

Description

The present invention relates to magnetic drives, and more particularly, to a magnetic tape drive for storage and retrieval of digital data in which a tape cartridge is endwise loaded onto a tray which is thereafter slid into a housing.

The five and one-quarter inch (133.3 mm) Winchester disk drive which provides substantial storage capacity and rapid data access is becoming increasingly popular as a principal memory for personal and small business computers, which until recently, used exclusively flexible or floppy disk memories. A five and one-quarter inch (133.3 mm) Winchester disk drive may have a memory storage capacity of, for example, fifty-five megabytes. On the other hand, a typical floppy disk drive may have a storage capacity of only one-quarter megabyte.

Many computer systems have backup memory devices to assure against malfunctions or physical damage that could destroy the principal data bank. In the past, in personal and small business computer systems, the backup storage unit has typically consisted of a second floppy disk drive. However, the increasing use of five and one-quarter inch (133.3 mm) Winchester disk drives in personal and small business computers has created a need for greater backup storage. Floppy disk drives are unsuitable for use as backup storage for a five and one-quarter inch (133.3 mm) Winchester disk drive because the hard disk stores many times more information than a single floppy disk. For example, forty one-quarter megabyte floppy disks would be needed to backup one ten megabyte Winchester disk drive, making backup storage a time-consuming inconvenience for the operator.

A magnetic tape drive would be a more practical form of backup storage for the five and one-quarter inch (133.3 mm) Winchester disk drive. Such tape drive would preferably utilize a tape cartridge for convenience and durability. ANSI X3.55-1977 defines a standard one-quarter inch (3.3 mm) tape cartridge to facilitate industry compatibility. One cartridge meeting this standard is the DC300XL cartridge manufactured by Minnesota Mining and Manufacturing. See U.S. Patent No: 3,692,255. That cartridge measures approximately six inches (152.4 mm) in length and four inches (101.6 mm) in width. In addition, the cartridge has a door along one of its longer sides which must be swung open so that the tape drive head can make contact with the tape. This door, when fully open, increases the width of the cartridge from approximately four inches (101.6 mm) to approximately five and three-quarter inches (146.0 mm).

Currently floppy disk drives and five and one-quarter inch (133.3 mm) Winchester disk drives are constructed to meet an industry standard which requires that they fit within a rectangular box measuring approximately three and one-quarter inches (82.5 mm) in height by five and three-quarter inches (146.0 mm) in width by eight

inches (203.2 mm) in length. The foregoing dimensions are hereinafter referred to as the five and one-quarter inch (133.3 mm) form factor for a mechanical transport. It would be desirable to provide a magnetic tape drive which would fit the foregoing industry mechanical form factor while utilizing the aforementioned 3M cartridge. The magnetic tape transport could then be inserted into the same physical enclosure or hardware designed to receive the five and one-quarter inch (133.3 mm) Winchester or floppy disk drives.

It is difficult to provide a magnetic tape drive which can receive and utilize the aforementioned 3M tape cartridge in the relatively small industry mechanical form factor. Because the cartridge is six inches (152.4 mm) in length, it cannot be loaded sideways into such a magnetic tape transport since the width of the mechanical form factor is only five and three-quarter inches (146.0 mm). If the tape transport were installed in a receptacle within a mini-computer, there would be no access to the side of the tape, drive unless the tape drive could be slid out of the mini-computer. Such sliding out of the entire drive would be undesirable since it would expose sensitive electronic and mechanical components of the drive to possible damage and contamination. Furthermore, such sliding out of the entire drive would require flexible busses and connectors which could fail with repeated use. Accordingly, it would be preferable to load the cartridge endwise into the tape drive. This presents a problem since the width of the cartridge is approximately five and three-quarter inches (146.0 mm) with the door fully open. Some mechanism would have to be provided for opening the door of the cartridge and engaging the head with the tape in an extremely confined amount of space.

US-A-3924823 discloses an example of a prior tape drive for loading an ANFJ quarter inch tape cartridge. However, the cartridge is inserted sideways into engagement with a stationary read/write head and capstan drive roller.

Accordingly, it is the primary object of the present invention to provide an improved cartridge tape drive.

Accordingly, the present invention provides a drive for an elongate, rectangular tape cartridge of the type having an access door along a side edge thereof which opens by pivoting about an axis substantially perpendicular to a base plate of the cartridge, the cartridge having a length of approximately 152.4 millimeters and a width of approximately 101.6 millimeters, the access door being sized so that it increases the width of the cartridge to approximately 146.0 millimeters when pivoted from a closed position to a fully open position, and the cartridge further having a belt capstan roller which protrudes from the side edge of the cartridge and can be rotated to wind a length of magnetic tape between a pair of reels inside the cartridge, the drive including a housing for receiving a cartridge of the aforementioned type, a read/write head, a capstan drive roller, a motor for driving the capstan drive roller, and

means for opening the access door of the cartridge upon insertion thereof into the housing to permit the read/write head to engage the tape characterised by:

means defining a slot at a transversely extending end of the housing;

the housing having a width that permits the housing to fit within an enclosure having a width of approximately 146.0 millimeters, and the slot being dimensioned to have a cartridge longitudinally inserted therein with its access door initially in its closed position;

means for supporting the cartridge within the housing when the cartridge is longitudinally inserted in the slot;

means for pivoting the access door of the cartridge when the cartridge is inserted into the housing through the slot, the access door being pivoted from its closed position to a partially open position; and

means for supporting the read/write head and the capstan drive roller within the housing adjacent the cartridge supporting means for movement into and out of engagement with the tape and the belt capstan roller, respectively, when the cartridge has been inserted into the housing through the slot and the access door has been pivoted to its partially open position so as to clear the read/write head and expose the tape.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a preferred embodiment of the cartridge tape drive with its tray extended and a cartridge partially inserted.

Figure 2 is a perspective view of the preferred embodiment with the cartridge fully inserted into the tray.

Figure 3 is a perspective view of the preferred embodiment with the tray closed and locked.

Figure 4 is an enlarged front-end elevation view of the preferred embodiment of the cartridge tape drive.

Figure 5 is a top plan view of the tape cartridge with portions cut away and showing the open position of its access door in phantom lines.

Figure 6 is a schematic illustration of the control system of the tape drive and the manner in which its capstan drive and head engage the tape cartridge.

Figure 7 is a horizontal sectional view of the preferred embodiment of the cartridge tape drive taken along line 7—7 of Figure 4.

