SPECIFICATION

Magnetic-tape cassette

The invention relates to a magnetic-tape cassette for use with a cassette recording and/or playback apparatus, hereinafter referred to simply as a "cassette apparatus". The invention relates particularly to a magnetic-tape cassette of the kind (hereinafter referred to as the "kind described") which is adapted for use selectively in a first operative position or a reversed second operative position on the cassette apparatus and which comprises a housing containing a magnetic tape which is carried on two reel hubs arranged side-by-side in the housing, the hubs being rotatable in the housing about parallel axes and each being constructed to receive drive from the cassette apparatus to be rotated thereby for transporting the tape from one reel hub to the other, and the housing comprising two main walls which are disposed opposite one another in planes perpendicular to the axes of rotation of the reel hubs and which have openings through which the reel hubs can receive drive from the cassette apparatus, and a plurality of walls which extend between the two main walls at the peripheries thereof and which include two side walls disposed opposite one another and a rear wall extending between the two side walls at one end thereof.

In a magnetic-tape cassette of the kind to which the invention relates, when the cassette is not mounted on a cassette apparatus a portion of the tape extends along the front of the cassette housing, which is the part opposite the rear wall of the housing. In the front portion of the housing, openings or recesses are provided through which elements of the cassette apparatus can engage this portion of the tape when the cassette is mounted in either of its two operative positions on the apparatus. To protect this portion of the tape against damage, it is known to provide cover means at the front of the cassette housing, which cover means are connected to the housing for pivotal movement relative thereto about an axis parallel to the main walls of the housing between a closed position in which the cover means at least partly cover the portion of the tape which extends along the front of the housing, and an open position in which, when the cassette is mounted in either of its two operative positions on a cassette apparatus, said portion of the tape can be engaged by the relevant elements of the apparatus.

Magnetic-tape cassettes in a variety of versions have gained a high degree of popularity in various fields of application. This may be attributed to the high vulnerability of the magnetic tape when not accommodated in a cassette. The magnetic tapes commonly used in magnetic-tape equipment for the consumer market and also for many semiprofessional and professional uses have a thickness dimension which is very small in comparison with the width dimension. The thickness dimensions generally range between 15 and 40 μm, whilst the width for the more customary magnetic tapes varies roughly between 12 and 25 mm. The magnetic tapes consist of a plastics foil which on one side is provided with a finely dispersed magnetizable material and have an extremely high degree of flexibility. The magnetic-tape cassette affords protection against damaging of the delicate and vulnerable magnetic tape, so that the ease of handling the magnetic-tape medium is substantially improved.

For many simple applications it suffices if the front of the cassette is at least partially closed and is provided with openings for the passage into the cassette of parts of a magnetic-tape apparatus, such as a recording/playback head, an erase head and a pressure

called Compact Cassette, also referred to as Philips cassette, which is generally used for audio purposes. With this cassette the magnetic tape need never be removed from the housing, so that the front may be partly closed and thus affords adequate protection of the magnetic tape against inadvertent touching. It is true that dust can reach the magnetic tape through the openings, but this presents less problems for the relevant purpose.

Still other known cassettes are intended for co-operation with a cassette apparatus which comprises means for partly withdrawing the magnetic tape from the cassette housing and bringing the portion of the magnetic tape thus removed from the cassette housing into contact with the magnetic heads. For audio applications this enables a better guidance of the magnetic tape during its transport from the one reel to the other along the magnetic heads to be obtained, so that higher quality standards in respect of signal recording and reproduction can be achieved. In the previously mentioned Compact Cassette the lace-up is determined by components of the cassette housing, so that the attainable lace-up quality is less high.

In known magnetic video tape equipment for home-entertainment use, which to date are always equipped with rotary magnetic heads which write obliquely oriented closely spaced tracks on the magnetic tape, the magnetic tape should also be withdrawn from the cassette housing. The front of the cassette housing should then not be provided with wall portions which could interfere with the withdrawal of the magnetic tape from the cassette housing. As a result of the absence of wall portions at the front the likelihood of the magnetic tape being touched inadvertently increases. This likelihood is further increased because there should be provided withdrawal

means on the cassette apparatus for withdrawing the magnetic tape from the cassette housing, which means can enter the cassette housing *via* the main walls at the back side of the magnetic tape and should be capable of co-operating with the back side of the magnetic tape during the withdrawal. Therefore, cut-outs which are open towards the front are necessary in the main walls of the cassette for the withdrawal means. These cut-outs expose the edges of the magnetic tape, which greatly increases the likelihood of the magnetic tape being damaged.

Another aspect is that when magnetic-tape cassettes are used on equipment which enable higher quality audio recording and reproduction or which enable video signals to be recorded and reproduced, dust should be prevented from reaching the magnetic tape as far as possible, because this may affect the high quality of recording and reproduction.

Therefore many magnetic-tape cassettes are provided with movable cover means in order to protect the stretched portion of the magnetic-tape which extends along the front of the magnetic-tape cassette when the magnetic-tape cassette is not located on a cassette apparatus.

Magnetic-tape cassettes which are suitable for co-operating with parts of a cassette apparatus in a first position only and which are consequently not suitable for co-operating with a cassette apparatus in a reversed second position, so-called non-reversible cassettes, present less problems in respect of the protection of the magnetic tape, because only one of the two main walls need be provided with cut-outs for the withdrawal of the magnetic tape from the cassette. Such a cassette is for example known from United States Patent Specification US–PS 3,900,172. A cassette cover closes the front of the cassette housing if the cassette is removed from a cassette apparatus. On its side which faces the rear of the cassette the cassette cover is provided with an additional ridge which covers the back side of the magnetic tape when the cassette cover is closed. Although one of the main walls of the cassette has a comparatively large opening this still provides satisfactory protection of the magnetic tape. However, dust can still rather easily reach the magnetic tape and can readily be damaged by the ridge if the stretched portion of the magnetic tape in the cassette is not sufficiently taut.

