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Kral et al.

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[54] **MAGNETIC CARD READOUT MACHINE AND CARDS THEREFOR**

[75] Inventors: **Fred Kral,** Lake Villa; **Robert L. Powers, Jr.,** Palatine, both of Ill.

[73] Assignee: **Bell & Howell Company,** Chicago, Ill.

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[52] **U.S. Cl.** ..... **360/73,** 35/35 C, 360/88, 360/131

[51] **Int. Cl.** ... **G11b 5/80,** G11b 15/06, G11b 15/46

[58] **Field of Search** ..... 179/100.2 CA, 100.2 MD, 179/100.2 R; 340/174.1 F, 174.1 C, 174.1 R, 149 A; 35/35 C; 235/61.11 D

[56] **References Cited**

UNITED STATES PATENTS

2,254,931	9/1941	Bryce	340/174.1 C
2,722,676	11/1955	Begun	340/174.1 R
2,849,542	8/1958	MacChesney	179/100.2 R
2,910,669	10/1959	Brand	340/174.1 R
2,918,656	12/1959	Nolde et al.	340/174.1 C
3,292,171	12/1966	Wilson	340/174.1 R
3,488,867	1/1970	Lyon et al.	35/35 C

Primary Examiner—Alfred H. Eddleman
Attorney, Agent, or Firm—John E. Peele, Jr.

[57] **ABSTRACT**

Disclosed is a novel combination of a plural speed card readout machine and cards for use therewith. The new cards each have a known magnetic media stripe and a notched leading edge operatively associated with switch means on the machine. The machine accepts the card along with prior art cards having straight leading edges and transports the cards at different pre-set rates of speed depending on the rate at which the card was transported when recorded. The notched leading edge of the new card actuates switches of a control circuit of the transport machine in different sequences so that the machine will transport cards with and without the notched edge at different pre-set rates.