Figure 8 is a horizontal sectional view of the preferred embodiment similar to Figure 7, but with the tray extended and the capstan drive mechanism of the tape drive disengaged.

Figure 9 is a vertical sectional view of the preferred embodiment taken along Line 9—9 of Figure 7.

Figure 10 is a vertical sectional view of the preferred embodiment taken along Line 10—10 of Figure 7.

Figure 11 is a vertical sectional view of the

preferred embodiment taken along Line 11—11 of Figure 10.

Figure 12 is a fragmentary, horizontal sectional view of the preferred embodiment taken along Line 12—12 of Figure 9.

Figure 13 is an enlarged, vertical sectional view taken along Line 13—13 of Figure 9 illustrating the mechanism which is utilized to sense the beginning of the magnetic tape and the end of the magnetic tape during operation of the tape drive.

Figure 14 illustrates a portion of the magnetic tape which has the end indicating perforations.

Figure 15 is a fragmentary, enlarged, vertical sectional view taken along Line 15—15 of Figure 9 illustrating the bearing structure which supports the read/write head for vertical reciprocation.

Figure 16 is an enlarged, fragmentary top plan view of the forward portion of the preferred embodiment of the cartridge tape drive showing the cartridge insertion guide.

Figure 17 is a rear elevation view of the structure of Figure 16 showing the insertion guide action.

Figure 18 is a horizontal sectional view of the cartridge insertion guide taken along Line 18—18 of Figure 16.

Figures 19 and 20 are sequential views illustrating the manner in which the tape cartridge door is gradually opened as the tray carrying the cartridge is inserted into the main portion of the drive to its final position illustrated in Figure 7.

Referring to Figure 1, the preferred embodiment 10 of the cartridge tape drive has a rectangular housing 12 whose width, height and length are such that the housing will fit within the industry form factor for five and one-quarter inch (133.3 mm) Winchester disk drives and floppy disk drives.

A completely enclosed housing is not necessary, where the drive is installed in a receptacle in a computer. Accordingly, the term "housing", as used herein, refers to any general support structure or frame for mounting the components of the drive in operative relationship. The term "within the housing" refers to something being located generally within the side edge boundaries of the frame or support structure. A horizontal tray 14 (Figure 1) slides partially out of the tape drive through a slot 16 formed in a front panel 18 of the housing. An LED 19 is mounted in the front panel to indicate the drive select status. The tray is dimensioned for receiving a magnetic tape cartridge 20 which is loaded endwise therein. The tape cartridge 20 is preferably of the type which meets ANSI specification X3.55—1977. One such cartridge is the model DC300XL sold by Minnesota Mining and Manufacturing.

The cartridge 20 is slid fully into the tray 14 as illustrated in Figure 2 so that the end edges of the cartridge coincide with the end edges of the tray. Thereafter, continued pushing on the car-

tridge 20 causes the tray to slide rearwardly until both the tray and the cartridge are entirely within the housing as illustrated in Figure 3.

During this loading of the cartridge, mechanisms hereafter described in greater detail, open the door 24 which is hingedly attached to one side edge of the tape cartridge 20. During the insertion of the cartridge, an upper cartridge insertion guide is lifted clear of the tape cartridge door. Once the cartridge is fully loaded into the drive, a load lever 26 (Figure 3) is rotated approximately ninety degrees into a vertical position. Through a linkage this causes a magnetic read/write head, a capstan drive, and cartridge location pins to move into engagement with the tape cartridge as described hereafter in greater detail. The unlocked and locked positions of the load lever 26 are illustrated in phantom lines and solid lines, respectively, in Figure 4. Detents and recesses, not illustrated, may be provided on the lever 26 and front panel 18 so that the load lever 26 snaps into its unlocked and locked positions.

The front panel 18 of the tape drive is formed with upper and lower, inwardly tapering finger recesses 28 and 30 (Figure 4) on either side of the slot 16. A similar recess 32 (Figure 8) is formed in the forward end of the tray 14, in alignment with the finger recesses 28 and 30. These finger recesses permit an operator to grasp the end of the tape cartridge 20 between his or her thumb and index finger and to remove the cartridge from the tray. The load lever 26, after it is rotated to its locked position shown in solid lines in Figure 4, blocks the entry slot 16. This lever thus provides assurance of full tray entry and also provides a visual cartridge loaded indicator.

Details of the conventional tape cartridge 20 are illustrated in Figure 5. That cartridge measures approximately six inches (152.4 mm) in length and four inches (101.6 mm) in width. The door 24 of the cartridge increases the width of the cartridge to approximately five and three-quarter inches (146.0 mm) when the door is fully opened.

The cartridge has a solid metal base plate 34, and a top cover 36. The end walls 38 of the cartridge are slightly indented from the end edges of the plates 34 and 36. A pair of reels 40 and 42 are rotatably mounted within the cartridge between the plates 36 and 38. A length of magnetic tape 44 is wound back and forth between the reels around a pair of idler rollers 46. A drive belt 48 is driven around three separate rollers, 50, 52 and 54. When the belt capstan roller 50 is rotated by a capstan drive roller 56 (Figure 6) the drive belt 48 rotates the reels 40 and 42 so that the magnetic tape is unwound from one of the reels and rewound onto the other reel.

The cartridge 20 has a cut-out region 58 along one side edge thereof which is conformably shaped for receiving the door 24. The door 24 is pivotally connected to the corner of the cartridge 20 by a hinge assembly 60. As previously indicated, when the tape cartridge 20 is inserted into the drive, mechanisms open the door 24 of the cartridge. Thereafter, rotation of the load lever 26

brings a read/write head 62 (Figure 6) into the cut-out region 58 so that the head can make contact with the tape 44 as illustrated in Figure 6.

Rotation of load lever also brings the capstan drive roller 56 (Figure 6) into a cut-out region 64 and into contact with the belt capstan roller 50. As best seen in Figure 5, the belt capstan roller 50 has an upper larger portion and a lower smaller portion illustrated in phantom lines. The larger portion of the drive belt capstan roller 50 extends above and beyond the magnetic tape 44 so that the capstan drive roller 56 can engage the belt capstan roller without touching either the tape 44 or the drive belt 48.