In the case of reversible magnetic-tape cassettes this solution cannot be adopted. If the housing of a reversible magnetic-tape cassette should have cut-outs in the main walls for the withdrawal of the magnetic-tape from the magnetic-tape cassette, the cut-outs should be formed in the two main walls. From German Offenlegungsschrift 2,552,063 a reversible magnetic-tape cassette of the type mentioned in the preamble is known. At its front this known magnetic-tape cassette has two cassette covers which partly extend along the front of the cassette housing, namely a first cassette cover on the side near the first main wall of the cassette housing and a second cassette cover on the side near the second main wall of the cassette housing. When the cassette covers are closed a part of the first cassette cover is situated in the plane of the first main wall and a part of the second cassette cover is situated in the plane of the second main wall. At the front of the magnetic-tape cassette perpendicular to the said parts there are provided parts which extend parallel to the rear of the cassette housing, which are thus perpendicular to the first-mentioned parts of the cassette covers. The first cassette cover is pivotable about a first pivoting axis disposed near the first main wall of the cassette housing and the second cassette cover is pivotable about a second pivoting axis disposed near the second main wall of the cassette housing. The two pivoting axes are parallel to each other and parallel to the main walls. The cassette covers are provided with gear-segments which engage with each other. When the one cassette cover is pivoted the second cassette cover is thus pivoted simultaneously and to the same extent. Each cassette cover covers the front of the cassette housing over half its height.

When this known magnetic-tape cassette is placed on a cassette apparatus, means on the deck of the cassette apparatus partly open the two cassette covers, after which the magnetic heads are brought into contact with the magnetic tape through the slot between the two cassette covers. The magnetic-tape cassette has cut-outs in the main walls for bringing the magnetic tape into contact with two pressure rollers by means of two capstans on either side of the magnetic head, which capstans are situated at the back side of the magnetic tape.

A disadvantage of this known cassette is that both in the first and in the second position of the magnetic-tape cassette on a cassette apparatus the two cassette covers should be opened. One of the two cassette covers is then always pivoted into a pivoted position in which it faces the cassette apparatus. In the cassette apparatus the magnetic-tape cassette should therefore be supported in such a way that there is a certain clearance between the main wall of the magnetic-tape cassette which faces the cassette apparatus and the parts of the cassette apparatus near said wall. Another drawback is that the opened cassette covers constitute an obstruction to parts of the magnetic-tape apparatus which withdraw the magnetic tape from the cassette, unless the cassette covers are opened very far, which demands a greater clearance, or unless on both sides adjacent the cassette covers, as in the known cassette, cut-outs are formed which open towards the

front, so that the magnetic tape is exposed at these locations. The space required above the cassette for the opened cassette cover is comparatively large, because the cassette cover portion which is disposed in the main wall also pivots upwards. This is a drawback because the overall height of a cassette apparatus should be minimized for obvious reasons.

Therefore, the known magnetic-tape cassette is less suitable for applications where the magnetic tape is to be withdrawn from the cassette housing. Moreover, unless openings are formed in the main walls of the cassette housing on both sides of the cassette covers for the passage of the tape withdrawal elements of a cassette apparatus, which means that there will be locations on both sides of the cassette covers where the magnetic tape can be touched and damaged, the two cassette covers should be pivoted into their open positions before the magnetic-tape cassette is moved to an operating position over the withdrawal elements of the cassette apparatus. However, for thus swinging open the cassette covers before the magnetic tape cassette is completely in its operating position, the known magnetic-tape cassette is less suitable because of the actuation elements for the cassette covers which are then required. Moreover, the part of the cassette cover which faces the deck of the cassette apparatus and which is situated at the front of the cassette housing constitutes an obstruction for the withdrawal elements even if the cassette covers are swung open very far.

It is an object of the invention to provide a magnetic-tape cassette of the kind described which mitigates the above drawbacks.

According to the invention there is provided a magnetic-tape cassette of the kind described in which, at least when the cassette is not mounted on a cassette apparatus, a portion of the tape extends along the front of the cassette housing, and in which in the front portion of the housing, openings or recesses are provided through which elements of the cassette apparatus can engage said portion of the tape when the cassette is mounted in either of its two operative positions on the apparatus, wherein at the front of the cassette housing cover means are provided comprising a single pivotable front cover which in a closed position covers substantially the entire front of the housing and which has two arms which are located one adjacent each of the two side walls of the housing and in the closed position of the cover extend towards the rear of the housing, and which are connected to the side walls by pivotal bearing means which permit pivotal movement of the cover relative to the housing from the closed position selectively to one or the other of first and second open positions, the front cover being pivotable from the closed position to the first open position in a first pivoting direction about an axis parallel to the main walls of the housing, and from the closed position to the second open position in a second pivoting direction about an axis parallel to the main walls of the housing, which second direction is opposite to the first pivoting direction.

In the cassette in accordance with the invention the entire front of the cassette housing is covered, so that also if the main walls have cut-outs which open towards the front of the cassette housing, the tape is protected to some extent against inadvertent touching. As the front cover of the cassette is movable in two pivoting directions, a magnetic-tape cassette is obtained which on its front portion has no obstacles which might impede placing of the cassette on the cassette apparatus or the insertion of elements of the apparatus into the cassette. Above the magnetic-tape cassette a certain clearance is required for the opening movement of the front cover. However, this clearance may be comparatively small and need not be greater than the height of the cassette, and may even be smaller. In most cassette equipment, the cassette is not placed directly onto the deck by hand but is slid into a movable cassette holder, after which the cassette holder is moved towards the deck. The magnetic-tape cassette in accordance with the invention is particularly suitable for such applications, because the movement of the cassette towards the deck allows provisions to be made on the deck for opening the front cover during the movement of the cassette holder. The front cover, which is thus opened during the movement of the cassette holder, does not impede the insertion into the cassette of elements such as capstans, pressure rollers, magnetic-tape retaining elements or elements for withdrawing the magnetic tape from the cassette.

In a simple embodiment of the invention the pivotal bearing means are disposed centrally between the two main walls of the cassette housing and the front cover is pivotable in the first and second pivoting directions about a single pivoting axis located midway between the two main walls. This embodiment reduces the likelihood of the front cover touching the portion of the magnetic tape which extends along the front of the cassette housing during the pivotal movement of the cover, if the pivoting axis is situated more to the rear of the cassette.

In a preferred embodiment of the invention the pivotal bearing means comprise first pivotal bearing means which are situated nearer a first one of the two main walls of the cassette housing than the second of these walls, for pivotal movement of the front cover in the first pivoting direction about a first pivoting axis which is parallel to said main walls and which is situated nearer the first main wall than the second main wall, and second pivotal

bearing means which are situated nearer the second main wall than the first main wall, for pivotal movement of the front cover in the second pivoting direction about a second pivoting axis which is parallel to said main walls and which is situated nearer the second main wall than the first main wall. This embodiment has the advantage that the distance between the portion of the magnetic tape which extends along the front of the cassette housing and the inner side of the front cover, which side faces the magnetic tape, can be reduced and that moreover the pivoting axes can be situated nearer the front of the cassette housing without the risk of the magnetic tape being damaged. Thus smaller cassette dimensions are obtained. A further advantage of this embodiment is that the front cover can be pivoted into a position in which the front side of the cover extends parallel to the main walls of the cassette housing without occupying much room, so that for the elements of the cassette apparatus an optimum accessibility to the magnetic tape is obtained.