12 Claims, 4 Drawing Figures

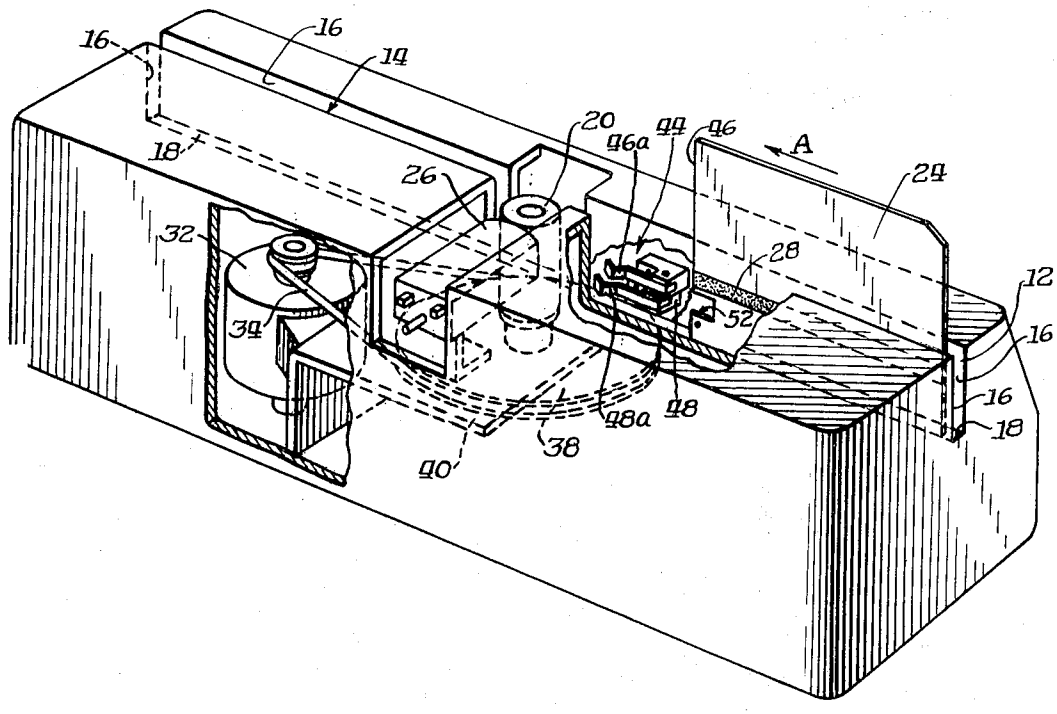
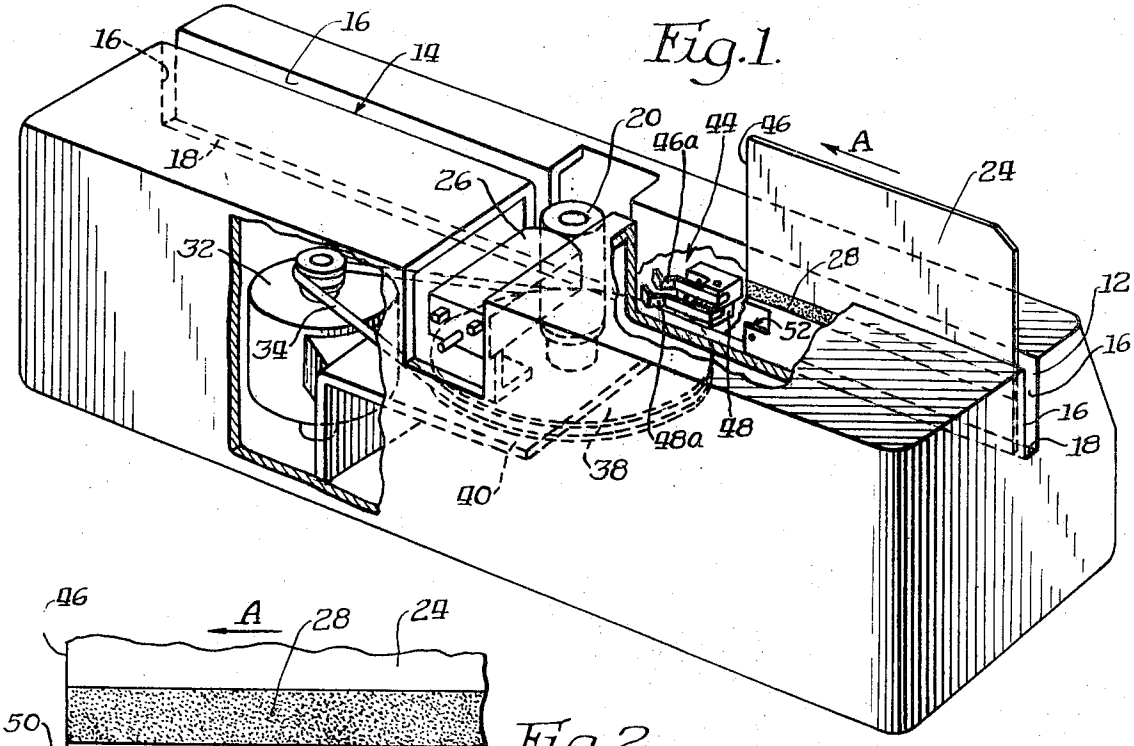


Fig. 1.



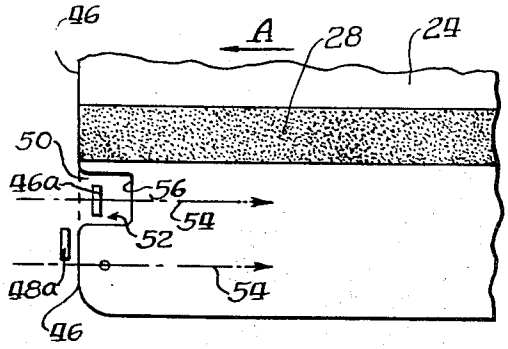


Fig. 2.

Fig. 3.

