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Totino

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[54] **ENDLESS LOOP TAPE-RECORDING HAVING SINGLE CAPSTAN BI-DIRECTIONAL DRIVE AND TAPE RUN ABOVE RECORDING STATION**

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[52] **U.S. Cl.** ..... **360/62,** 179/100.1 DR, 226/51, 360/90, 360/93

[51] **Int. Cl.** **G11b 15/29,** G11b 23/12

[58] **Field of Search** 179/100.2 R, 100.2 Z, 100.2 S, 179/100.1 DR; 226/49, 51, 50; 274/4 D

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[57] **ABSTRACT**

An endless loop tape-record machine comprises dictating and transcribing stations and respective tape storage bins therebelow placed end-to-end. The tape is drawn from the far end of the transcriber's bin across the two stations and back into the far end of the dictator's bin. Excess tape is stored folded in loops back and forth on itself in the transcriber's bin as the transcriber catches up with the dictator, and in the dictator's bin as the dictator runs ahead more and more from the transcriber. Each station has a single motor drive with a friction-wheel train engaged by the weight of the motor and shiftable by drive and scan solenoids to drive the tape at either normal forward speed or at scan speeds in either direction. A suspensory band at the bottom of the transcriber's bin is attached at one end to a yieldable support for operating a switch by the weight of the tape to give a first preliminary warning to the dictator as he comes to an intermediate point along the tape — say 4 or 5 minutes of using up the available tape, and for giving a near-end warning as he approaches the end of the available tape.