The cartridge 20 also has a mirror 66 (Figure 5) positioned behind a window 68 which is utilized in connection with an end of tape/beginning of tape (EOT/BOT) sensing mechanism 70 in the tape drive. The cartridge 20 also has a file protect mechanism consisting of a rotatable half cylinder 72 (Figure 5) positioned in front of a cutout region 74. A file protect sensor 76 (Figure 6) determines whether or not the cut-out region 74 is blocked by the semi-circular portion 72a of the file protect cylinder.

Referring to Figure 6, the read/write head 62 is vertically reciprocable by energizing a stepper motor 78 to select any one of twelve different tracks on the tape. The capstan drive roller 56 is mounted on the upper end of the shaft of a brushless DC motor 80. A sensor 82 is mounted in the tape drive adjacent the file protect sensor 76 and is utilized to detect when a cartridge is in place within the drive.

Figure 6 also illustrates the control circuitry of the tape drive, details of which are not the subject of the present application. This circuitry is mounted on one or more PC boards (not shown) which are positioned horizontally above the cartridge within the housing. The control system includes a microprocessor, logic and firmware denoted 84 in Figure 6. A host interface 86 is provided for enabling communication between a computer or other source of data. Read/write logic 88 is connected between the head 62 on the one hand and the microprocessor 84 and host interface 86 on the other hand. The head 62 also functions to erase blocks of data from the tape 44 under control of the read/write logic 88. The microprocessor controls the stepper motor 78 and the brushless DC motor 80 through a servo and control logic 90.

The tray 14 has a horizontal base 92 (Figures 7 and 11) having a width and length substantially equal to that of the tape cartridge 20 which it supports. A pair of support blocks 94 and 96 (Figures 7, 10 and 11) are attached to the underside of the base 92 at spaced locations adjacent the left hand side edge thereof. These support blocks have horizontal holes therethrough so that they can slide back and forth on a rod 98 (Figures 7 and 10). The rear end of this rod is secured to a bracket 100 (Figure 8) attached to the left side wall of the housing 12. The forward end of the rod 98 is secured to the front panel 18 of the housing. The

right side edge of the base 92 of the tray is slidably supported. Referring to Figures 8 and 17, an elongate guide tooth 100' is secured to the underside of the base 92 of the tray 14 and extends forwardly and rearwardly. The projecting portion of the guide tooth 100' slides within a conformably shaped track piece 102 attached to the front panel 18.

The base 92 of the tray is thus supported for sliding movement between a retracted position illustrated in Figure 7 and a fully extended position illustrated in Figure 8. The amount that the tray can be extended is limited by the forward one of the spacer blocks 94 which contacts the inside surface of the front panel 18 to limit further extension of the tray as best seen in Figure 8. The retracted and extended positions of the tray are further illustrated by the retracted and extended positions of the spacer blocks 94 and 96 illustrated in solid and phantom lines, respectively, in Figure 10.

As best seen in Figures 8 and 10, the rear end edge of the base 92 of the tray 14 has an upwardly extending flange 104 and the right side edge of the base has an upwardly extending flange 106. These flanges engage the rear and right side edges of the tape cartridge to help maintain the tape cartridge in proper alignment within the tape drive. The left side edge of the tape cartridge is engaged by a boss 108 (Figure 8) which extends from the inside surface of the left side wall of the housing 12. The right side edge of the base 92 has a cut-out region 110 (Figure 8) which coincides with the cut-out region 58 of the tape cartridge when the tape cartridge has been fully inserted into the tray. This cut-out region 110 in the base provides clearance to allow the head 62 to engage the tape as illustrated in Figure 7.

A coil spring 112 (Figure 8) is secured at one end to the bottom wall of the housing 12 and at its other end to the support block 96. The spring 112 is shown in its compressed condition in phantom lines in Figure 7. When the tray 14 is pulled out, the spring 112 expands from its compressed condition, and the force of the spring aids the operator in pulling the tray out. The expanded condition of the spring is illustrated in solid lines in Figure 8. As will become more apparent hereafter, the spring insures that the tray extends all the way so that the cartridge door opening mechanism is clear to enable the cartridge to be pulled out of the tray.

When the tape cartridge 20 is initially inserted into the tray 14, a cartridge insertion guide 114 (Figure 16) engages the top right side edge of the cartridge and guides the cartridge into engagement with the flange 106 (Figure 8) of the base 92 of the tray. Shortly after the cartridge insertion guide engages the rearward end of the cartridge, the guide swings upwardly away from the cartridge. Thus, when the cartridge has been completely inserted into the tray, the cartridge insertion guide does not interfere with opening of the cartridge tape access door.

Details of the construction of the cartridge

insertion guide are illustrated in Figures 16, 17 and 18. The cartridge insertion guide 114 includes a horizontal panel 116 having a downwardly extending flange 118 which extends from its outer end. The flange has a straight rearward portion 118a (Figure 16) and an outwardly diverging forward portion 118b. A mounting block 120 is secured to the inside edge of the panel 116. This mounting block rotates on a post 122 whose inner end is rigidly fixed in a boss 124 on to the inside surface of the front panel 116. A retainer 126 holds the block 120 on the post. A torsion spring 128 is wrapped around the post 122. One leg of the torsion spring rests against the upper side of the panel 116 and the other leg of the torsion spring is held by a pin 130 which extends from the inside surface of the front panel 18. The torsion spring thus biases the insertion guide 114 downwardly to its position shown in solid lines in Figures 17 and 18.

A tab 132 (Figure 16) is secured to the top surface of the outer portion of the panel 116 and extends forwardly beyond the forward edge of the panel. The forward end of the tab extends into a vertical slot 134 formed in the inside surface of the front panel 18 and illustrated in phantom lines in Figure 16. As illustrated in Figure 18, the lower end of the slot 134 is positioned so that the downward limit of the movement of the tab 132 places the panel 116 in a horizontal position.

The underside of the panel 116 has an inclined cam 136 (Figures 16 and 18). When the rearward end of the tape cartridge 20 (Figure 18) is inserted into the tray through the loading slot in the front panel of the drive, the flange 118 of the cartridge insertion guide engages the side edge of the cartridge to guide the cartridge to the side flange 106 of the base 92 of the tray. Slightly before the end of the tape cartridge reaches the flange 106, the cam 136 engages the end of the tape cartridge and lifts the panel 116 and the flange 118 away from the cartridge. Thus, when the cartridge is fully inserted onto the tray, as illustrated in Figure 2, the cartridge insertion guide does not obstruct the opening of the access door 24 of the cartridge. The cam 136 may be replaced by a roller wheel.