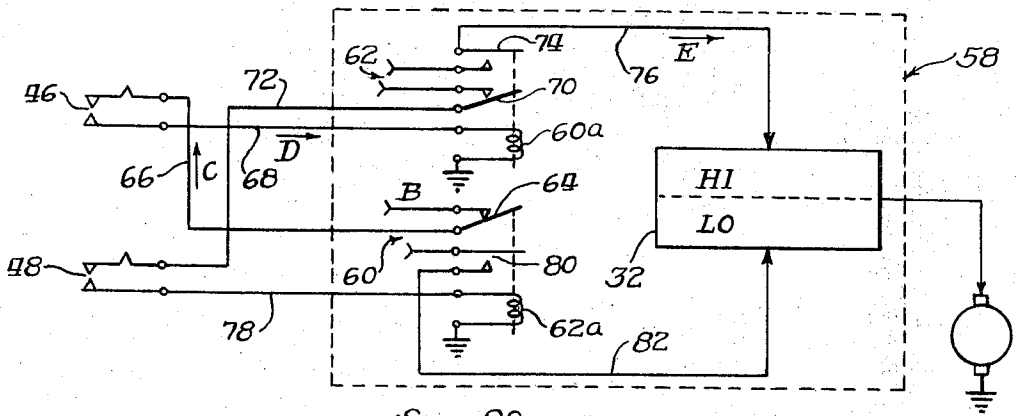
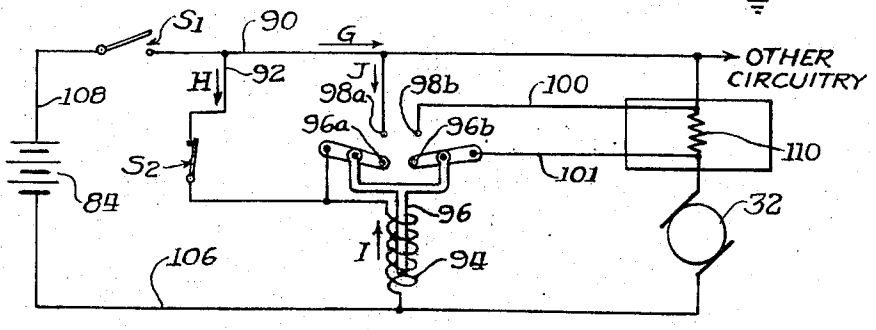


Fig. 4.



MAGNETIC CARD READOUT MACHINE AND CARDS THEREFOR

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to improvements in teaching devices in the form of audio transducing machines and the like and, more particularly, to a new and improved teaching machine and information cards for use therewith, together providing greater versatility than has been possible in the past with teaching machines and cards of the character described.

Teaching machines employing a feed roller for engaging information cards for feeding the cards through a side channel past a transducing or readout station are known in the art. Generally speaking, such machines transport the information card past a readout or transducing head which reads a sound track containing a magnetic recording of selected audio information. Corresponding and/or complementary information is usually printed on the card to stimulate the student visually at substantially the same time as the student is being stimulated audibly. For use in the existing machines, cards have been recorded for reproduction at a single rate of transport, generally 2-¼ inches per second. For several years, this rate approached a standard in view of technological limitations which caused the sound output at a lower speed to be unacceptable as to fidelity, and higher speeds to be unacceptable due to the maximum length of the audio track for a given card length. The standard cards normally were of uniform generally rectangular size and shape, with generally straight edges.

To provide a card of a given length with increased length of audio information has been a continuing desire for educators. That is, the quantity of audible information from a card of a given length can be increased to nearly double the present quantity if the rate of card transprt is reduced by half. Due to improvements in technology, such cards can be made and machines adapted to accept these cards. Because of the large number of cards and of teaching machines operating at the standard rate for those standard cards currently in the field, it is desirable to enable any new machine to be usable with the older high speed cards as well as with the new low speed cards. Because of the likelihood that the cards will be intermixed during use, it is desirable further that the new machines be capable of distinguishing between older cards and the newer cards, and that the cards be distinguishable to the machine so as to be transported past the transducer or readout head automatically at the rate at which the magnetic material has been recorded on the card.

Accordingly, a primary object of this invention is to provide a teaching machine which can use interchangeable information cards on which the information was recorded at different rates.

A further object of this invention is to provide a new and improved information card which controls its own rate of transportation through a teaching machine capable of distinguishing one card series from another.

Another object of this invention is to provide a new and improved teaching machine capable of transporting cards at different rates and for distinguishing at which rate each card is to be transported therethrough.

In the exemplary embodiment of the invention, the above objects and advantages are achieved by the use of an information card generally as is known in the prior art, an information card of the new type having at least one notch on the leading edge thereof, and a machine which will accept the cards. The cards of either class are adapted to be manually moved to a position on the teaching machine wherein the leading edge of the cards are in alignment with portions of a plurality of switches extending into the path of the leading edge of the card. Should a prior art card having a generally straight continuous leading edge be inserted into the machine, the switches will be actuated in a predetermined sequence and the machine will operate at the speed at which these cards were recorded. However, should a new card having a notched leading edge be inserted into the machine, the switches will be actuated in a different sequence and will alter the rate of operation of the machine so that the drive means thereof will transport the new card at a different pre-set rate therefore correlated to the speed at which the cards were recorded. By this arrangement, each card inserted into the machine will cause the machine to drive that card at the rate intended for the card.