8 Claims, 6 Drawing Figures

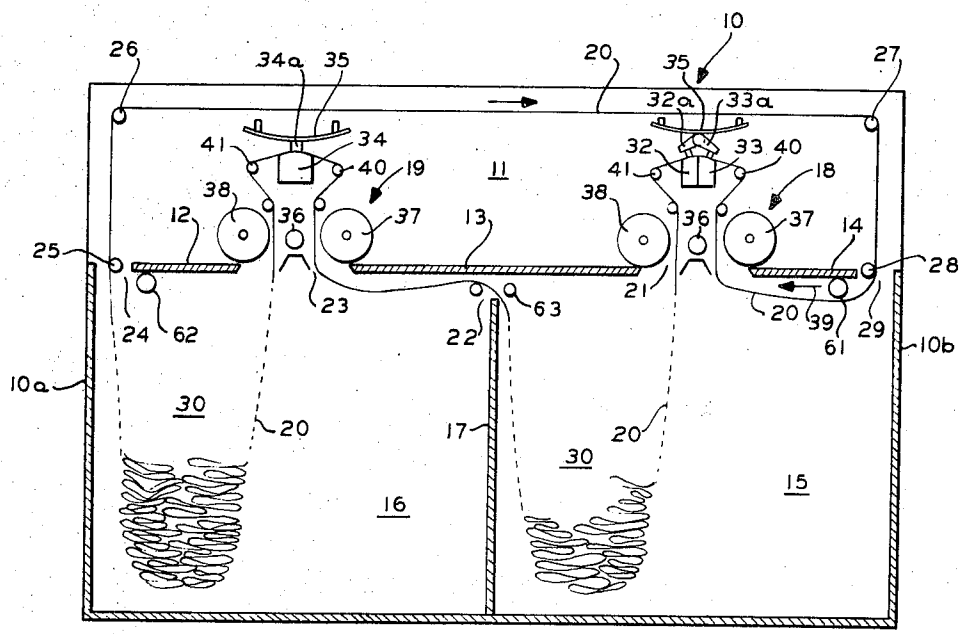


FIG. 1

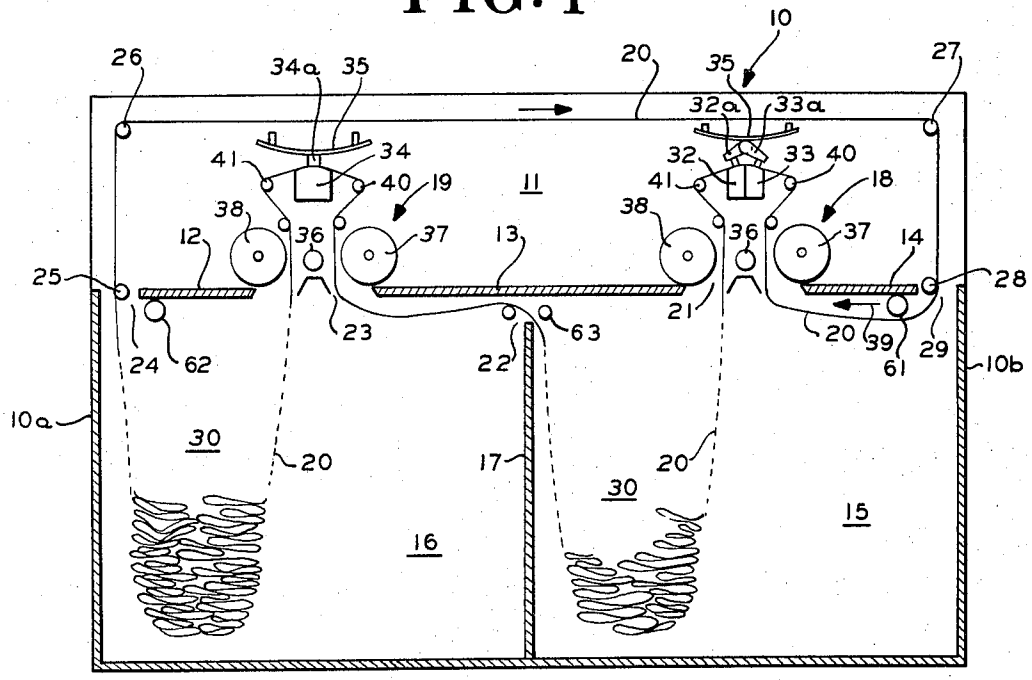

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FIG. 2

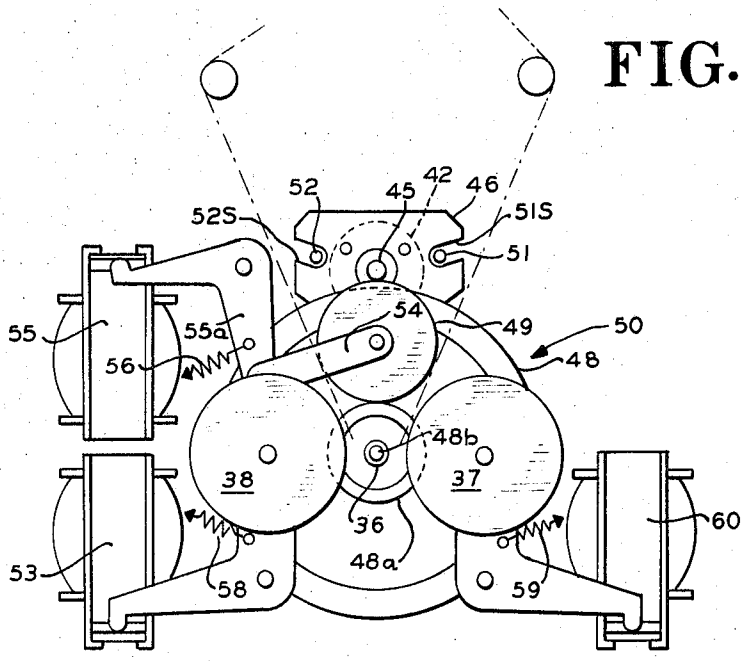

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FIG. 3

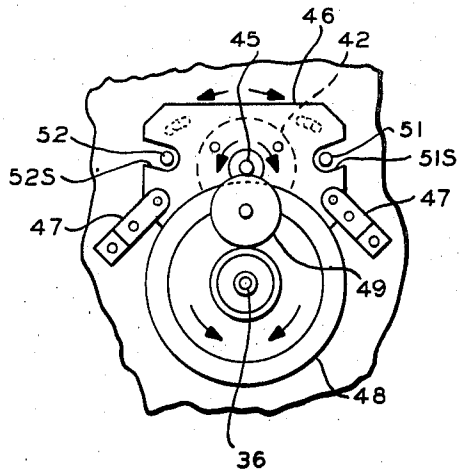


FIG. 4

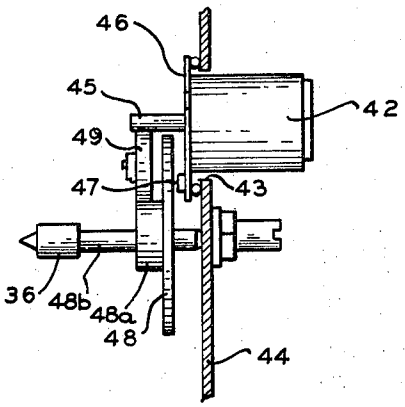


FIG. 5

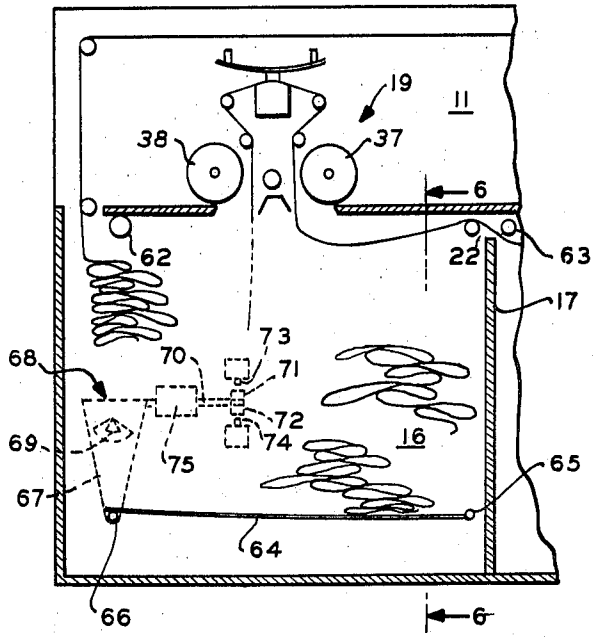
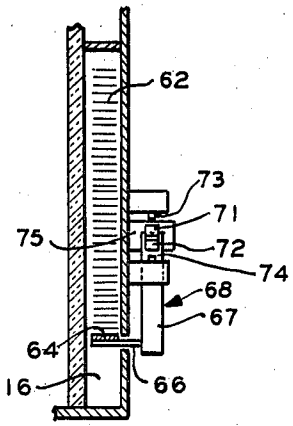


FIG. 6



ENDLESS LOOP TAPE-RECORDING HAVING SINGLE CAPSTAN BI-DIRECTIONAL DRIVE AND TAPE RUN ABOVE RECORDING STATION

An object of the invention is to provide a simplified endless-loop tape recording and reproducing machine for recording and transcribing dictation.

Another object is to provide such machine having an economical drive system utilizing a single motor at each station with a single friction drive train for selectively advancing the tape at normal speed or for advancing and backfeeding the tape at a scan speed.

Another object is to provide such simplified drive system wherein the weight of the drive motor is utilized to provide driving pressure between the friction wheels of the drive train.

Another object is to provide such a machine wherein a tape storage bin is provided for each station with the station centrally located above the bin to allow for storage of tape between the station and either end of the bin.

Another object is to provide such a machine wherein the drive capstan and forward and back feed pinch rollers of the drive system constitute a wall portion of the respective bins.

Another object is to provide such a machine wherein the bins are located end-to-end with passage of the tape through the inter wall and from the outer end of the transcriber's bin across the top of the stations back to the outer end of the dictator's bin.

Another object is to provide such a machine wherein intermediate-end and near-end signals are given to the dictator according to the weight of the tape in the transcriber's bin.

Another object is to provide a suspensory strap or tape across the bottom of the transcriber's bin having attachment at one end to an adjustably biased switch for controlling the dictator's warning means.

These and other objects and features of the invention will be apparent from the following description and the appended claims.

In the description of my invention, reference is had to the accompanying drawings, of which:

FIG. 1 is a front elevational view of an endless loop tape-record machine according to the invention with the front panel cut away to show the internal mechanism;

FIG. 2 is a front view of the drive mechanism for one of the stations of the machine;

FIG. 3 is a fractional view of one the station drive mechanisms illustrating the mounting of the drive motor;

FIG. 4 is a side view of the mechanism shown in FIG. 3;

FIG. 5 is a front view of the transcriber's station and associated storage bin with the front panel removed showing a dictator's warning-control mechanism responsive to the weight of the tape in the transcriber's bin; and

FIG. 6 is a vertical section on line 6—6 of FIG. 5.