Referring to Figures 7 and 8, within the housing 12 the read/write head 62 and the capstan drive motor 80 are supported on an elongate frame 138. The frame enables these components to be engaged and disengaged with the tape cartridge 20 after it has been inserted onto the tray and the tray has been moved to its retracted position within the housing. The frame 138 extends longitudinally within the housing almost the entire length thereof. The frame 138 consists of a horizontal planar section 140 and a vertical flange 142 (Figures 7 and 15) which extends along portions of the peripheral edge of the planar section.

The flange 142 imparts strength and rigidity. The rearward end of the frame 138 is rotatably supported by a bearing assembly 144 (Figures 7 and 9). Ninety degree rotation of the load lever 26 from its horizontal position illustrated in phantom lines in Figures 4 and 8 to its vertical position

illustrated in solid lines in Figures 3 and 7 causes the frame 138 to pivot or rotate in a clockwise direction. The frame is rotated through approximately four and one-half degrees of rotation from the position illustrated in Figure 8 to the position illustrated in Figure 7. The frame 140 rotates beneath the base 92 of the tray 14. When the tray is in its retracted position illustrated in Figure 7, and a cartridge is loaded on the tray, the capstan drive roller 56 engages the belt capstan roller 50 of the tape cartridge and the head 62 engages the magnetic tape 44.

As the tape cartridge and tray are pushed into the housing of the drive, the tape access door 24 of the cartridge is opened. This opening of the tape access door takes place when the frame 138 is in its disengaged position illustrated in Figure 8. As will be described hereafter in greater detail, a special mechanism opens the access door as the tray is being pushed in so that the tape access door will swing clear of, and not contact, the head support mechanism. This action is illustrated by the sequence of views consisting of Figures 19, 20 and then Figure 7. Because of the dimension constraints of opening the tape access door of the 3M cartridge within the industry mechanical form factor, an advantage is achieved by opening the tape access door before the tape cartridge is totally inside the housing.

Means are provided for preventing twisting or out of plane movement of the pivoting frame 138. Specifically, a tab 146 (Figure 8) extends from the rearward end of the frame and moves horizontally within a slot 148 (Figures 8 and 10) formed in the side of a support block 150 mounted to the bottom wall of the housing. A flange 152 (Figures 8 and 9) extends horizontally from the forward end of the frame 138 and slides within a horizontal recess 154 (Figure 9) formed in the inside wall of the front panel 18.

Linkage means are provided for coupling the load lever 26 with the frame 138 so that rotation of the load lever will pivot the frame between its disengagement and engagement positions. Referring to Figure 10, the load lever 26 is secured to the forward end of a rod 156 which extends through holes in a pair of longitudinally spaced upstanding projections of a support member 158 mounted on the bottom wall of the housing. A crank 160 (Figures 10 and 11) is secured to the rearward end of the rod 156. The outer arm 162 of the crank has a rounded end which seats in a rounded vertical socket 164 (Figure 11) formed in an arm 166 (Figure 7) extending from the inside side edge of the frame 138. When the load lever 26 is rotated, the rounded end of the outer arm 162 of the crank moves vertically within the socket 164 and causes lateral displacement of the frame 138. The dimensions of the crank, the length of the frame 138 and the relative position of the frame bearing assembly 144 are such that ninety degree rotation of the load lever 26 between the positions illustrated in Figure 4 rotates the frame through approximately four and one-half degrees of rotation. A rub block 167a abuts the rod 156

and is biased by a compressed spring 167b slidable in a socket 167c. This rub block accommodates crank over travel to ensure rigid seating of the cartridge.

The frame 138 carries a pair of reference locators 168 and 170 (Figure 8). These locators have cartridge location pins 172 and 174, respectively, which engage and hold down the base plate 34 of the cartridge when the cartridge is fully loaded and the frame is swung to its engagement position as illustrated in Figure 7. The detent pin 174 (Figure 9) extends eccentrically from a cylindrical main portion 176 (Figure 7). This main portion is squeezed between a pair of clamping blocks 178 and 180 held together by a screw 182. The screw 182 may be loosened and the main portion 176 of the pin 174 rotated. This changes the height of the pin and this height adjustment can be used to adjust the tilt of the cartridge on the frame.

Another reference locator 184 (Figure 7) having similar construction to the reference locator 170 is mounted to the bottom wall of the housing forward of the support block 150. The cartridge location pin 186 of the reference locator 184 engages the rearward edge of the base plate of the cartridge 34. The height of the pin 186 may also be adjusted in a fashion similar to the adjustment of the height of the pin 174. Thus, the reference locators 170 and 184 provide a means for adjusting the tilt of the cartridge with respect to the base 92 of the tray. This adjustment can be used for factory fine tuning of the azimuth adjustment of the head with respect to the tape. Leaf springs 187a and 187b (Figure 8) associated with the reference locators 170 and 184 deflect downwardly when contacted by the base plate 34 of the cartridge and urge the base plate up against the cartridge location pins 174 and 186.

As illustrated in Figures 11 and 12, the capstan drive motor 80 is gimbal mounted. Specifically, the frame has a large cut-out region 188 in which the motor 80 is located. Pins 190 extending from opposite sides of the motor, and diametrically with respect thereto, are rotatably supported within recesses formed in the portions of the frame 138 defining the cut-out region 188. A coil spring 192 is connected between the motor and the frame and urges the capstan drive roller 56 against the belt capstan roller 50 of the cartridge.

A special bearing structure is utilized to support the head for vertical reciprocation so that different tracks of data can be recorded onto and read from the tape. Due to the extremely small width of the tape (in the preferred embodiment one-quarter inch (6.4 mm)) the head must be vertically moved in a very precise manner. It is important that there be very little tilt of slope in the bearing during vertical movement of the head or else azimuth errors will be created. The read/write support bearing structure 194 is illustrated in detail in Figure 15.

Referring to Figure 15, a cylindrical sleeve 196 has its lower end seated within a receptacle 198 formed in the forward portion of the pivoting

frame 138. The vertically extending sleeve 196 has a horizontal circumferential flange 200 which is firmly seated against the planar section 140 of the frame. A metal shaft 202 extends vertically within the sleeve 196 and is vertically spaced from the inside walls of the sleeves. A smaller diameter section 204 of the shaft is rotatably supported in a bearing 206 rigidly held within the lower end of the cylindrical sleeve 196. A gear 208 is rigidly connected to the lower end of the smaller diameter section 204 of the shaft. A graphite piston 210 is tightly fit around the upper end of the sleeve 196. A glass cylinder 212 surrounds the piston and is vertically reciprocable with respect to the piston.

