior thereof to form a pair of opposed, cylindrical recesses opening towards the outside of the magazine 30. The sides of each recess are formed with a rotary coupling structure comprising a set of spline-like gear teeth engageable by corresponding sets of teeth on a pair of drive hubs 128 and 130 extending through the main support plate 132 in the recording machine proper. The individual teeth in each set are spaced a substantial distance apart peripherally, i.e. in the nature of a conventional gear with every other tooth missing, to lessen the probability of interference when the magazine is inserted in the casing. Also, the hubs are formed with tapered ends 128a and 130a which insure positive engagement with the loosely-held rings 120 and 122 when the magazine is placed in the machine, and are rotatably driven by hub shafts 129 and 131 in accordance with the setting of the machine control levers 12 and 14. The hubs serve not only to supply rotary driving force to the reels, but also to provide bearing surfaces for aligning the reels accurately with respect to the other recording machine elements.

These features are more clearly shown in FIGURE 7 wherein one hub 128 is engaged with the internal teeth of the lower recess of the ring portion 120. The transverse dividing wall 124 is formed on opposite sides thereof with upstanding pins 134a and 134b disposed vertically with respect to the plane of the wall. (Similar pins 136a and 136b are formed on the dividing wall 126 of the other ring 122.) The pin 134b facing the hub 128 engaged with the supply reel 84 extends into a corresponding vertical bore formed in that hub without contacting the bottom of the bore. The tip of the opposing pin 134a is engaged by the nylon pad 80 which is urged against this tip by the spring arm 78 (associated with the cover 26) and serves as a thrust bearing for the rotation of the supply reel.

It will be apparent that such a magazine construction is advantageous particularly in that no precision machining or other expensive techniques are necessary in its

manufacture. For example, the spacing between the rings 120 and 122 and the edges of the corresponding magazine is not a critical dimension because the bearing surfaces for rotation of the reels are in the recording machine proper. Also, this spacing may be relatively wide (as shown) since the hub construction assures proper engagement with the reels even though they are held in only approximate alignment when the magazine is outside of the casing. Thus, the magazine parts may be produced and assembled without applying severe manufacturing tolerances to the dimensions or surface finish thereof. Because each recording machine will normally require a number of tape magazines, this simplification of design is especially important in that the construction costs per magazine unit will be relatively low.

FIGURES 8 and 9 show details of the mechanism for controlling the machine operation and driving the magnetic tape. FIGURE 8 represents a plan view showing the main support plate 132 on which the hubs 128 and 130 are mounted, while FIGURE 9 represents a sectional view of the structure immediately beneath, and secured to, this support plate. In both of these views, the on-off lever 12 is in its "off" position and the control lever 14 is in its "reproduce" position.

Referring now to the upper right-hand corner of FIGURE 9, an electrically-operated motor 140 is provided for driving the tape and the reels in the removable magazine 30 (described above). This motor is powered by small batteries (not shown) contained in the casing 10, and its speed is maintained substantially constant by a governor within the motor housing. The output shaft 142 of this motor is provided with a worm-gear drive assembly, generally indicated at 144, which transmits motion through a resilient endless band 146 to a central drive shaft 148. This shaft carries with it a flywheel (not shown, in order to simplify the presentation) and a capstan 150 extending vertically upwards through the support plate 132. The capstan is partially enclosed within a U-shaped protective housing 152 (FIGURE 8) having a bearing insert 154 for rotatably supporting the upper end of the capstan.

Immediately above the capstan 150 is a pressure roller 156 formed of resilient material and arranged, when the machine is turned on and conditioned for "record" or "reproduce," to move down and press the magnetic tape against the capstan. This roller is rotatably mounted on a shaft 158 secured to the right-hand end of an S-shaped control arm 160 which is pivotally mounted, near its left-hand end, on the support plate 132 by a pin 162. Movement of the control arm 160 and the roller 156 about the pivot pin 162 is produced by operation of either of the control levers 12 or 14 in a manner to be explained.