As shown herein, the control means for the machine may have various control circuits having holding circuit portions or other conditioning means which will deactivate or render inoperative at least a certain one of the actuatable switches when another of the switches first is actuated, thereby determining the rate of operation of the machine.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a portion of a teaching machine embodying the concepts of the present invention;

FIG. **2** is a portion of an information card, illustrating the notched leading edge thereof, in accordance with the concepts of the present invention;

FIG. **3** is a schematic view of one embodiment of control means circuitry for operating the machine of the present invention at plural speeds; and

FIG. **4** is an alternate form of control means circuitry for operating the machine of the present invention at plural speeds.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings in greater detail, and first to FIG. **1**, an information card transport mechanism includes first and second portions, generally designated **12** and **14**, respectively, of a U-shaped channel, together defining a card guide path. Each channel has side wall portions **16** and a bottom wall portion **18**. A feed roller or capstan **20** is located between the first and second channel portions **12** and **14** immediately adjacent the card guide path defined thereby to engage and transport an information card **24** past a transducer or record/reproduce head **26**, in the direction of arrow A (FIG. 1).

The transducer or record/reproduce head **26** is connected to known recording/reproducing circuitry so that audio information may be recorded on and reproduced from a magnetic media stripe **28** of known mate-

rial, which stripe has been applied to the information card **24** in a known manner. The card is formed of cardboard or another support media of suitable material.

When a card **24** is introduced into guide channel **12**, capstan **20** is powered to transport the card by a motor **32** connected to a belt **34** and a pulley **38** to which the capstan is drivingly connected. Capstan **20** is located either adjacent a backup roller (not shown) or the transducer **26** which is attached to the frame of the transport mechanism by a bracket **40**. To control energization of motor **32** and audio circuitry (not shown), control switch means, generally designated **44** in FIG. **1**, is connected electrically therewith. The switch means **44** is arranged to extend into the card guide channel portion **12** into the path of the leading edge **46** of the information card **24** so that the switch means is actuated by the card moving in the guide channel portion **12**.

The switch means **44** actually is physically displaced by the card **24** and thereupon energizes the motor **32** to rotate the capstan **20** and feed the card past the transducer head **26** at one of a plurality of pre-set speeds determined by the sequence of closing of switch portions of the switch means **44**. More particularly, the switch means **44** has a pair of switches **46** and **48** connected in circuit with the motor **32**. The switches **46** and **48** have conductive leaf spring type switch contact portions **46***a* and **48***a*, respectively, protruding into the path of the leading edge **46** of the information card **24**. However, the switches are offset relative to each other in the direction of movement of the information card **28** through the machine in the direction of arrow A (FIGS. **1** and **2**). Thus, depending on the configuration of the leading edge **46** of th information card **24**, one or the other of the switch contact portions **46***a* and **48***a* may be engaged prior to the other and thereby determine the pre-set speed of operation of the motor **32**.

The configuration of the leading edge **24'** of the card **24** therefore controls the card's own rate of speed or transport through the teaching machine which, through the switch contacts **46***a* and **48***a*, is capable of distinguishing one card series from another. As will be shown hereinafter, means are provided for deactivating or rendering ineffective the second switch (**46** or **48**) after one of the switches first is actuated by engagement of the leading edge of the card with its respective contact portion.

In the exemplary embodiment of the invention, the machine and the information card **24** are adapted for dual speeds of operation in order to accommodate known prior art information cards having straight continuous leading edges as indicated by the dotted line **50** in FIG. **2** for operating the motor **32** at a relatively high rate of speed, while accommodating a card having a notch, generally designated **52**, in accordance with the concepts of the present invention for driving the motor **32** at a relatively slower rate of speed. The relative positioning of the switch contact portions **46***a* and **48***a*, and their transverse positioning relative to a moving information card **24**, is shown by the schematic rectangles **46***a* and **48***a* in FIG. **2**. The arrowed dot-dash lines **54** indicate the relative movement of the contact portions as the card **24** moves through the machine in the direction of arrow A.