Preferably the outside diameter of the graphite piston 210 (Figure 15) is extremely close to the inside diameter of the glass cylinder 212. This is so that there will be almost no tilt of the glass cylinder with respect to the graphite piston during relative vertical movement. This in turn insures that there will be very little, if any, azimuth error with respect to the tape in the cartridge. Graphite pistons and glass cylinders manufactured to very close tolerances are available from Airpot Corporation. As an example, parts of this type are available which will insure that the tilt in .25 inches of graphite is a maximum of fifty microinches (1.3 mm), producing less than one minute of arc.

A plastic cylinder 214 (Figure 15) is tightly fit over the glass cylinder 212 and has a shelf 216 extending horizontally therefrom on which the read/write head 62 is securely mounted. The coefficients of thermal expansion of the graphite piston 210, glass cylinder 212 and plastic cylinder 214 are matched to minimize bearing inaccuracies. The upper end of the shaft 202 has a threaded segment 218 and a smooth upper end segment 220. A nut 222 is threadably engaged with the threaded segment 218 of the shaft and is snugly secured into the upper ends of the glass cylinder 212 and the plastic cylinder 214. An air bleed hole 223 extends through the nut 222. A stop 224 is rigidly secured to the smooth upper end segment 220 of the shaft.

Referring to Figure 9, the stepper motor 78 is mounted on the upper side of the frame 138 forward of the bearing support structure for the magnetic head. The output shaft of the stepper motor extends vertically downwardly through a hole in the frame. A gear 228 rigidly secured to the end of the stepper motor output shaft 226 meshes with the gear 208 on the lower end of the shaft 202 (Figures 9 and 15). When the stepper motor is energized, the shaft 202 of the bearing support structure 194 is rotated, causing the glass cylinder 212, plastic cylinder 214, and read/write head 62 to travel vertically.

A leaf spring 230 (Figure 15) has one end secured to the planar section 140 of the frame 138. The other end of the leaf spring presses downwardly on a shelf 232 which extends horizontally from the lower end of the plastic cylinder 214 which carries the read/write head 62. This leaf

spring serves to prevent any slope or slight movement otherwise possible between the nut 222 and the threaded segment 218 of the shaft from introducing any inaccuracies in positioning of the read/write head 62.

Details of the tape access door opening mechanism are illustrated in Figures 19 and 20. A pin 234 is mounted within a horizontal slot 236 formed within a block 238 mounted to the rear side of the side panel 22 of the tray 14. As best seen in Figure 9, the slot 236 has a rounded portion within which the body of the pin can slide. The slot also has a groove portion in which an ear 240 (Figures 9 and 19) connected to the pin 234 can slide. As best seen in Figure 19, the pin 234 is positioned so that its forward end can engage the rearward end 24a of the tape access door of the cartridge 20 when the cartridge has been fully inserted onto the tray 14. This rearward end 24a of the tape access door is forward of the hinge assembly 60 about which the access door pivots.

Linkage means are provided for connecting the pin 234 (Figure 19) with the housing so that during inward movement of the tray to its retracted position, the pin 234 will push against the rearward end 24a of the tape access door to open the same. Referring to Figure 19, the linkage means of the access door opening mechanism includes a telescopic element 244 which is surrounded by a coil spring 246. One end of the telescopic element 244 is attached to the ear 240 of the pin 234 by a pivotal connector 248. The other end of the telescopic element is connected to another ear 250 extending from the side wall of the housing 12 via a pivotal connector 252. The coil spring 246 is slightly compressed between the pivotal connectors 248 and 252 when the tray is in its extended position illustrated in Figure 8.

The operation of the tape access door opening mechanism will now be better understood by a review of the loading sequence. Initially, the cartridge is inserted into the tray 14 as illustrated in Figure 2 when the tray is in its extended position. Thereafter, the operator pushes on the forward end of the cartridge to push the tray to its retracted position in which both the tray and the cartridge are entirely within the housing. Figure 19 illustrates the cartridge 20 fully inserted onto the tray 14 with the tray in its extended position and the tape access door 24 closed.

Inward pushing of the tray as illustrated by the arrow in Figure 20 causes the telescopic element 244 to initially retract in length somewhat. However, the force of the compressed coil spring 246 gradually moves the pin 234 into contact with the rearward end 24a of the tape access door 24. This causes the tape access door 24 to open as the tray is being pushed inwardly, the opening of the tape access door being indicated by the curved arrow in Figure 20.

It should be noted that when the tray and the cartridge are being pushed into the drive, the frame 138 and thus the read/write head and the capstan drive mechanism carried thereby are in their disengaged positions, adjacent the sidewall

of the housing. The various structures in the drive are dimensioned so that the tape access door follows a path which will just clear the bearing support structure 194 and the head 62. When the tray and cartridge have been fully inserted into the drive, the tape access door is in the position illustrated in Figure 7.

The unloading sequence is as follows. Initially the load lever 26 is rotated to the horizontal position shown in phantom lines in Figure 4. This leaves the cartridge loading slot 16 unobstructed. Rotation of the load lever 26 to its horizontal position causes the frame 138 to rotate counter-clockwise to its disengaged position illustrated in Figure 8. This moves the head and capstan drive clear of the cartridge. Thereafter, as the tray is pulled manually out of the housing, the pin 234 slides to the right in Figure 8, so that the cartridge cap be withdrawn.

The file protect sensor 76 (Figure 6) is provided by a Microswitch 254 (Figure 9). The cartridge in place sensor 82 (Figure 6) is provided by a Microswitch 256 (Figure 9) both of the microswitches 254 and 256 are mounted on and carried by the pivoting frame 138.

The EOT/BOT sensing mechanism 70 (Figure 6) is carried by the frame 138 as illustrated in Figure 7. Details of the EOT/BOT sensing mechanism 70 are illustrated in Figure 13. This mechanism includes a housing 258 having a beam 260 which extends over the top of the cartridge 20 adjacent the mirror 66 (Figure 5) mounted therein. Referring again to Figure 13, radiation from an infrared light emitting diode 262 is projected through a top transparent window 264 in the top panel of the cartridge 20. This radiation is reflected off of the angled mirror 66 through perforations 266 (Figure 14) in one end of the length of magnetic tape 44 in the cartridge. Radiation which passes through the perforations in the magnetic tape passes through the front transparent window 68 in the side wall of the cartridge 20. The radiation which passes through the window 68 passes through upper and lower holes 272 and 274 in the side wall of the housing 258. Radiation thus transmitted is detected by upper and lower photo detectors 276 and 278 mounted on the opposite vertical side wall of the housing 258. This sidewall is a small PC board. The various patterns of perforations on the tape and how they are detected as indicating the end of tape, beginning of tape, or early warning holes, is done in conventional fashion.