Bearing constructions which enable a component to be pivoted in two different pivoting directions about two different parallel pivoting axes are known. Examples of these are the known hinge constructions for swing doors, whilst there are also constructions comprising crosswise-arranged straps. In a simple bearing construction which is suitable for use in the preferred embodiment of the invention, the first pivotal bearing means comprise first bearing journals and first bearing recesses which receive the first bearing journals, and the second pivotal bearing means comprise second bearing journals and second bearing recesses which receive the second bearing journals, each of the first bearing recesses having an opening in its boundary wall through which the associated first bearing journal leaves the first bearing recess when the front cover is pivoted in the second pivoting direction, and each of the second bearing recesses having an opening in its boundary wall through which the associated second bearing journal leaves that second bearing recess when the front cover is pivoted in the first pivoting direction. It is obvious that in such a bearing construction provisions are necessary which prevent the front cover in its closed position, or during its pivotal movement, or in either of its open positions, from becoming detached from the cassette housing by the bearing journals moving out of the bearing recesses. For this purpose arcuate first guide tracks are provided which terminate in the openings in the boundary walls of the first bearing recesses, for guiding the first bearing journals with play when the front cover is pivoted in the second pivoting direction, and arcuate second guide tracks are provided which terminate in the openings in the boundary walls of the second bearing recesses, for guiding the second bearing journals with play when the front cover is pivoted in the first pivoting direction.

The first and second bearing journals may be formed on the arms of the front cover and the first and second bearing recesses and first and second guide tracks in the side walls of the cassette housing. Alternatively, the first and second bearing journals may be formed on the side walls of the cassette housing and the first and second bearing recesses and first and second guide tracks in the arms of the front cover.

The two guide tracks intersect each other midway between the two main walls of the cassette housing. At the location of the intersection there is a possibility that a bearing journal may not move in the corresponding guide track, with the result that the front cover could assume an incorrect position. To prevent this each of the first and second bearing journals may have an elongate cross-section in a plane perpendicular to the respective pivoting axis, and the boundary wall of each of the first and second bearing recesses may be at least partly circular with a diameter substantially equal to the maximum dimension of the elongate cross-section of the associated bearing journal, and the first and second guide tracks may each be formed by a slot or groove having a width which corresponds to the width of the associated bearing journal plus said play and which is smaller than said diameter of the boundary wall of the associated bearing recess so as to inhibit movements of the front cover other than pivotal movements about the first or the second pivoting axis respectively in every position of the cover.

If the bearing journals are formed on the arms of the front cover and the bearing recesses and guide tracks are formed in the side walls of the cassette housing, each of these side walls may be formed with grooves through which the first and second bearing journals on the adjacent arm of the front cover can be inserted in the first and second bearing recesses in the respective side wall by a translational movement of the front cover in a direction perpendicular to the pivoting axes, each of these insertion grooves being open at one end and terminating at the other end in the opening in the boundary wall of a respective one of the first and second bearing recesses, and the bottom of each insertion groove having a portion which slopes to vary the depth of the groove in such a manner that during the initial part of the insertion movement of the front cover there is play between the cover and the cassette housing in the direction of the pivoting axes, and during a subsequent part of the insertion movement the cover is deflected by forces acting between the bearing journal and the bottoms of the insertion grooves. Thus, when the front

cover is being fitted on the housing, the cover is slightly deflected until the bearing journals reach the bearing recesses, whereupon the bearing journals snap into the bearing recesses as a result of the resilience of the front cover. In order to obtain precisely defined open positions of the front cover, if the bearing journals are formed on the arms of the front cover and the bearing recesses are formed in the side walls of the cassette housing, stops may be provided on said side walls for co-operation with the second bearing journals so as to limit the pivotal movement of the front cover in the first pivoting direction, and further stops may be provided on said sidewalls for co-operation with the first bearing journals so as to limit the pivotal movement of the front cover in the second pivoting direction. When guide tracks for the bearing journals are formed in the side walls of the cassette housing, at the ends of the first guide tracks remote from the first bearing recesses, stops may be provided on the side walls of the cassette housing for co-operation with the first bearing journals to limit the pivotal movement of the front cover in the second pivoting direction, and at the ends of the second guide tracks remote from the second bearing recesses, stops may be provided on said side walls for co-operation with the second bearing journals to limit the pivotal movement of the front cover in the first pivoting direction.

The invention is suitable both for audio and for video cassette, both when they are not provided with cut-outs in the main walls of the cassette housing which open towards the front of the housing and when such cut-outs are provided. If cut-outs are provided they are preferably made large enough to permit the passage of elements of cassette apparatus of different types. The presence of large cut-outs opening towards the front of the cassette housing increases the risk of the magnetic tape being damaged and of dust and dirt penetrating into the interior of the cassette. In an embodiment of the invention in which the two main walls of the cassette housing each have a cut-out or cut-outs which opens or open towards the front of the cassette housing and which forms or form an opening or openings in the respective main wall through which elements of a cassette apparatus can engage the rear side of the portion of the magnetic-tape which extends along the front of the housing, adjacent a first one of the two main walls there is disposed a first side plate and adjacent the second main wall there is disposed a second slide plate, each slide plate being movable between a closing position in which it at least partly closes the opening or openings in the adjacent main wall and a retracted position which is nearer the rear of the cassette housing than the closing position and in which the slide plate leaves the opening or openings in the adjacent main wall free. Thus it is possible to have a magnetic-tape cassette which, when it has been removed from the cassette apparatus, is almost completely closed, except of course for the openings in the main walls of the cassette housing for the passage of spindles for driving the reel hubs, but which, when it has been placed on a cassette apparatus, is fully open at the front and also provides satisfactory access to the rear side of the magnetic tape for elements of the cassette apparatus through the cut-outs in the main walls of the cassette housing.