It is apparent that should a prior art known card having a straight continuous leading edge **50** be fed through the machine in the direction of arrow A, the leading edge thereof first will come in contact with and displace the contact portion **46***a* and thereby actuate the switch **46** to the motor **32**. The motor, thus, can be actuated at a higher rate of speed, while providing means to deactivate switch **48** as described hereinafter. Vice versa, should an information card **24** made in accordance with the concepts of the present invention with the notch **52** be fed through the machine, the switch contact portion **46***a* will ride into the notch **52** and the leading edge **46** of the card will make first engagement with switch contact portion **48***a* to energize the motor **32** at the relatively slower rate of speed, while the switch **46** for switch portion **46***a* is rendered inoperative by means described hereinafter. The notch **52** must be deep enough to permit the switch contact portion **48***a* to be engaged and displaced to actuate switch **48** before switch contact portion **46***a* comes in contact with base edge **56** of the notch **52**.

Referring to FIG. **3**, one form of control circuit means is shown for operating the motor **32** at dual high and low speeds. Control switches **46** and **48** are shown in conjunction with a motor control circuit, generally designated by the block **58** which includes two separate DC power sources **60** and **62**. Power source **60** feeds a solenoid **60***a* and power source **62** feeds a solenoid **62***a*. With this arrangement, assuming a prior art card is fed through the machine as described above so as to actuate switch **46** first. A normally closed secondary switch **64** permits current from the source **60** to pass in the direction of arrow B through the switch **64**, through line **66** in the direction of arrow C, through control switch **46** and line **68** in the direction of arrow D to the solenoid **60***a*. Solenoid **60***a* then pulls normally closed switch **70** open to render control switch **48** inactive, through line **72**. Solenoid **60***a* also closes normally open switch **74** so that current from source **62** thereof passes through line **76** in the direction of arrow E to the "Hi" side of the motor **32** to operate the machine at the faster rate of speed for the prior art information card.

With the circuitry shown in FIG. **3**, when the prior art card passes through the machine and comes out of engagement with control switch **46**, the normally closed and normally open switches **70** and **74**, respectively, will return to the position shown in FIG. **3**.

Alternatively, should an information card **24** made in accordance with the concepts of the present invention, with the notch **52**, be fed into the machine, control switch **48** will be closed first and an identical sequence of electrical functions will occur, but with solenoid **62***a* being actuated and control switch **46***b* rendered inoperative. More particularly, when control switch **48** is closed, current from the source **62** thereof will pass through a normally closed secondary switch **70**, through line **72** and control switch **48**, through line **78** to the solenoid **62***a* to actuate the same. Solenoid **62***a*, as with solenoid **60***a*, performs two functions. It opens normally closed secondary switch **64** to prevent current from flowing from the source **60** to the control switch **46** and thereby deactivates the control switch **46**. The solenoid also closes a secondary switch portion **80** so that current from source **60** may pass through line **82** to the "Lo" side of the motor **32** to operate the machine at the relatively slower rate of speed for the series of cards having the notch **52** and the increased length of audio information.

It should be pointed out at this time that although a machine, card, and two different forms of circuitry are shown for operating the machine at a dual speed for prior art cards and slower rate cards, no limitation is intended thereby because multiple speed machines, plural notched cards, and other circuitry are contemplated by the concepts of the present invention for more than two speeds.

FIG. 4 shows another form of circuitry wherein a single power source is shown for operating the motor **32** at plural preset rates of speed by a pair of switches, generally indicated at **S1** and **S2**. Although either of the switches **46, 48** may be used as switches **S1, S2** for purposes of this description, switch **46** will be identified as normally open switch **S1** and switch **48** will be identified as normally closed switch **S2**. With this circuitry, should switch **S1** be actuated first o as to be closed, current will pass from source **84** through line **90** in the direction of arrow G, through line **92** in the direction of arrow H, and through the normally closed switch **S2** to the relay **94**. Energization of relay **94** causes an armature arm **96** to move in the direction of arrow I so that its contact portions **96*a*** and **96*b*** make contact at **98*a*** and **98*b***, respectively. Closing of contacts **96*a*** and **98*a*** complete a circuit in the direction of arrow J to establish a holding circuit through relay **94** although switch **S2** was open as the leading edge of the card passed thereover. Since this circuit is completed and the solenoid **94** retains the armature at **96** in operative condition between the contacts **96*b*** and **98*b***, current passing in the direction of arrow G will enter the speed control circuitry and by the path of least resistance will pass along the wire **100** to contacts **98*b***, **96*b*** and thereafter through wire **101** bask to the motor **32**. The motor will be operated at a preset rate for the card inserted into the transport path of the machine. As the end of the card clears the switches **S1** and **S2** to return these switches to their normal conditions, the holding circuit will be de-energized and the control circuit will likewise be energized to enable the next card introduced to establish its own preset rate of transport.