Claims

1. A drive for an elongate, rectangular tape cartridge (20) of the type having an access door (24) along a side edge thereof which opens by pivoting about an axis substantially perpendicular to a base plate (34) of the cartridge, the cartridge having a length of approximately 152.4 millimeters and a width of approximately 101.6 millimeters, the access door (24) being sized so that it increases the width of the cartridge to approximately 146.0 millimeters when pivoted from a

closed position to a fully open position, and the cartridge further having a belt capstan roller (50) which protrudes from the side edge of the cartridge and can be rotated to wind a length of magnetic tape (44) between a pair of reels (40, 42) inside the cartridge, the drive including a housing (12) for receiving a cartridge of the aforementioned type, a read/write head (62), a capstan drive roller (56), a motor (80) for driving the capstan drive roller, and means for opening the access door (24) of the cartridge (20) upon insertion thereof into the housing (12) to permit the read/write head (62) to engage the tape (44), characterised by:

means (18) defining a slot (16) at a transversely extending end of the housing (12);

the housing having a width that permits the housing to fit within an enclosure having a width of approximately 146.0 millimeters, and the slot (16) being dimensioned to have a cartridge (20) longitudinally inserted therein with its access door (24) initially in its closed position;

means (14, 92) for supporting the cartridge (20) within the housing (12) when the cartridge is longitudinally inserted in the slot (16);

means (234, 236, 238, 240, 244, 246, 248, 250, 252) for pivoting the access door (24) of the cartridge (20) when the cartridge is inserted into the housing (12) through the slot (16), the access door (24) being pivoted from its closed position to a partially open position; and

means (138) for supporting the read/write head (62) and the capstan drive roller (56) within the housing adjacent the cartridge supporting means (14, 92) for movement into and out of engagement with the tape (44) and the belt capstan roller (50), respectively, when the cartridge has been inserted into the housing (12) through the slot (16) and the access door (24) has been pivoted to its partially open position so as to clear the read/write head and expose the tape (44).

2. A drive according to Claim 1, further comprising means (78, 194) for reciprocating the read/write head (62) for movement in a direction substantially perpendicular to a plane of the bottom plate (34) of the cartridge to select one of a plurality of tracks on the tape.

3. A drive according to Claim 1, further comprising manually actuatable means (26, 156, 158, 160, 162, 164, 166) for moving the read/write head (62), the capstan drive roller (56) and supporting means (138) to simultaneously engage the read/write head (62) with the tape (44) and the capstan drive roller (56) with the belt capstan roller (50).

4. A drive according to Claim 1, further comprising at least one movable reference locator means (168, 170, 172, 174, 176, 178, 180, 182) mounted within the housing (12) adjacent the cartridge supporting means (14, 92) for engaging at least one discrete location on the base plate (34) of the cartridge (20) to thereby establish a predetermined azimuth adjustment between the cartridge (20) and the read/write head (62).

5. A drive according to Claim 2 wherein the means (78, 194) for reciprocating the read/write

of the housing. The various structures in the drive are dimensioned so that the tape access door follows a path which will just clear the bearing support structure 194 and the head 62. When the tray and cartridge have been fully inserted into the drive, the tape access door is in the position illustrated in Figure 7.

The unloading sequence is as follows. Initially the load lever 26 is rotated to the horizontal position shown in phantom lines in Figure 4. This leaves the cartridge loading slot 16 unobstructed. Rotation of the load lever 26 to its horizontal position causes the frame 138 to rotate counter-clockwise to its disengaged position illustrated in Figure 8. This moves the head and capstan drive clear of the cartridge. Thereafter, as the tray is pulled manually out of the housing, the pin 234 slides to the right in Figure 8, so that the cartridge cap can be withdrawn.

The file protect sensor 76 (Figure 6) is provided by a Microswitch 254 (Figure 9). The cartridge in place sensor 82 (Figure 6) is provided by a Microswitch 256 (Figure 9) both of the microswitches 254 and 256 are mounted on and carried by the pivoting frame 138.

The EOT/BOT sensing mechanism 70 (Figure 6) is carried by the frame 138 as illustrated in Figure 7. Details of the EOT/BOT sensing mechanism 70 are illustrated in Figure 13. This mechanism includes a housing 258 having a beam 260 which extends over the top of the cartridge 20 adjacent the mirror 66 (Figure 5) mounted therein. Referring again to Figure 13, radiation from an infrared light emitting diode 262 is projected through a top transparent window 264 in the top panel of the cartridge 20. This radiation is reflected off of the angled mirror 66 through perforations 266 (Figure 14) in one end of the length of magnetic tape 44 in the cartridge. Radiation which passes through the perforations in the magnetic tape passes through the front transparent window 68 in the side wall of the cartridge 20. The radiation which passes through the window 68 passes through upper and lower holes 272 and 274 in the side wall of the housing 258. Radiation thus transmitted is detected by upper and lower photo detectors 276 and 278 mounted on the opposite vertical side wall of the housing 258. This sidewall is a small PC board. The various patterns of perforations on the tape and how they are detected as indicating the end of tape, beginning of tape, or early warning holes, is done in conventional fashion.