The present endless-loop tape-record machine has an oblong cabinet **10** with a top compartment **11** separated by horizontal coplanar partition walls **12, 13** and **14** from the main lower portion of the cabinet divided by a vertical partition wall **17** to form end-to-end dictator's and transcriber's tape storage bins **15** and **16.** The top compartment **11** houses a dictator's operating

mechanism **18,** otherwise referred to as a dictator's station, centrally located above the dictator's storage bin **15** and a transcriber's operating mechanism **19,** otherwise referred to as a transcriber's station, centrally above the transcriber's storage bin **16.** A tape **20** with a magnetic coating on one side is led from the storage bin **15** upwardly into and from the dictator's station **18** via an opening **21** between partition walls **14** and **13,** then from the bin **15** to the bin **16** via an opening **22** between the horizontal partition wall **13** and the vertical partition wall **17,** next from the bin **16** into and from the transcriber's station **19** via an opening **23** between the horizontal partition walls **13** and **12,** then upwardly from the bin **16** via an opening **24** between the horizontal partition wall **12** and end wall **10***a* of the cabinet **10** into the top compartment **11.** By means of guide rollers **25, 26, 27** and **28** at the four corners of the top compartment the tape **20** is led over and across the stations **19** and **18** and then via an opening **29** between the horizontal partition wall **14** and end wall **10**b of the cabinet back into the storage bin **15** to complete its entire loop. The overall length of the tape is typically very long, say 1,000 ft., with the excess of the tape being stored in folds looped back and forth on itself in one or the other, or both, of the storage bins. As will appear, there will be operating conditions wherein there will be an excess of tape between the entrance opening **29** and the dictator's station **18** or between the dictator's station and the exit opening **22** in either case of which the excess tape will assume a loose mass **30** of multitudinous folds in the dictator's bin. Likewise, there will occur conditions in which a mass of excess tape will accumulate between the entrance opening **22** and the transcriber's station **19** and/or between the transcriber's station and the exit opening **24** in either case in which it will form a loose mass **30** of multitudinous folds **31** in the bin **16.** Further, there will be conditions wherein an excess of tape will occur between a station and both the entrance and exit ends of the associated bin causing two separate loose masses of tape to accumulate in the respective bin. A feature of the invention which simplifies the overall construction of the machine is in providing the return loop of the tape back through the top cabinet **11** from the transcriber's bin **16** to the dictator's bin **15.**

The dictator's station **18** has an upper centrally located record-reproduce head **32** and a reproduce head **33,** and the transcriber's station has a reproduce head **34** across each of which the tape is drawn as it passes through these stations. A pair of pressure pads **32***a* and **33***a* at the dictator's station and a pressure pad **34***a* at the transcriber's station each under pressure of a spring **35** maintains the tape in intimate contact with the gaps of these heads. Directly below the respective heads of the stations is a reversible drive capstan **36,** and at opposite sides thereof are forward and reverse pinch rollers **37** and **38.** When the capstan is driven counterclockwise and the pinch roller **38** is engaged the tape is drawn into the respective station and across the respective head as in the direction of arrow **39** from the bin **15,** with the tape passing from the bin between the right side of the capstan **36** and the pinch roller **37** now disengaged, then across guide pin **40** the respective head and guide pin **41,** and next downwardly between the left side of the capstan **36** and the pinch roller **38** now engaged. When the dictator wants to listen back to a portion of previously recorded tape the drive of the

capstan is reversed, the pinch roller **38** is disengaged and the pinch roller **37** is engaged. Since the drive mechanisms of the two stations may be identical corresponding parts of the drive mechanisms are given the same reference characters.

As shown by the detailed views in FIGS. **2, 3** and **4,** each drive mechanism comprises a reversible drive motor **42** having a floating mounting wherein the motor extends horizontally through a clearance opening **43** in a vertical frame plate **44** and has a drive spindle **45** at one end and a flange plate **46** at the same end abutting against the rim of the opening **43** at the side of the frame plate facing the drive end of the motor. Two retainer bars **47** secured to the frame plate at the bottom of the opening **43** bear against the lower portion of the flange plate **46** to retain the motor slidably in a vertical plane against the frame plate, leaving the weight of the motor supported by the engagement of the drive spindle **45** against one or another wheel **48** or **49** of a friction drive train **50.** Two studs **51** and **52** on the frame plate extend through clearance slots **51s** and **52s** in the flange plate **46** allowing the motor to turn bodily to a slight extend in one direction or the other as the direction of the motor is reversed. As the motor is shifted against one or the other of the studs **51** and **52** that stud becomes the fulcrum at one side or the other of a vertical plane through the drive spindle to provide the necessary traction to drive the friction train.