With the circuitry shown in FIG. **4**, should the shape of the leading edge of the card be such that the switch **S2** as above identified is engaged prior to switch **S1**, the normally closed switch **S2** opens the circuit to the relay **94** to prevent the establishment of a holding circuit. Thence, relay **94** is not actuated and therefore the armature **96** is not caused to complete circuits **96*a*–98*a*** and **96*b*–98*b***. By the subsequent closing of switch **S1** which causes energizing of the motor along line **90** in the direction of arrow G, the motor operates at a different preset rate than the prior circuit due to the insertion of a resistor **110** in the circuit. Should the notch be selected for a reverse in the rate of card transport as compared to a non-notched card, the switches might be reversed or the circuit including the resistor may be reversed whereby proper selection of the speed of the motor **32** will be appropriate for the card being transported by the machine. Since switch **S1** is selected as the main power switch, this switch may also be wired to turn on and off other circuitry of the machine as required for example for amplifiers and lights to indicate the rate of transit of a card and/or to indicate the function of other circuitry of the machine.

It is to be understood that the embodiment shown is illustrative of the principle of operation of a magnetic card read out machine and that certain changes, alterations, modifications or substitutions may be made to the structure of the device without departing from the spirit and scope of the invention.

We claim:

1. The combination of a plural speed card readout machine and cards for use therewith, the machine comprising:

plural speed drive means for transporting one of said cards along a card guide path past transducing means;

electrical control means for operating said drive means at a plurality of selected pre-set different speeds, including a plurality of switch means at said card guide path for actuation in a plurality of different sequences to determine the operating speed of said drive means; and

the card comprising:

a support media transportable by said drive means along said card guide path through said machine;

magnetic media carried on said support media for being transduced at a selected of a plurality of preset drive speeds; and

means on said support media for actuating said switch means in a predetermined sequence to operate said drive means at a speed corresponding to the proper transducing speed of the magnetic media on the respective card.

2. The combination of claim **1** wherein said actuating means is disposed along an edge of the support media.

3. The combination of claim **2** wherein said actuating means on said support media comprises irregular edge surface means shaped to engage and thereby actuate said plurality of switch means in a particular sequence which is a function of the shape of said irregular edge surface means.

4. The combination of claim **3** wherein said irregular edge surface means includes at least one notch aligned with at least one of said plurality of switch means.

5. The combination of claim **3** wherein said irregular edge surface means is disposed on the leading edge of said support media.

6. The combination of claim **5** wherein said support media is a generally rectangular card having a leading edge extending generally transversely of the direction of travel of the card through the machine, and said irregular edge surface means is formed on said leading edge.

7. The combination of claim **6** wherein said plurality of switch means comprise a plurality of switches having portions extending into the path of said leading edge of a card, the switch portions being disposed for engaging different transverse portions of the card's leading edge.

8. The combination of claim **7** wherein the leading edge of the card includes at least one notch aligned with at least one of said switch portions to engage the switch portion at a later point in time than at least one other switch.

9. The combination of claim **7** wherein at least one of said switch portions is offset in the direction of travel of the card so that it is engaged at a different point in time than another switch portion for determining a particular transducing speed when a card having a straight leading edge is transported through the machine.

10. The combination of claim 3 wherein said electrical control means includes conditioning means to deactivate at least a certain one of said plurality of switch means when another of said switch means first is actuated.

11. A magnetic record member for use in an audio teaching machine having drive means operable at selected of a plurality of pre-set drive speeds for causing transducing of information recorded at one of the plurality of speeds on the magnetic media of the member, the record member comprising:

a card transportable along a card guide path through the machine to energize the machine at a selected of said plurality of pre-set drive speeds;

magnetic media carried on said card for being transduced at a selected one of said plurality of pre-set drive speeds; and

actuating means defined along an edge of said card for physically engaging and actuating control components of the machine to drive the machine at a selected speed corresponding to the proper transducing speed of the magnetic media on the respective card.

12. The magnetic record member of claim 11 wherein the leading edge of said card has irregular surface means for engaging the machine's control components in a predetermined sequence to operate the machine at a predetermined speed.

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