Claims

1. A drive for an elongate, rectangular tape cartridge (20) of the type having an access door (24) along a side edge thereof which opens by pivoting about an axis substantially perpendicular to a base plate (34) of the cartridge, the cartridge having a length of approximately 152.4 millimeters and a width of approximately 101.6 millimeters, the access door (24) being sized so that it increases the width of the cartridge to approximately 146.0 millimeters when pivoted from a

closed position to a fully open position, and the cartridge further having a belt capstan roller (50) which protrudes from the side edge of the cartridge and can be rotated to wind a length of magnetic tape (44) between a pair of reels (40, 42) inside the cartridge, the drive including a housing (12) for receiving a cartridge of the aforementioned type, a read/write head (62), a capstan drive roller (56), a motor (80) for driving the capstan drive roller, and means for opening the access door (24) of the cartridge (20) upon insertion thereof into the housing (12) to permit the read/write head (62) to engage the tape (44), characterised by:

means (18) defining a slot (16) at a transversely extending end of the housing (12);

the housing having a width that permits the housing to fit within an enclosure having a width of approximately 146.0 millimeters, and the slot (16) being dimensioned to have a cartridge (20) longitudinally inserted therein with its access door (24) initially in its closed position;

means (14, 92) for supporting the cartridge (20) within the housing (12) when the cartridge is longitudinally inserted in the slot (16);

means (234, 236, 238, 240, 244, 246, 248, 250, 252) for pivoting the access door (24) of the cartridge (20) when the cartridge is inserted into the housing (12) through the slot (16), the access door (24) being pivoted from its closed position to a partially open position; and

means (138) for supporting the read/write head (62) and the capstan drive roller (56) within the housing adjacent the cartridge supporting means (14, 92) for movement into and out of engagement with the tape (44) and the belt capstan roller (50), respectively, when the cartridge has been inserted into the housing (12) through the slot (16) and the access door (24) has been pivoted to its partially open position so as to clear the read/write head and expose the tape (44).

2. A drive according to Claim 1, further comprising means (78, 194) for reciprocating the read/write head (62) for movement in a direction substantially perpendicular to a plane of the bottom plate (34) of the cartridge to select one of a plurality of tracks on the tape.

3. A drive according to Claim 1, further comprising manually actuable means (26, 156, 158, 160, 162, 164, 166) for moving the read/write head (62), the capstan drive roller (56) and supporting means (138) to simultaneously engage the read/write head (62) with the tape (44) and the capstan drive roller (56) with the belt capstan roller (50).

4. A drive according to Claim 1, further comprising at least one movable reference locator means (168, 170, 172, 174, 176, 178, 180, 182) mounted within the housing (12) adjacent the cartridge supporting means (14, 92) for engaging at least one discrete location on the base plate (34) of the cartridge (20) to thereby establish a predetermined azimuth adjustment between the cartridge (20) and the read/write head (62).

5. A drive according to Claim 2 wherein the means (78, 194) for reciprocating the read/write



head (62) is mounted on the means (138) for movably supporting the read/write head (62) and the capstan drive roller (56).

6. A drive according to Claim 3 wherein the manually actuatable means includes a load actuating member (26) mounted on the transversely extending end of the housing (12) and movable from an unlocked position clear of the cartridge insertion slot (16) to a locked position in which the load actuating member (26) blocks a portion of the slot (16) to prevent withdrawal of the cartridge (20) therethrough.

Patentansprüche

1. Antrieb für eine längliche, rechteckige Bandkassette, die an einer Seitenkante mit einer Zugangstür (24) versehen ist, die sich durch eine Schwenkbewegung um eine im wesentlichen senkrecht zu einer Basisplatte (34) der Kassette stehende Achse öffnet, wobei die Kassette eine Länge von etwa 152,4 mm und eine Breite von etwa 101,6 mm aufweist und die Zugangstür (24) so ausgelegt ist, daß sie die Breite der Kassette auf etwa 146 mm vergrößert, wenn sie aus ihrer geschlossenen in die voll geöffnete Stellung geschwenkt ist, und wobei die Kassette außerdem mit einer Bandwickelrolle (50) versehen ist, die von der Seitenkante der Kassette abragt und in Drehung versetzbar ist, um eine bestimmte Länge des Magnetbandes (44) zwischen einem Paar von innerhalb der Kassette vorgesehenen Bandspulen abzuwickeln, wobei der Antrieb mit einem Gehäuse (12) zur Aufnahme der Kassette der vorher erwähnten Art sowie ein Lese/Schreibkopf (62), eine Antriebsrolle (56) für die Bandwickelrolle, ein Motor (80) zum Antreiben der Antriebsrolle und Mittel zum Öffnen der Zugangstür (24) der Kassette (20) während des Einschlebens dieser in das Gehäuse (12) vorgesehen sind, um den Lese/Schreibkopf (62) die Berührung des Bandes (44) zu erlauben, gekennzeichnet durch folgende Merkmale:

Mittel (18), die einen Schlitz (16) an einem Querende des Gehäuses (12) definieren;

das Gehäuse besitzt eine Breite, die es erlaubt, das Gehäuse in eine Verkleidung einzupassen, die eine Breite von etwa 146,0 mm aufweist und wobei der Schlitz (16) so ausgelegt ist, daß er eine längs eingeschobene Kassette (20) aufnehmen kann, deren Zugangstür (24) zunächst in der geschlossenen Lage ist;

Mittel (14, 92), um die Kassette (20) innerhalb des Gehäuses (12) zu halten, wenn die Kassette längs in den Schlitz (16) eingeschoben ist;

Mittel (234, 236, 238, 240, 244, 246, 248, 250, 252), um die Zugangstür (24) der Kassette (20) zu schwenken, wenn die Kassette in das Gehäuse (12) durch den Schlitz (16) eingesetzt ist, und zwar so, daß die Zugangstür (24) aus der geschlossenen in eine teilweise offene Lage geschwenkt wird und

Mittel (138), um den Lese/Schreibkopf (62) und die Antriebsrolle (56) für die Bandwickelrolle innerhalb des Gehäuses benachbart zu den Kas-

settenhaltemittel (14, 92) zu halten und zu einer Bewegung zur Berührung des Bandes (44) und der Bandwickelrolle (50) bzw. weg davon zu veranlassen, wenn die Kassette in das Gehäuse (12) durch den Schlitz (16) eingesetzt ist und die Zugangstür (24) sich in ihre teilweise offene Stellung verschwenkt hat, um den Lese/Schreibkopf freizugeben und das Band (44) freizulegen.

2. Antrieb nach Anspruch 1, gekennzeichnet ferner durch Mittel (78, 194), um den Lese/Schreibkopf (62) in einer im wesentlichen senkrecht zu einer Ebene der Grundplatte (34) der Kassette verlaufenden Richtung hin- und herzubewegen, um eine von mehreren Spuren auf dem Band auszuwählen.

3. Antrieb nach Anspruch 1, gekennzeichnet durch manuell betätigbare Mittel (26, 156, 158, 160, 162, 164, 166), um den Lese/Schreibkopf (62), die Antriebsrolle (56) für die Bandwickelrolle und Führungsmittel (138) zu bewegen, um gleichzeitig den Lese/Schreibkopf (62) mit dem Band (44) und die Bandantriebsrolle (56) mit der Bandwickelrolle (50) in Berührung zu bringen.