The friction wheel is part of a compound friction roller having a smaller concentric wheel **48*a*** and a still smaller wheel or capstan **36** (before described) on a common shaft **48*b*** journaled to the frame **44** (FIG. **4**). When the drive spindle engages the whel **48** and the forward pinch roller **38** is engaged by solenoid **53** the capstan is driven at a speed to advance the tape at a normal recording rate. Any desired variation in the speed of the tape is accomplished by varying the voltage applied to the d. c. motor **42.**

The friction wheel **49** is an intermediate one of the friction train **50** journaled to a link **54** which is in turn pivoted to an armature **55*a*** of a solenoid **55.** When the solenoid is not energized the wheel **49** is disengaged from the train by a spring **56** allowing the drive spindle **45** to engage the wheel **48** as before described.

However, when the solenoid **55** is energized the intermediate wheel **49** is interposed between the drive spindle **45** and the wheel **51** raising the motor spindle slightly to disengage it from the wheel **48.** The coupling now obtained between the drive spindle **45** and the capstan **36** is at an increased ratio by the ratio of the diameter of the wheel **48** to that of the concentric wheel **48*a*** to drive the capstan at a scan speed. Any further described increase in the scan speed is accomplished by increasing the voltage applied to the d. c. motor **42.** When the forward pinch roller **38** is engaged simultaneously by activation of solenoid **53** the tape is advanced at the scan speed. When solenoid **53** is deenergized pinch roller **38** is disengaged by spring **58** and a pinch roller **37** — normally held disengaged by spring **59** — is simultaneously engaged by solenoid **60** to backfeed the tape at scan speed. In summary, when solemoid **53** is energized and solenoids **55** and **60** deenergized, the tape is advanced at normal speed; when both solenoids **55** and **53** are engaged the tape is advanced at scan speed; and when both solenoids **55** and **60** are energized the tape is backfed at scan speed.

As the dictator proceeds dictating, the tape is drawn taut from the transcriber's bin **16** via the overhead path across the transcriber's station **19** and dictator's station **18** and around the guide roller **28** direct to the pinch roller **37** as shown in FIG. **1.** The taut run of the tape from the guide roller **28** to the pinch roller **37** actuates a memory device **61** located just past the guide roller **28.** The tape from the dictator's station then accumulates in the dictator's bin **15** between the forward pinch roller **38** and the guide roller **22.**

The instant the dictator backspaces the tape to listen back to a prior portion of his recording he begins drawing tape from the mass of the tape in the bin **15** between the pinch roller **38** and guide roller **22** and releases the tension on the run of the tape between the pinch roller **37** and the guide roller **28** to release the memory device **61** the effect of which is to mark the point of farthest advance of the recording along the tape. As soon as the dictator returns to this point of farthest advance and begins to draw a further tape from the transcriber's bin the memory device is again actuated to give a suitable signal and to shift the machine back into recording condition as are well known in the art.

If the dictator continues dictating without the transcriber at the same time continuing to reproduce the recorded dictation, he will eventually use up all of the available tape in the transcriber's bin causing the tape to be drawn taut against a dictator device **62** located between the transcriber's forward pinch roller **38** and the guide roller **25** the effect of which can be utilized to give a signal to the dictator and transcriber that this condition has occurred.

If the transcriber begins reproducing the tape at this point, the device **62** is immediately released to signal the dictator that further tape is now available for dictation. As the transcriber runs ahead of the dictator the tape fed from the transcriber's station will accumulate in the bin **16** between the transcriber's pinch roller **38** and the guide roller **25.** If the transcriber reproduces all of the tape available from the dictator's bin the tape will be drawn taut against a transcriber's device **63** to operate the same. This device **63** can be utilized to signal the transcriber that no further tape is available for transcription and also to apprise the dictator of this condition.

If at any time the transcriber backspaces the tape, the same will be drawn from the accumulated mass in the bin **16** between the transcriber's forward pinch roller **38** and the guide roller **25** and will begin to accumulate another mass in the bin **16** between the transcriber's pinch roller **37** and guide roller **22.** Such backspacing could be continued until the tape is drawn taut from the transcriber's station to the dictator's station at which time the dictator's device **62** would be again operated to signal the transcriber and dictator and to stop the reverse speed of the tape at the transcriber's station.