The two slide plates may form parts of a single slide member which is bodily movable between retracted and closing positions corresponding to the retracted and closing positions of the side plates and which comprises the two slide plates and two side walls which extend along the side walls of the cassette housing and which interconnect the slide plates. The slide member may consist of a single component which is manufactured in one piece from a plastics material. These embodiments have the advantage that easy guidance and journalling of the side plates on the cassette housing is assured. Alternatively, the slide member may comprise two identical parts which are each manufactured in one piece from a plastics material and which are provided with snap-connection means for securing the two parts together. As the two parts of the slide member are identical only one tool is required for manufacturing the slide member. The advantage of this embodiment mainly resides in the simplified fitting of the slide member, the two parts of which can readily be fitted separately on the cassette housing and then secured together by the snap-connection means after the reel hubs and the front cover have been mounted in and on the cassette housing respectively. If the two arms of the front cover are located on the outer sides of the side walls of the cassette housing, the side walls of the slide member may be constructed to cover the arms in the closed position of the front cover. Thus, the arms are well protected when the cassette is removed from a cassette apparatus, which means that the comparatively vulnerable pivotal bearing means of the front cover are protected against mechanical damage. Moreover, the cassette is given a clean-cut and smooth appearance, because the bearing means are covered by the side walls of the slide member.

For certain uses of the magnetic-tape cassette in accordance with the invention it may be important that the front cover, when it is open, does not swing back to its closed position under the influence of gravity. To prevent this, resilient means may be provided which load the front cover relative to other parts of the cassette in such a manner that when the front cover is in either of its open positions it

remains in a stable balanced condition in this position under the influence of the resilient load for any orientation of the cassette relative to the direction of the force of gravity. The resilient means may, for example, act on the front cover and on the slide member to urge these components towards each other. Leaf spring constructions are also possible which co-operate with non-circular bearing journals of the front cover. However, it is not always desirable to subject the front cover to a resilient load, because the bistable positions which the cover can assume under the influence of the resilient means demand the use of provisions on the cassette apparatus which allow the cover to be closed against the resilient load.

For moving the slide plates comparatively simple means can be provided on the cassette apparatus. Since the slide plates slide over the main walls of the cassette housing they are eminently suitable to be opened during the operation of inserting the cassette into a cassette holder on the apparatus. Suitably, resilient means may be provided which act both on the cassette housing and on the slide plates so as to urge the slide plates towards their closing positions. The slide plates are then always automatically moved towards their closed positions when the cassette is removed from the cassette apparatus. Moreover, the resilient means permit an automatic ejection, or at least partial ejection, of the cassette from the cassette holder. Accommodating the resilient means in the cassette may be a problem in view of the limited space which is available. When a bodily movable slide member is used, the first and second slide plates of the slide member may be interconnected by a connecting member midway between the two side walls of the slide member and at the rear of the portion of the magnetic tape which extends along the front of the cassette housing, and the resilient means for loading the slide plates towards their closing positions may comprise a compression spring arranged to act between the connecting member and the cassette housing. In the cassette housing, midway between its side walls, a space exists between the two reel hubs, which space can readily accommodate a helically wound compression spring, thus utilizing a space which is generally unused. A further advantage of this embodiment is that owing to the connection between the two slide plates at a location between the two side walls of the slide member, this member has greater rigidity. If the slide member consists of a single component which is manufactured in one piece from a plastics material, the slide member and the connecting member together may constitute a single component manufactured in one piece from a plastics material. As the connecting member is located at the rear of the magnetic tape and thus may give rise to problems when the slide member is to be fitted, the slide member and the connecting member may together be constructed as a unit which comprises two identical parts which are each manufactured in one piece from a plastics material and which are provided with snap-connection means for securing the two parts together. After the reel hubs have been mounted in the cassette housing and, if necessary, also after fitting the front cover, the slide member can be fitted onto the cassette housing by moving the two parts of the slide member towards each other in a direction perpendicular to the main walls of the cassette housing and securing them together by the snap-connection means. Subsequently, the spring can be mounted between the cassette housing and the slide member.

When a bodily movable slide member is used, the slide member and the front cover may be provided with co-operating parts which, when the cover is in either of its open positions and the slide member is moved from the retracted position towards the closing position, cause the front cover to pivot towards its closed position. The advantage of this is that the movement of the slide member to its closing position and the pivotal movement of the front cover from an open position to its closed position can take place simultaneously, namely, when the slide member is moved towards its closing position. The slide member and the front cover may be provided with interlocking means which inhibit movement of the front cover in either of the first and second pivoting directions when the slide member is in the closing position. Thus, it is ensured that the front cover is always closed as long as the slide member is in its closing position. For moving the slide member and subsequently opening the front cover when the cassette is placed on the cassette apparatus, that edge of each of the side walls of the slide member which is remote from the rear of the cassette housing, at least at parts of this edge which are disposed adjacent the main walls of the housing, is arranged for cooperation with stop means in a cassette holder of the cassette apparatus for moving the slide member to its retracted position when the cassette is inserted into the cassette holder. For opening the front cover after the cassette has been inserted and for moving the slide member in the cassette holder, that edge of each of the side walls of the slide member which is remote from the rear of the cassette housing is formed with a recess midway between the slide plates of the slide member, and the front cover is provided with lateral projections which engage in said recesses when the cover is closed. These projections may be used for co-operation with elements on a cassette apparatus which open the front cover of the cassette during the movement of the cassette holder to an operating position.

Each of the slide plates of the slide member will have a length which is roughly equal to the distance between the side walls of the cassette housing and, transversely thereof, a width which is substantially smaller than the length. The width is limited by the fact that the slide member should not in its retracted position impede the drive means which co-operate with the reel hubs. The comparatively large length/width ratio of the slide plates is apt to give rise to jamming, which can occur if the slide member does not perform a purely translational movement between its closing position and its retracted position but also turns slightly about an axis parallel to the axes of rotation of the reel hubs. Since jamming of the slide member is obviously undesirable, a portion of the outer surface of each of the side walls of the cassette housing along which the adjacent side wall of the slide member travels during movement of this member between the closing and retracted positions may be convexly curved with a radius of curvature substantially equal to the distance between the side walls of the cassette housing so that the slide member is free to turn to a limited extent about an axis parallel to the axes of rotation of the reel hubs during its movement between the closing and retracted positions.

Alternatively, the side walls of the slide member may be so dimensioned that in the closing position of the slide member they extend rearwardly beyond the position which the rear edges of the slide plates of the slide member occupy in the retracted position of the slide member. This position, as previously stated, is dictated by the fact that the drive means for the reel hubs should not be impeded by the slide plates. However, the side walls of the slide member may extend further towards the rear of the cassette housing, so that a favourable ratio between the length of the slide member and the width at the location of the side walls of the slide member is obtained. A further advantage of the extended side walls is that when the slide member is in the closing position, they give the cassette a smoother appearance.