4. Antrieb nach Anspruch 1, gekennzeichnet durch mindestens einen beweglichen Bezugsstellenanzeiger (169, 170, 172, 174, 176, 178, 180, 182), der innerhalb des Gehäuses (12) benachbart zu den Kassettenhaltemittel (14, 92) angebracht ist, um mindestens eine bestimmte Stelle auf der Grundplatte (34) der Kassette (20) zu berühren und dadurch eine vorbestimmte Scheiteleinjustierung zwischen der Kassette (20) und dem Lese/Schreibkopf (62) zu erreichen.

5. Antrieb nach Anspruch 2, bei dem die Mittel (78, 194) zum Hin- und Herbewegen des Lese/Schreibkopfes (62) an den Mitteln (138) zur beweglichen Halterung des Lese/Schreibkopfes (62) und der Antriebsrolle (56) für die Bandwickelrolle angebracht sind.

6. Antrieb nach Anspruch 3, bei der die von Hand betätigbaren Mittel ein das Laden bewirkendes Teil (26) aufweisen, das an dem Querende des Gehäuses (12) angebracht ist und aus einer unblockierten Lage, in der der Kassetteneinschiebeschlitz (16) frei ist, in eine Blockierlage bewegbar ist, in der das das Laden bewirkende Teil (26) einen Teil des Schlitzes (16) blockiert, um das Herausziehen der Kassette (20) zu vermeiden.

Revendications

1. Entraînement par cassette de bande rectangulaire allongée (20) du type comportant, le long d'un bord latéral de celle-ci, une porte d'accès (24) s'ouvrant par pivotement autour d'un axe essentiellement perpendiculaire à une plaque de base (34) de la cassette, cette cassette présentant une longueur d'environ 152,4 millimètres et une largeur d'environ 101,6 millimètres, la porte d'accès (24) étant dimensionnée de manière à augmenter la largeur de la cassette jusqu'à environ 146,0 millimètres, lorsque'on la fait pivoter d'une position fermée à une position complètement ouverte, et la cassette comportant en outre un galet de cabestan à courroie (50) faisant saillie sur



le bord latéral de la cassette et pouvant être entraîné en rotation pour enrouler une longueur de bande magnétique (44) entre une paire de bobines (40, 42) placées à l'intérieur de la cassette, l'entraînement comprenant un boîtier (12) destiné à recevoir une cassette du type ci-dessus, une tête de lecture/écriture (62), un galet d'entraînement de cabestan (56), un moteur (80) destiné à entraîner le galet d'entraînement de cabestan, et des moyens pour ouvrir la porte d'accès (24) de la cassette (20), lorsqu'on introduit celle-ci dans le boîtier (12), de façon que la tête de lecture/écriture (62) puisse venir s'engager contre la bande (44); entraînement caractérisé en ce qu'il comprend: des moyens (18) définissant une fente (16) disposée transversalement à une extrémité du boîtier (12); un boîtier présentant une largeur lui permettant de s'adapter dans une enceinte d'environ 146,0 millimètres de largeur, et la fente (16) étant dimensionnée de façon qu'on puisse introduire longitudinalement dans celle-ci une cassette (20) dont la porte d'accès (24) est initialement en position de fermeture; des moyens (14, 92) pour supporter la cassette (20) dans le boîtier (12) lorsque cette cassette est introduite longitudinalement dans la fente (16); des moyens (234, 236, 238, 240, 244, 246, 248, 250, 252) pour faire pivoter la porte d'accès (24) de la cassette (20), lorsque cette cassette est introduite dans le boîtier (12) par la fente (16), la porte d'accès (24) pivotant de sa position de fermeture à une position partiellement ouverte; et des moyens (138) pour supporter la tête de lecture/écriture (62) et le galet d'entraînement de cabestan (56) dans le boîtier au voisinage des moyens de support de cassette (14, 92), de façon qu'ils viennent respectivement en contact et hors de contact avec la bande (44) et le galet de cabestan à courroie (50) lorsqu'on à introduit la cassette dans le boîtier (12) par la fente (16), et lorsqu'on a fait pivoter la porte d'accès (24) dans sa position partiellement ouverte de manière à dégager la tête de lecture/écriture et à exposer la bande (44).

2. Entraînement selon la revendication 1, caractérisé en ce qu'il comprend en outre des

moyens (78, 194) pour faire aller et venir la tête de lecture/écriture (62) de façon qu'elle se déplace dans une direction sensiblement perpendiculaire au plan de la plaque de fond (34) de la cassette, pour sélectionner l'une de plusieurs pistes sur la bande.

3. Entraînement selon la revendication 1, caractérisé en ce qu'il comprend en outre des moyens manoeuvrables manuellement (26, 156, 158, 160, 162, 164, 166) pour déplacer la tête de lecture/écriture (62), le galet d'entraînement de cabestan (56) et les moyens de support (138) de manière à amener simultanément la tête de lecture/écriture (62) en contact avec la bande (44) et le rouleau d'entraînement de cabestan (56) en prise avec le galet de cabestan à courroie (50).

4. Entraînement selon la revendication 1, caractérisé en ce qu'il comprend en outre au moins un dispositif de localisation de référence mobile (168, 170, 172, 174, 176, 178, 180, 182) monté dans le boîtier (12) au voisinage des moyens de support de cassette (14, 92) pour venir s'engager, dans au moins une position discrète, sur la plaque de base (34) de la cassette (20) de manière à établir ainsi un réglage d'azimut prédéterminé entre la cassette (20) et la tête de lecture/écriture (62).

5. Entraînement selon la revendication 2, caractérisé en ce que les moyens (78, 194) pour faire aller et venir la tête de lecture/écriture (62) sont montés sur les moyens (138) destinés à supporter en mouvement la tête de lecture/écriture (62) et le galet d'entraînement de cabestan (56).

6. Entraînement selon la revendication 3, caractérisé en ce que les moyens manoeuvrables manuellement comprennent un élément de manoeuvre de charge (26) monté sur l'extrémité transversale du boîtier (12) et pouvant se déplacer pour passer d'une position de déverrouillage libérée de la fente d'introduction de cassette (16), à une position de verrouillage dans laquelle l'élément de manoeuvre de charge (26) bloque une partie de la fente (16) pour empêcher qu'on puisse retirer la cassette (20) par celle-ci.