The lower edge of the right-hand end of the control arm carries two upstanding pins 164, and the tape drops down between these pins and the roller 156 when the magazine 30 is inserted into the casing 10. When the roller moves down to engage the capstan, these pins move by the capstan on either side thereof so as not to interfere with driving of the tape. Before removing the magazine, the roller is shifted up out of engagement with the capstan, and the two pins 164 carry the tape away from the capstan so that there will be no interference with the capstan housing 154 when the tape is lifted out with the magazine.

The on-off lever 12 includes a ring base 166 loosely pivoted about a shaft 168. Pivotally pinned to the periphery of this base is a small yoke 170 the remote end of which is formed with forked arms surrounding a pin 172 secured to the left-hand end of the control arm 160. This yoke is so arranged that, when the lever 12 is in its "off" position (as shown), it holds the end of the control arm depressed, against the tension of a spring 174, with the pressure roller 156 out of engagement with the capstan 150. When the lever 12 is moved up (i.e. to its "on" position), the resulting clockwise rotation of the

base 166 carries the small yoke 170 upwards and permits the control arm to move under spring tension until the roller and capstan are firmly engaged. This upwards movement of the lever 12 also operates a set of switch contacts, diagrammatically indicated at 175, to connect the batteries to the sound amplifier and to the motor 140, and the capstan therefore starts rotating to drive the magnetic tape at constant lineal speed.

During recording or reproducing, it is necessary also to rotate the take-up reel 86 so as to prevent any slack from building up in the tape driven by the capstan, and this is accomplished as follows: The central drive shaft 148 carries with it a pinion 176 which engages a gear wheel 178 rotatably secured to a rockable transfer arm 180. Mounted on and rotatable with this gear wheel is a smaller friction wheel 182 the outer periphery of which is drivably engaged with the resilient ring 183 surrounding a relatively large disc 184. Rotation of this disc is transmitted to the hub shaft 131 through a slipping-clutch arrangement comprising a plate 184 which is fixed to the shaft and formed with spring fingers 185a pressed against the under surface of the disc. Accordingly, when the machine control lever 12 is moved to its "on" position to energize the motor 140, the hub shaft rotates the hub 130 (FIGURE 6) and the take-up reel 86 to eliminate slack in the tape delivered by the capstan 150.

When the machine is conditioned for "rewind," it is necessary to apply the motor drive in a reverse direction to the supply reel 84. This is accomplished as follows: The transfer arm 180 is pivotally secured at its lower end to a pin 186 so that it may be rotated counterclockwise to move the gear wheel 178 to the left (while still maintaining driving engagement with the pinion 176) against the tension of a spring 188 fastened to the top of the transfer arm. A very small movement of the transfer arm brings a large friction wheel 190, which is rotatably mounted with the gear wheel 178, into contact with an idler wheel 192 rotatably mounted on the end of a pivot arm 194, and disengages the friction wheel 182 from the disc 184. The idler wheel transmits rotary movement to a small friction disc 196 secured to the hub shaft 129, to drive the hub 128 (FIGURE 6) and the supply reel 84 in a direction to rewind the magnetic tape back onto the supply reel. It may be noted that the gear train in this instance is arranged to provide a tape speed during rewind that is considerably higher than during recording or reproducing.

This counterclockwise rotation of the transfer arm 180 results from moving the control lever 14 (FIGURE 8) upwards to its "rewind" position, as follows: The control lever is anchored to the vertical shaft 168 to which is fixedly secured (FIGURE 9) a crank arm 200. The remote end of the crank arm is pivotally pinned to a large yoke 202 the forked arms of which embrace a pin 204 secured to the upper end of a bell crank 206 which, like the control arm 160, is pivoted to the support plate 132 by the pin 162. Thus, when the control lever rotates the shaft 168 clockwise, the lower end of the bell crank is shifted to the left against the tension of a spring 208 secured thereto. A stop pin 210 is provided to limit the extent of this movement.