The slide member and the cassette housing may be provided with co-operating stop means which prevent the slide member, when it has been mounted on the cassette housing, from sliding off the housing when the front cover has not yet been mounted on the housing or has been removed therefrom. This facilitates manipulation of the cassette during its assembly. If resilient means are provided for loading the slide member towards the closing position, a further advantage is obtained if said cooperating stop means are so arranged that when the slide member is in the closing position said stop means transmit to the cassette housing at least the greater part of the resilient load exerted by the resilient means. With this arrangement the front cover, and thus the pivotal bearing means for the cover, are not loaded by the resilient means.

Embodiments of the invention will now be described in more details with reference to the accompanying drawings, in which:

Figure 1 is a plan view of an embodiment of a magnetic-tape cassette according to the invention having a front cover which is pivotable about a single axis, the cassette being shown in the first operative position,

Figure 2 is a front view of the cassette shown in Fig. 1,

Figure 3 is a similar view to Fig. 1 but showing the cassette in the reversed second operative position,

Figure 4 is a side view of the cassette shown in the preceding figures,

Figure 5 is a detail of Fig. 4, showing in full lines the front cover swung open in the first pivoting direction and showing in broken lines the cover swung open in the second pivoting direction,

Figure 6 is a plan view of an embodiment of a cassette according to the invention whose front cover is pivotable about two pivoting axes and which is provided with a slide member for closing the openings in the main walls of the cassette housing, the cassette being shown in the first operative position,

Figure 7 is a front view of the cassette of Fig. 6,

Figure 8 is a view similar to Fig. 6 but showing the cassette in the reversed second operative position,

Figure 9 is a perspective view of the cassette of Figs. 6 to 8, showing the slide member in its closing position and the front cover in its closed position,

Figure 10 is a view similar to Fig. 9 but with the slide member in its retracted position and with the front cover opened in the first pivoting direction,

Figure 11 is a view similar to Fig. 10 but with the front cover opened in the second pivoting direction,

Figure 12 is a partially exploded perspective view of the cassette of Figs. 6 to 11,

Figure 13 is a view drawn to an enlarged scale of a portion of one of the side walls of the housing of the cassette of Figs. 6 to 12, showing the position of the bearing journals relative to the bearing recesses and the guide tracks when the front cover is closed,

Figure 14 is a view similar to Fig. 13 but showing the positions of the bearing journals when the front cover is opened in the first pivoting direction,

Figure 15 is a sectional view taken on the line XV–XV in Fig. 14,

Figure 16 is a sectional view of the slide member of the cassette of Figs. 6 to 12, taken on the line XVI–XVI in Fig. 12,

Figure 17 is a sectional view of a portion of the slide member taken on the line XVII–XVII in Fig. 16,

Figures 18, 19 and 20 are views of a connecting member for interconnecting the slide plates of the slide member of the cassette of Figs. 6 to 12,

Figure 21 is a perspective view of a one-piece plastics slide member for the cassette of Figs. 6 to 12,

Figure 22 is a perspective view of a slide member consisting of two plastics parts which are secured together by snap connections,

Figure 23 is a sectional view of one of the snap connections for interconnecting the parts of the slide member shown in Fig. 22,

Figure 24 and Fig. 25 are side views drawn to an enlarged scale of an arrangement in which the slide member and the front cover are loaded relative to each other by means of a tension spring, Fig. 24 showing the front cover closed and Fig. 25 showing it open,

Figure 26 is a view similar to Fig. 8 but showing the slide member turned slightly about an axis parallel to the axes of rotation of the reel hubs,

Figure 27 is a perspective view of a cassette similar to the cassette of Figs. 6 to 12 but having a slide member with side walls which are extended towards the rear of the cassette housing,

Figure 28 is a plan view of the cassette shown in Fig. 27,

Figure 29 is a sectional side view of part of a cassette apparatus with a hinged cassette holder, showing a cassette in accordance with the invention inserted in the holder and the slide member of the cassette moved into its retracted position during insertion of the cassette, and

Figure 30 is a view showing the cassette holder of Fig. 29 in its operating position and with the cassette front cover being opened by means provided on the deck of the cassette apparatus.

The magnetic-tape cassette *1* shown in Figs. 1 to 3 is adapted to co-operate with a cassette apparatus in a first operative position, as is shown in Fig. 1, and in a reversed second operative position, as shown in Fig. 3. As is customary with such reversible cassettes, the two main walls are provided with designations "1" and "2" respectively, for the benefit of the user. The cassette comprises first and second reel hubs 2 and 3 respectively, which are arranged side-by-side and are rotatable about parallel spaced axes of rotation. These hubs each have a central opening 4 and 5 respectively for co-operation with a reel hub drive spindle which belongs to the cassette apparatus. Around the central openings 4 and 5 a number of openings 6 and 7 respectively are formed for a reel hub carrier pin of a cassette apparatus. The magnetic-tape cassette *1* is provided with a cassette housing which comprises a first main wall 8 and, parallel thereto, a main wall 9. The main wall 8 has a first opening 10 which is coaxial with the first reel hub 2 in view of its co-operation with a reel drive spindle, and a similar second opening 11 for the second reel hub 3. The second main wall 9 has corresponding first and second openings 12 and 13 respectively. At the short sides of the magnetic-tape cassette the main walls 8 and 9 are interconnected by side walls 14 and 15. A rear wall 16 is disposed at the rear. The reel hub 2 is provided with reel flanges 17 and the reel hub 3 with reel flanges 18. A magnetic tape 19 is connected to the reel hubs 2 and 3 with its two ends, so as to enable it to be wound from the first reel hub 2 to a reel on the second reel hub 3 and back from the second reel hub 3 to reel on a first reel hub 2. Near a front side *20*, which is disposed opposite the rear 16 of the cassette, there is situated a stretched tape portion 21 for co-operation with parts of a cassette apparatus. For keeping the stretched tape portion 21 taut along the front of the cassette housing there are provided tape guide members in the form of two guide rollers 22 and 23 between the two main walls 8 and 9 of the cassette housing. In the main wall 8 three cut-outs 24, 25 and 26 are formed, which are open towards the front *20* of the cassette housing, for the passage of components of a cassette apparatus at the back side of the stretched tape portion 21 and, as the case may be, serving for withdrawing the magnetic tape from the cassette housing. The main wall 9 has corresponding cut-outs 27, 28, and 29 which are open towards the front *20* of the cassette housing.