A preliminary signal and a near-end signal are given to the dictator as the dictator approaches and then reaches the near-end of the tape available for dictation. The signalling apparatus is controlled by a device responsive to the weight of the tape in the transcriber's bin **16.** As shown in FIGS. **5** and **6,** a flexible horizontal strap **64** at the bottom of the transcriber's bin **16** is suspended at one end from a stationary pin **65** and at the other end by a movable pin **66** staked to a depending arm **67** of a bell crank lever **68** pivoted at **69** to a side

wall of the bin 16. A second horizontal arm 70 of this lever carries a pair of switch contacts 71 and 72 operable between adjustable contacts 73 and 74. An adjustable weight 75 on the arm 70 provides a bias which normally holds the strap 64 in a nearly taut condition and the contacts 72 in engagement with the contacts 74. When a substantial amount of tape is in the bin 16 the weight thereof on the strap 64 actuates the switch lever 68 in a counterclockwise direction to hold the contact 71 in engagement with the contact 73. As the tape is used by the dictator to a point where an intermediate-end condition is reached — say a condition wherein the dictator has only four or five minutes of tape available for recording — the contacts 71–73 are broken to release a relay to close a preliminary signal circuit. As the dictator continues to use the tape to within a minute or less of the end of the tape available, the contacts 72–74 are closed to actuate a relay to close a near-end signalling circuit. By adjustment of the weight 75 along the arm 70 the points whereat these intermediate-end and near-end signals are started can be varied to suit the needs of the dictator.

The embodiment of my invention herein particularly shown and described is intended to be illustrative and not necessarily limitative of my invention since the same is subject to changes and modifications without departure from the scope of my invention, which I endeavor to express according to the following claims.

I claim:

1. In an endless loop tape-recording and/or transcribing machine: the combination of a bin means for storing said tape in loops folded back and forth on itself, a recording and/or transcribing station above said bin means including a recording and/or transcribing head, means guiding a run of said tape between opposite ends of said bin means above said station, and a reversible drive means included in said station for drawing the tape across said head from either end of said run at normal or scan speeds and then feeding the tape from said station into the bin means with the tape being tautened from the other end of the bin means throughout said tape run to the input of said drive means, said drive mechanism including a reversible drive capstan above said bin means driven selectively at normal and scan speeds, pinch rollers at opposite sides of said capstan, means guiding the tape from either end of said tape run to between one side of said capstan and respective pinch roller then across said head and back betweeen the other side of said capstan and respective pinch roller to said bin means, and means for selectively engaging said pinch rollers with said capstan and for simultaneously setting the drive of said capstan at normal and scan speeds.

2. The tape recording and/or transcribing machine set forth in claim 1 wherein said bin means includes two storage bins positioned end-to-end and two of said stations each with said reversible drive mechanism and with means guiding said top run of the tape from the outer end of one bin above both of said stations and back into the outer end of the other bin with feed of the tape directly from one bin to the other.

3. The tape recording and/or transcribing machine set forth in claim 2 wherein one of said stations is adapted primarily to serve as a recording station and the other primarily as a transcribing station, including a dictator's control means in the bin below the transcriber's station between the drive mechanism of the transcriber's station and the outer end of the transcriber's bin for giving to give a warning signal responsive to a continued forward drive of the tape from the recording station resulting in a tautening of the tape when all of the available tape has been drawn from the transcriber's bin.

4. The tape recording and/or transcribing machine set forth in claim 2 wherein one of said stations is adapted primarily to serve as a recording station and the other primarily as a transcribing station, including a memory means held operated during recording by the tautening of said top run of the tape from said transcriber's bin to said recorder's station and released by the slackening of said top run of the tape upon the tape being back-fed at the recorder's station for registering the prior point of farthest advance along the tape.

5. The tape recording and/or transcribing machine set forth in claim 2 wherein one of said stations is adapted primarily to serve as a recording station and the other primarily as a transcribing sation, including a control means between said recording and transcribing stations operated by a tautening of the tape between said stations for signalling when all stored tape between said stations has been either transcribed or has been back-fed through said recording station.

6. The tape recording and/or transcribing machine set forth in claim 1, including a flexible strap having end supports for holding the strap horizontally across the bottom of said bin means, one of the end supports for said strap having a yieldable mounting, and control means for said machine responsive to the position of said yieldable end support and operated by the weight of the tape in said bin on said strap upon said weight reaching a preset value for signalling when the recorder reaches predetermined intermediate and near-end points along the available tape.

7. The tape recording and/or transcribing machine set forth in claim 6 wherein said control means includes a single-pole double-throw switch biased in one direction and held in its other position by the weight of the tape in the transcriber's bin, said bias being set to cause the switch to break with its other contact when the recorder reaches said intermediate point in the amount of available tape, and wherein the switch makes with its first contact when the recorder reaches said near-end point in the amount of available tape.

8. The tape recording and/or transcribing machine set forth in claim 7 including adjustable means for varying the tension on said flexible strap to shift said intermediate-end and near-end points of said available tape.

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