The lower portion of the bell crank 206 is pivotally connected at 212 to a slide 214 which moves therewith and is guided along its lower edge by a pin 216 secured to the support plate 132. The right-hand end of this slide is formed into a hook 217 which extends partly around a stud 218 fastened to the upper left-hand corner of the transfer arm 180. Thus, leftward motion of the slide, in response to shifting the control lever 14 to "rewind" position, rotates the transfer arm 180 about its pivot pin 186 and transfers the driving force of the motor 140 to the supply reel hub shaft 129. In addition, the slide carries at its left-hand end the brake pin 116 which, as described above with reference to FIGURES 2 and 5, extends into the tape magazine 30 to remove the felt pad 106 from the

tape when the machine is conditioned for rewind operation.

The upper edge of the slide 214 is formed, near its right-hand end, with an inclined cam surface 220 engageable with a cam pin 222 secured to the control arm 160. When the slide is shifted to the left (i.e. into its "rewind" position), the control arm is thereby cammed in a counterclockwise direction around the pivot pin 162 to move the pressure roller 156 out of engagement with the capstan 150. Thus, the magnetic tape will be free to move rapidly back onto the supply reel at high speed.

When it is desired to shift the machine from rewind operation to "reproduce" condition, the highspeed rotation of the take-up reel 86 during rewind presents a special problem since it is necessary quickly to reverse the direction of rotation of this reel. This problem is solved by means of a unique brake device, generally indicated at 224 and associated with the lower end of the transfer arm 180. This device includes an offset arm 226 pivotally mounted on the pin 186 and carrying on its remote end a nylon finger 228 which is engaged, when the machine is conditioned for recording or reproducing, with the resilient peripheral surface of the disc 184. A spring 230 lightly urges this arm against the disc, but with the disc rotating in a clockwise direction, the finger 228 develops effectively no restraining frictional force.

The brake device 224 also includes a second offset arm 232 secured by an adjustment screw 234 to the first arm 226 and pivotally mounted on the pin 186. This second arm is formed at its remote end with an upstanding hook member 236 which engages the left-hand edge of the transfer arm 180. When the transfer arm is shifted to the left to condition the machine for rewind operation, it carries the offset arms 226 and 232 with it and thereby lifts the nylon finger 228 away from the disc 184. Accordingly, this disc is free to rotate at a relatively high speed (counterclockwise) while the tape is being rewound onto the supply reel.

If, while the machine is rewinding, the control lever 14 is moved to its "reproduce" position (e.g. to listen back to a portion of previously recorded material), the transfer arm 180 shifts to the right and permits the nylon finger 228 to again engage the disc 184 under tension of the spring 230. Because the disc is rotating counterclockwise at this instant, it will tend to rotate offset arm 232 clockwise about the pivot pin 186 and jam the nylon finger hard against the disc surface. This jamming action almost immediately brakes the disc to a stop. Thereafter, the rotary force imparted to the disc by the friction wheel 182 quickly starts the disc rotating in a clockwise direction to take up the slack of the tape driven by the capstan 150. Once the disc is rotating clockwise, of course, the friction developed by the finger 228 drops essentially to zero since there is then no tendency for this finger to jam against the disc surface.

Referring now to the upper left-hand corner of FIGURE 9, means are provided for interlocking the on-off control lever 12 with the control lever 14 (FIGURE 8) so that the machine will be turned on whenever the control lever is moved to its "rewind" position. This interlock arrangement includes a bias spring 240 wrapped around the shaft 168 with its lower end in engagement with a post 242 secured to the support plate 132, and with its upper end engaged with a bend 244 in the lever arm 12 to urge the arm towards its "on" position. The on-off lever normally is held in its "off" position against this spring urge by the detent action of the small yoke 170 which is pressed upwardly by the control arm 160 under tension of the spring 174. The on-off lever 12 also is provided with a stop pin 246, secured to the support plate 132, which rides in a slotted portion of the ring base 166 to limit its motion.

When the control lever 14 is moved to its "rewind" position, the control arm 160 will be rotated counterclockwise about its pivot pin 162 (as described above)

thereby removing the pressure on the small yoke 170 so that the on-off lever 12 then is free to move to its "on" position under pressure of the bias spring 240. Thus, this interlock arrangement causes the electrical switch contacts 175 to be actuated to connect the batteries to the drive motor 140 whenever the control lever is shifted to "rewind."