A cassette cover 30 is connected to the cassette housing and is pivotable relative thereto about a pivoting axis 31, which is parallel to the main walls, between a closed position, shown in Figs. 1 to 4, and an open position which is obtained by a pivotal movement in a pivoting direction towards a main surface of the cassette housing. The cassette cover covers substantially the entire front *20* of the cassette housing. On both sides the cassette cover is provided with pivoting arms 32 and 33 which extend along the respective side walls 14 and 15 of the cassette housing. The pivoting arms comprise free ends 34 and 35 respectively which face the rear 16 of the cassette housing in the closed position. The side walls 14 and 15 of the cassette housing and the pivoting arms 32 and 33 of the cassette cover 30 are provided with pivotal bearing means which co-operate with each other near the free ends 34 and 35 of the pivoting arms 32 and 33. As is shown in Fig. 5 the cassette cover 30 is pivotable from its closed position into two different opened positions. Solid lines in Fig. 5 represent a first open position of the cassette cover 30, which is obtained by pivoting the cassette cover in a first pivoting direction indicated by an arrow 36 towards the first main wall 8 of the

cassette housing. Dashed lines represent a second open position of the cassette cover which is obtained by pivoting the cassette cover in a second pivoting direction in accordance with an arrow 37 towards the second main wall 9. The main wall 8 has slots 38 and 39 which are open towards the front *20* of the cassette housing for the passage of the pivoting arms 32 and 33 when the cassette cover 30 is pivoted in its first pivoting direction 36. The main wall 9 has corresponding slots 40 and 41 for pivoting in the second pivoting direction 37. The bearing means for the pivotal bearing of the cassette cover comprise two bearing journals 42 and 43 near the free ends 34 and 35 of the pivoting arms 32 and 33 and corresponding recesses in the side walls 14 and 15 of the cassette housing. An example of such a recess is the recess 44 in Figs. 4 and 5.

The bearing journals 42 and 43 have a square cross-section and the recesses 44 as well as the corresponding recess, not shown, in the side wall 15 of the cassette housing has a semicircular cross-section. In the side walls at the location of the bearing journals 42 and 43 leaf springs are provided for loading the bearing journals towards the rear 16 of the cassette housing. As an example see the leaf spring 45 in Figs. 4 and 5. Owing to the co-operation of the leaf springs with bearing journals of square cross-section of the cassette cover, it is achieved that the cassette cover is in a stable balanced position, both in its closed position and in its two open positions for any orientation of the magnetic-tape cassette relative to the direction of the force of gravity.

Figs. 6 to 20 relate to a different embodiment of the invention. The magnetic-tape cassette *47* is largely identical to the magnetic tape cassette *1* of Figs. 1 to 5. The cassette comprises reel hubs 48 and 49 with central openings 50 and 51 and openings 52 and 53 which are arranged around the first-mentioned openings. The cassette housing comprises a first main wall 54 and a second main wall 55 with first openings 56 and 57 respectively and with second openings 58 and 59 respectively for the reel hubs 48 and 49. The main walls 54 and 55 are interconnected by side walls 60 and 61 and a rear wall 62. Opposite the rear wall there is located a front side *63*, see Figs. 10 to 12. The cassette housing accommodates a magnetic tape 64 with a stretched tape portion 65 near the front *63*.

A cassette cover 66 substantially covers the entire front *63* of the cassette housing and is on both sides provided with pivoting arms 67 and 68 which extend along the side walls 60 and 61 and which have free ends 69 and 70 which, in the closed position, face the rear 62 of the cassette housing. The side walls 61 and 62 and the pivoting arms 67 and 68 are provided with co-operating pivotal bearing means near the free ends 69 and 70 of the pivoting arms. The cassette cover 66 is pivotable from its closed position, see Figs. 6 to 8, into two different open positions, namely in a first open position, by pivoting in a first pivoting direction 71 (Fig. 10) towards the first main wall 54, and in a second open position, by pivoting in a second pivoting direction 72 (Fig. 11) towards the second main wall 55 of the cassette housing.

In the magnetic-tape cassette *47* the pivotal bearing means comprise first pivotal bearing means, which are situated nearer the side of the first main wall 54, for pivoting the cassette cover 66 in its first direction 71 about a first pivoting axis 73 which is situated nearer the side of the first main wall 54 as well as second pivotal bearing means, which are situated nearer the side of the second main wall 55, for pivoting the cassette cover in the second pivoting direction 72 about a second pivoting axis 74 which is situated nearer the side of the second major wall. The first pivotal bearing means comprise first bearing journals 75 and 76 as well as parts of the magnetic-tape cassette *47* which define first bearing recesses 77 which receive the first bearing journals. Of said first bearing recesses only the bearing recess for co-operation with the bearing journal 75 is shown, namely in Figs. 11 and 12. The second pivotal bearing means comprise second bearing journals 78 and 79 and parts of the magnetic-tape cassette which define second bearing recesses 80 for receiving these bearing journals. Of the second bearing recesses the bearing recess for receiving the bearing journal 78 is shown in Figs. 10 and 12.

The bearing recesses 77 and 80 are partly open at their circumference for moving the bearing journals 75 and 76 out of the corresponding bearing recesses when the cassette cover is pivoted about the second pivoting axis 74 and for moving the bearing journals 78 and 79 out of the associated bearing recesses when the cassette cover 66 is pivoted about the first pivoting axis 73.

Arcuate first guide slots 81 terminate in the first bearing recesses 77 for guiding the first bearing journals 75 and 76 with play when the cassette cover 66 is pivoted into its second pivoting direction 72. Arcuate second guide slots 82 terminate in the second bearing recesses 80 for guiding the second bearing journals 78 and 79 with play when the cassette cover 66 is pivoted into its first pivoting direction 71. As is evident from the drawing the bearing recesses and the guide slots are situated in the side walls 60 and 61 of the cassette housing and the bearing journals are disposed on the pivoting arms 67 and 68 of the cassette cover 66.

As is in particular apparent from Figs. 13 to 15 the bearing recesses 77 and 80 which, as shown, have an at least partly circular cross-

section with a diameter equal to the maximum transverse dimension L of the associated bearing journals 75 or 78 plus the play. The bearing journals have an elongate shape with a width dimension T which is smaller than the length dimension L. The arcuate guide slots have a width dimension W which is adapted to the width dimension T of the associated bearing journal and which is smaller than the diameter of the associated bearing recess. In this way movements of the cassette cover 66 other than in the first or the second pivoting directions 71 and 72 are prevented in any position of the cassette cover by co-operation of the bearing journals and the parts of the side walls 60 and 61 which surround the bearing recesses. The bearing journals are also arcuated, so that they always engage with the associated guide slots in a comparatively accurate manner.

The side walls 60 and 61 have mounting slots 83 to 86 for mounting the bearing journals in the bearing recesses. Figs. 13 and 14 show that the mounting slots 83 and 84 respectively intersect the guide slots 82 and 81 at the location of the intersections C1 and C2 respectively. The mounting slots each have an open entry side for the free entry of the bearing journal into the mounting slots and furthermore a bottom with a profile which extends between a level N1 at which there is play between the cassette cover 66 and the cassette housing, and a level N2 at which the cassette cover is slightly bent by forces between the bearing journals and the bottoms of the mounting slots. As is apparent in particular from Fig. 14 in conjunction with Fig. 15 the cassette cover in its first open position is not only prevented from moving in a direction other than the pivoting direction by co-operation of the first bearing journals, such as the bearing journal 75, with the wall of the associated first bearing recesses 77. Indeed, the second bearing journals, such as the bearing journal 78, co-operate with the side walls of the second guide slots 82 in the pivoted position of the cassette cover. The levels N1 and N2 of the mounting slots have been selected in such a way that also if a bearing journal is situated at the location of an intersection C1 or C2 it is guided by the side walls of the relevant guide slot.

In order to limit the pivotal movements of the cassette cover 66 the side walls 60 and 61 of the cassette housing are provided with stops which co-operate with the bearing journals. It can be seen from Figs. 13 and 14 that the guide slots 82 and 81 are closed at the ends 87 and 88 which are remote from their associated bearing recesses 80 and 77 respectively. At these locations the relevant parts of the side walls 60 and 61 of the cassette housing constitute stops for the bearing journals.

Both main walls 54 and 55 of the magnetic tape cassette *47* have cut-outs 89 and 90 which are open towards the front of the cassette housing for the passage of elements of a cassette apparatus at the back side of the stretched tape portion 65. In order to minimize the penetration of dust into the magnetic-tape cassette, also when the cassette cover is open, the cassette is provided with a closed front wall 91 which only for the purpose of withdrawing the magnetic tape 64 is provided with two openings 92 and 93 at a location of two tape guide rollers 94 and 95 respectively.

Near the first and near the second main wall there are respectively located a first slide plate 96 and a second slide plate 97, which are slidable between a retracted position (Figs. 10, 11) nearer the rear 62 of the cassette housing and a closing position (Figs. 6–9) nearer the front *63* of the cassette housing. In the retracted position the slide plates 96 and 97 leave the cut-outs 89 and 90 in the corresponding main walls 54 and 55 free. In the closing position the cut-outs are completely closed.

The two slide plates 96 and 97 form part of a single slide member *98* which is bodily movable between a retracted position (see Figs. 10 and 11) and a closing position (see Figs. 6 to 9), which member comprises the two said slide plates 96 and 97 as well as two side walls 99 and 100 which extend along the side walls 60 and 61 of the cassette housing and which interconnect the slide plates. For the sake of simplicity the slide member *98* and similar slide members will be referred to hereinafter as "the slide".

The slide *98* is integrally manufactured from a plastic. It is alternatively possible to use a slide 101 as shown in Fig. 22, which comprises slide plates 102 and 103 and side walls 104 and 105. This slide comprises two identical parts which are integrally manufactured from a plastic, the one part comprising the slide plate 102 and the side wall 105 and the other part the slide plate 103 and the side wall 104. The parts are connected to each other by means of snap connections. Fig. 23 shows a cross-section across the snap-connection means, which connect the slide plate 102 to the side wall 104. The connection means comprise a pin 106 with a thickened frusto-conical upper end 107. At the location of the pin 106 the slide plate 102 has two coaxial openings 108 and 109. The opening 109 has the greater diameter and serves for receiving the conical end 107 of the pin 106. This conical end has a diameter which is slightly larger than the opening 108 and when the slide plate 102 is mounted on the side wall 104 it is slightly elastically deformed until the opening 109 is reached. The slide *101* operates in an identical manner to the slide *98*.

In the magnetic tape cassette *47* the two pivoting arms 67 and 68 of the cassette cover

66 are located outside the cassette housing. When the slide *98* is in its closing position the lateral arms 67 and 68 are covered by the side walls 99 and 100 of the slide, so that when the magnetic tape cassette is removed from a cassette apparatus the pivoting arms and thus the bearing means are satisfactorily protected against mechanical damaging. Moreover, a clean-cut appearance is thus obtained.

The complete slide *98* is loaded towards its closing position by means of a pressure spring 110. For this purpose the slide plates 96 and 97 are interconnected by means of a connecting plate 111 halfway between the side walls 99 and 100 at the back side of the stretched tape portion 65. On the connecting plate there is located a pin 112. The pressure spring 110 is fitted around the pin 112 and bears against the connecting plate 111 and against the cassette housing. For this purpose the cassette housing has a cylindrical opening 113, see Fig. 12, midway between its side walls 60 and 61. The connecting member, also see Figs. 18 to 20, not only serves as point of attachment for the pressure spring 110, but also serves to stiffen the slide *98*. The comparatively thin slide plates 96 and 97 can readily be bent, which can be prevented effectively by means of the connecting plate 111. The connecting plate 111 has two slots 114 and 115 which engage with two ridges 116 and 117 in the centre of the slide plates 96 and 97.

Instead of the slide *98* with a separate connecting plate 111 is alternatively possible, see Fig. 21, to employ a slide *118* which is integrated with a connecting plate 119. The slide plates 120 and 121, as well as the side walls 122 and 123, the connecting plate 119 and the pin 124 which is disposed on said plate, are integrally manufactured from a suitable plastic by injection moulding. When such a slide is used the various components should be mounted in such a sequence that the stretched tape portion 65 along the front of the cassette does not constitute an obstruction when the slide is fitted. In order to facilitate the mounting of the pressure spring a pin may be used which is substantially shorter than the pin 124. Instead of the pin a local recess in the surface of the connecting plate may be used in order to prevent undesired lateral movements of the end of the pressure spring.

The slide *101* in accordance with Fig. 22 enables the slide to be mounted after the magnetic tape has been placed in the cassette housing. This slide comprises a connecting plate 125 consisting of two parts 125a and 125b, which are integral with the slide plate 102 and the slide plate 103 respectively. The part 125b is connected to the slide plate 102 by means of a snap connection of the type of Fig. 23 and the part 125a is connected to the slide plate 103 by means of a similar snap connection. The pin 179 also consists of two parts. In respect of this pin the same applies to this pin as remarked with respect to the pin 124, in the preceding paragraph.