Referring now to FIGURES 2 and 8, when the magazine 30 has been inserted into the casing 10 the magnetic tape 46 will extend in a generally horizontal direction between the pressure roller 156 and the capstan housing 152, and will pass by the pole-pieces 259 of a combination magnetic recording and reproducing head 260, of conventional design. During recording or reproducing operations, the tape is held tautly against these pole-pieces in the region thereof between the magazine guide pins 90 and 92 (see also FIGURES 4 and 5), by virtue of the tension produced by the pulling force of the capstan 150 and the restraining force of the brake pad 106.

Secured to the upper edge of the magazine, between the pins 90 and 92 and beneath the tape 46, is a shield strip 261a formed of magnetic material (e.g. Mu Metal) curved to fit the general contours of the magazine. This strip is directly opposite the pole-pieces 259 of the head 260 and serves to shield these pole-pieces from interference due to external magnetic fields when the machine is conditioned for reproducing operation. A similar shield 261b is secured to the magazine between the pins 94 and 96, to accomplish the same function when the magazine is reversed in the casing.

Adjacent the recording and reproducing head 260 there is provided (FIGURE 8) an erase head 262 comprising a pair of permanent magnets enclosed in a plastic housing. This erase head is secured to the end of a crank arm 264, pivotally mounted on the support plate 132 by a pin 266, to permit movement of the erase head towards and away from the tape. The crank arm is urged in a clockwise direction, to press the erase head against the tape, by a wire spring 268 which is wrapped about a stud 270 with its left-hand end bearing against a small pin 272 on the crank arm and its right-hand end bearing against a small pin 274 secured to the support plate.

When the control lever 14 is in its "reproduce" or "rewind" positions, the erase head 262 is held (as shown) away from the magnetic tape by a cam finger 276 on the crank arm which abuts the outer surface of the circular base 278 of the control lever. However, when the control lever is moved to its "record" position, the cam finger 276 drops into a recess 278a formed in this circular base and the erase head 262 moves down to contact the tape passing by. Thus, during recording, the tape is cleared of magnetic impressions immediately preceding its contact with the recording head 260.

Secured to the control lever shaft 168 is a spring arm 280 which presses downwardly against the control lever 14 so that, to condition the machine for recording, the user must lift the control lever upwards in order to avoid interference with the step 282 (FIGURE 1) formed in the slot in the casing through which the lever extends.

Although a specific preferred embodiment of the invention has been set forth in detail, it is desired to emphasize that this is not intended to be exhaustive or necessarily limitative; on the contrary, the showing herein is for the purpose of illustrating one form of the invention and thus to enable others skilled in the art to adapt the invention in such ways as meet the requirements of particular applications, it being understood that various modifications may be made without departing from the scope of the invention as limited by the prior art.

We claim:

1. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in ac-

cordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing, a tape magazine secured to said casing and removable therefrom, a supply reel and a take-up reel rotatably mounted adjacent one another in said magazine, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, drag brake means forming part of said magazine and operable to apply a restraining force to the movement of said tape between said reels, brake control means associated with said casing and including means engageable with said brake means to operate said brake means, a drive mechanism secured to said casing and having motion transmitting means operably coupled to said tape to move said tape between said supply reel and said take-up reel, a tape-movement control lever secured to said casing and operable to control said drive mechanism to change the direction of tape movement between said reels, and means operatively connecting said lever to said brake control means to release said drag brake means upon actuation of said lever.

2. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing, a tape magazine secured to said casing and removable therefrom, a supply reel and a take-up reel rotatably mounted adjacent one another in said magazine, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, a first brake pad near said tape in the region thereof adjacent said take-up reel, first spring means for urging said pad towards said tape, first brake control means secured to said casing to hold said brake pad away from said tape while said magazine is in place and to release said pad to make frictional contact with said tape when said magazine is removed from said casing, a drive mechanism secured to said casing and having motion transmitting means operably coupled to said tape to move said tape between said supply reel and said take-up reel, a tape-movement control lever connected to said drive mechanism for changing the direction of tape movement, a second brake pad adjacent said supply reel, second spring means for urging said second pad towards said tape, second brake control means secured to said casing and operative to shift said second pad away from said tape, and means interconnecting said lever and said second brake control means to shift said second pad away from said tape when said lever is moved to rewind position.

3. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing, a tape magazine secured to said casing and removable therefrom, a supply reel and a take-up reel rotatably mounted adjacent one another in said magazine, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, a drive mechanism secured to said casing and having motion transmitting means operably coupled to said tape to move said tape between said supply reel and said take-up reel, motor means within said casing for actuating said drive mechanism, a tape movement control member coupled to said drive mechanism and shiftable into either of two positions to establish at least two conditions of movement of said tape, a brake element disposed adjacent said tape, and brake control means operable by said control member and including means connected to said brake means for shifting said brake means into contact with said tape

when one of said conditions has been established and to prevent such contact when the other of said conditions has been established.

4. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape at substantially constant lineal speed past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, a replaceable magazine for holding the magnetizable tape comprising, in combination, a rigid housing comprising two parallel side walls each formed with a pair of apertures, said pairs of apertures being opposite one another, a supply reel and a take-up reel rotatably mounted within said housing, each of said reels having an axially aligned center portion which protrudes into said apertures, a magnetizable tape wound on said reels, one portion of said tape extending between said reels in a position open to the outside of said housing to permit contact between said one tape portion and the magnetic recording head of said recording equipment, and rotary drive structure formed on both sides of said reel center portions whereby said structure is accessible through either one of said magazine side walls to permit contact between said structure and said drive means in said recording equipment.

5. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing, a tape magazine secured to said casing and removable therefrom, a supply reel and a take-up reel rotatably mounted adjacent one another in said magazine, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, a drive mechanism secured to said casing and operably coupled to said tape to move said tape from said supply reel to said take-up reel, said drive mechanism including a pair of shafts each drivably engaged with one of said reels, motor means within said casing for actuating said drive mechanism, a friction wheel member operably coupled to said motor to be rotated thereby, a pivotally mounted transfer arm located between said shafts and carrying said friction wheel member, said transfer arm being rockable on its pivot mounting to either of two positions to transmit rotary motion from said friction wheel member to either of said shafts, and a tape movement control element operatively connected to said transfer arm to rock said arm between said two positions whereby to condition said machine for forward or reverse tape movement.

6. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing having a supply reel and a take-up reel rotatably mounted adjacent one another, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, a drive mechanism secured to said casing and including a drivable capstan and a freely-rotatable pressure roller engageable therewith, motor means within said casing for actuating said drive mechanism, linkage means mounting said pressure roller for movement towards and away from said capstan, on-off control means for activating said motor means, tape-movement control means for conditioning said drive mechanism for either recording or rewinding operation, said linkage means being operatively coupled to said on-off control means and including means coupled to said pressure roller to move said pressure roller away from said capstan whenever

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said on-off control means is shifted to "off" position and coupling means interconnecting said linkage means and said tape-movement control means, said coupling means being operable to shift said pressure roller away from said capstan whenever said tape-movement control means is shifted to rewind position.

7. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing having a supply reel and a take-up reel rotatably mounted adjacent one another, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, a drive mechanism including a capstan secured to said casing, a rotatable pressure roller engageable with said capstan to press said tape portion thereagainst and thereby to move said tape when said drive mechanism is actuated, motor means within said casing for actuating said drive mechanism, an on-off lever for controlling the activation of said motor means, a pivotally-mounted control arm carrying said roller for movement towards and away from said capstan, drive means secured to said control arm and a yoke pivotally mounted on said on-off lever and having a pair of forked arms engageable with said control arm drive means, said forked arms being operable to shift said control arm in a direction to move said roller away from said capstan whenever said lever is moved to its "off" position.

8. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape at substantially constant lineal speed past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, a replaceable magazine for holding the magnetizable tape comprising, in combination, a thin, rigid box-like housing of generally rectangular shape, said housing being formed of a pair of substantially identical mating shells the side walls of which are parallel, a supply reel and a take-up reel rotatably mounted within said housing at opposite ends thereof, a magnetizable tape wound on said reels, one portion of said tape extending between said reels through a path having a substantial length thereof passing outside said housing to permit contact between said tape portion and the magnetic recording head of said recording equipment, a first spring arm secured to said magazine and carrying a friction pad urged against said tape in the region thereof adjacent said supply reel, a second spring arm secured to said magazine and carrying a friction pad urged against said tape in the region thereof adjacent said take-up reel, whereby said one tape portion is held tautly in place, the side walls of said magazine shells being apertured opposite said first and second spring arms to permit cooperating elements on said recording equipment to pass through either of said walls and release said friction pads from contact with said tape in accordance with selected operating conditions, and rotary drive structure associated with said reels having at least a part thereof accessible from outside said housing to permit contact between said structure and said drive means in said recording equipment.

9. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone, apparatus comprising, in combination, a casing, a tape magazine secured to said casing and removable therefrom, said magazine including a pair of opposing side walls that are identical in construction, a supply reel and a take-up

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reel rotatably mounted adjacent one another in said magazine and parallel to said side walls, a strip of magnetizable tape wound on both of said reels with a portion thereof extending between said reels, both sides of each of said reels being formed with identical drive elements, a drive mechanism secured to said casing for moving said tape from said supply reel to said take-up reel, said drive mechanism including a pair of rotatable shafts engaged respectively with the drive elements of said reels through apertures in one of said side walls to rotate said reels, whereby said magazine may be removed and replaced in said casing in reverse position such that said shafts engage said reel drive elements through the other of said side walls.

10. For portable recording and reproducing equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving a magnetizable tape at substantially constant lineal speed past a magnetic reproducing head to develop electrical signals in accordance with magnetic impressions on said tape, a replaceable magazine for holding the magnetizable tape comprising, in combination, a rigid housing, a supply reel and a take-up reel rotatably mounted within said housing, a magnetizable tape wound on said reels, one portion of said tape extending between said reels in a position accessible from outside said housing to permit contact between one side of said portion and the magnetic reproducing head of said recording and reproducing equipment, and a shield element consisting of a strip of magnetic material secured to said magazine immediately adjacent and extending generally parallel to said tape portion on the side thereof opposite from said one side, said strip of magnetic material being positioned between said tape portion and one of said reels to protect said reproducing head from external interference during reproducing operation of said equipment.

11. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving linear recording media past a recording head to form impressions on the media in accordance with sound signals developed by a microphone, a replaceable magazine for holding the record media comprising, in combination, a thin rigid housing having a pair of parallel side walls, each of said side walls being provided with first and second apertures, a supply reel and a take-up reel in said housing, said reels having central hubs protruding through said first and second apertures respectively and loosely fitted therein, whereby said reels are rotatably mounted in said side walls, a strip of linear recording media wound on said reels, one portion of said media extending between said reels in a position accessible from outside said housing to permit contact between said portion and the recording head of said recording equipment, and rotary drive structure associated with at least one of said reel hubs to permit contact between said structure and the drive means in said recording equipment.

12. For portable recording equipment of the type adapted to be hand-carried and having a self-contained source of operating power, and wherein means are provided for driving linear recording media past a recording head to form impressions on the media in accordance with sound signals developed by a microphone, a replaceable magazine for holding the record media comprising, in combination, a thin rigid housing of generally rectangular shape and having a pair of flat parallel side walls, each of said side walls being provided with a pair of circular holes defining first and seconds sets of oppositely-located mounting apertures, a supply reel and a take-up reel in said housing, said reels having circular hubs extending into said first and second sets of apertures respectively and loosely fitted therein, and a strip of linear recording media wound on said reels, one portion of said media extending

between said reels in a position accessible from outside said housing to permit contact between said portion and the recording head of said recording equipment, all of said hubs being formed with internal gear means arranged to engage the drive means in said recording equipment, whereby said magazine may be operatively engaged with said drive means from either of said sides.

13. For use with recording equipment of the type wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone; a replaceable magazine for holding the magnetizable tape comprising, in combination: a rigid housing having a pair of parallel side walls of generally rectangular shape, a supply reel and a take-up reel rotatably mounted within said housing at opposite ends of said housing, a magnetizable tape wound on said reels, a portion of said tape extending between said reels in a position accessible from outside said housing to permit contact between said tape portion and the magnetic recording head of said recording equipment, a resilient spring arm mounted within said housing, and a brake pad secured to said spring arm and directly contacting said tape at one end of said tape portion, said spring arm normally urging said brake pad against said tape to apply a tensioning force thereto, at least one of said magazine side walls being formed with a hole opposite said spring arm to permit a corresponding element of said recording equipment to engage said spring arm for moving said brake pad away from contact with said tape during a predetermined operating condition of said recording equipment.

14. For use with recording equipment of the type wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a microphone; apparatus comprising, in combination: a casing having a magazine receiving region, a replaceable magazine for holding the magnetizable tape and including a pair of parallel side walls of generally rectangular shape, said magazine being secured to said casing with one of said side walls lying parallel to and adjacent said magazine receiving region, a supply reel and a take-up reel rotatably mounted within said magazine at opposite ends thereof; a magnetizable tape wound on said reels, a portion of said tape extending between said reels in a position accessible from outside said magazine to permit contact between said tape portion and the magnetic recording head of said recording equipment, first and second spring arms mounted within said magazine adjacent said supply and take-up reels respectively, first and second brake pads secured to said spring arms respectively, said spring arms urging said brake pads into direct contact with the corresponding ends of said tape portion, both of said magazine side walls being formed with holes symmetrically located opposite said spring arms respectively, and brake control elements forming part of said recording equipment and extending out from said magazine receiving region into the holes formed in said one magazine side wall, said brake control elements being engaged with said spring arms to permit said arms to be shifted for moving said brake pads out of contact with said tape portion, and a drive mechanism secured to said casing, said drive mechanism including a pair of rotary drive devices extending out from said magazine receiving region and engaged with said reels respectively.

15. For recording equipment of the type wherein means are provided for driving a magnetizable tape past a magnetic recording head to form impressions on the tape in accordance with sound signals developed by a micro-

phone, a replaceable magazine for holding the magnetizable tape comprising, in combination, a rigid housing of generally rectangular shape the long edges of which are provided with opposed recesses in the waist section thereof to form a finger-grip for manually holding the magazine, one of said long edges also being formed with apertures located on opposite sides of said waist section, a supply reel and a take-up reel rotatably mounted within said housing on opposite sides of said waist section, and a magnetizable tape wound on said reels, one portion of said tape extending between said reels and through said apertures in said one long edge of said housing, said tape portion having a part thereof that is fully outside of said housing and that is positioned in bridging relationship across the corresponding one of said recesses whereby to permit contact outside of said housing between said tape part and the magnetic recording head of said recording equipment.

16. For recording equipment of the type wherein a magnetizable flexible tape is driven past a magnetic recording head to form impressions on the tape in accordance with sound signals fed thereto; the combination comprising a recording machine casing provided on one side thereof with a magazine receiving surface, first and second rotary drive means mounted within said casing with the axes thereof perpendicular to said magazine receiving surface and extending therethrough, a generally rectangular magazine for holding said magnetizable tape and having a pair of parallel side walls, one of said side walls lying parallel to and closely adjacent said magazine receiving surface, a supply reel and a take-up reel rotatably mounted within said magazine at opposite ends thereof and engaged with said first and second rotary drive means respectively, a magnetizable tape wound on said two reels with a portion of the tape extending between said reels along a path that is at least substantially straight and approximately parallel to one long edge of said rectangular magazine, said one edge being formed with a recess extending completely through said magazine from one side thereof to the other side, said one edge further being formed with apertures at opposite ends of said recess respectively, said tape portion having at least a part thereof extending through said apertures and bridged across said recess, said tape part extending for a substantial distance completely external to said magazine, a magnetic recording head mounted in said recording machine casing and positioned to permit engagement thereof with said external tape part, and first and second roller means mounted in said machine casing and pressed together on opposite sides of said external tape part for driving said tape past said recording head, at least one of said roller means being movable away from said tape part to release said tape so that said magazine may be lifted out of said machine casing in a direction perpendicular to said magazine receiving surface.

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