The pressure spring 110 ensures that normally speaking the slide *98* is in its closing position when the cassette is not placed on a cassette apparatus, and thus covers the openings 89 and 90 in the main walls of the cassette housing. In its closing position the slide also covers any other openings in the main walls, such as the customary locating openings 126 to 129 for locating the cassette relative to a cassette apparatus with the aid of locating pins provided on the deck of the apparatus. However, the pressure spring 110 also has another function, namely the closure of the cassette cover 66 when the slide *98* is moved to its closing position. For this purpose the slide *98* and the cassette cover 66 are provided with co-operating parts for causing the cassette cover to pivot to its closed position, no matter which of its two open positions the cassette cover occupies. The said co-operating parts, as is evident from Figs. 10 and 11, comprise the sides of the pivoting arms 67 and 68 and parts of the slide plates 96 and 97 which co-operate therewith in a sliding fashion.

The slide *98* and the cassette cover 66 are provided with co-operating latching means for preventing the cassette cover 66 from moving to an open position if the slide *98* is in its closing position, so that a magnetic tape cassette which has been removed from an apparatus cannot readily be opened. This is possible only after at least partly moving back the slide 98 to its retracted position against the force of the pressure spring 110. The said latching means again comprise the sides of the pivoting arms 67 and 68 of the cassette cover 66 and parts of the slide plates 96 and 97 of the slide *98*, namely those parts of the slide pates which, when the slide is in its closing position, cover the pivoting arms 67 and 68 together with the side walls 99 and 100. The latching means also include two projections 130 and 131 on either side of the cassette cover 66.

As is clearly shown especially in Fig. 7 and also in Fig. 9 the cassette cover 66 leaves the sides 132 and 133 of the side walls 99 and 100 of the slide 98 which are remote from the rear 62 of the cassette housing free at locations which are disposed nearer the main walls 54 and 55 of the cassette housing. This has been done for stop means for moving the slide *98* to its retracted position when the magnetic-tape cassette is placed in a cassette holder of a cassette apparatus, see Figs. 29 and 30. These Figures show a part of a cassette apparatus 134 in cross-section at the location of a cassette holder 135. The cassette holder is pivotable about a hinge pin

136 and is thus movable from a cassette insertion position shown in Fig. 29 to an operating position shown in Fig. 30. At its front the cassette holder 135 has a cassette insertion opening. By means of tension springs 139 levers 138 urge a cassette against a partly open bottom plate 140, which is provided with projections 141. During insertion of a cassette these projections co-operate with the front sides 132 and 133 of the slide *98*. When the cassette *47* is inserted into the cassette holder 135 the slide *98* is thus simply moved from its closing position to its more retracted position.

The side walls 99 and 100 of the slide *98* have recesses 142 and 143 which can receive the lateral projections 130 and 131 of the cassette cover in the closed position. In this way the projections 130 and 131 together with the relevant parts of the side walls 99 and 100 of the slide *98* function as latching means for latching the cassette cover in its closed position. However, the projections also serve for opening the cassette cover after the cassette has been inserted into a cassette holder of a cassette apparatus. For this purpose, see Figs. 29 and 30, a cassette apparatus 134 may be provided with a cover opener 144 which with the aid of a pressure spring 145 and a pin 146 is mounted on the deck of a cassette aparatus 134 so as to be movable in a slotted hole 147. In Fig. 29 the slide *98* already occupies its more retracted position, so that the cassette cover 66 can be pivoted. The cassette cover is pivoted when the cassette holder 135 is moved downwards, during which movement the top of the cover opener 144 co-operates with the projection 130 on the cassette cover 66. The projection 131 can co-operate with a similar cassette cover opener in a similar way.

Fig. 26 shows the view of Fig. 8 once again, the side wall 100 of the slide *98* now being moved towards the more retracted position, whilst the side wall 99 is still in a position corresponding to the closing position of the slide. In such a situation the slide *98* can readily become jammed on the cassette housing. In order to prevent such an undesired situation the side walls 60 and 61, at the location of the side walls 99 and 100 of the slide *98*, if these are in their more retracted positions, have been given a curved profile P with a radius of curvature R which is substantially equal to the distance between the two side walls 60 and 61 of the cassette housing. Thus, at least a limited degree of obliquity of the position of the slide *98* relative to the cassette housing is posssible without the slide becoming jammed on the cassette housing. For the sake of simplicity Fig. 26 only shows a single radius R, *i.e.* of the profile P of the side wall 60.

Another possibility of preventing the slide from becoming jammed is shown in Figs. 27 and 28. These Figures show a magnetic-tape cassette *148* which is substantially identical to the magnetic-tape cassette shown in Fig. 6 to 12, except for a slightly different shape of the slide member and the side walls of the cassette housing. Therefore, the magnetic tape cassette *148* will not be described in full detail for the sake of brevity. It comprises a bodily movable slide member *149* with side walls 150, 151. These are provided with prolonged portions 153 and 154 respectively, which face the rear 152 of the cassette housing, so that in the closing position of the slide each side wall of the slide *149* extends beyond the location where the sides 155 and 156 which face the rear of the cassette housing are in the more retracted position of the slide. This location is disposed near two ridges 157 and 158 on the cassette housing. The side walls 159 and 160 of the magnetic tape cassette 148 have corresponding guide slots for guiding the prolonged portions of the side walls of the slide *149*. Fig. 27 shows such a guide slot 161. The prolonged portions 153 and 154 not only prevent the slide 149 from becoming jammed, but, as is shown in Fig. 28, a smoother appearance of the cassette is obtained at least viewed at the main walls, which is desirable from an aesthetical point of view.

In the magnetic-tape cassette *47* the slide member *98* and the cassette housing are provided with co-operating stop means so as to prevent a slide once mounted, from sliding off the cassette housing, when the cassette cover 66 has not yet been mounted or has been removed. The slide is provided with two hooks 162 and 163 (see Figs. 12, 16 and 17), whilst the side walls 60 and 61 of the housing are provided with slots for engagement with the hooks. The Figs. 9 and 12 show such a slot 164, namely in the side wall 60 of the cassette housing. The part of the side wall 60 at the location of the end 165 of the slot 164, see Fig. 12, serves as a stop for the hook 162. The side wall 61 has a similar slot, not shown, and comprises a stop for the hook 163. The location of the end 165 of the slot 164 has been selected so that the hook 162 has reached the end 165 in the closing position of the slide *98*, so that in the closing position the pressure of the spring 110 is transmitted to the side wall 60 of the cassette housing by the hook 162 and to the side wall 161 of the cassette housing by the hook 163. The cassette cover 66 and, in particular, the bearing journals 75 to 79 are not loaded by the pressure spring 110 in the closing position of the slide *98*, because there is always some clearance between the cassette cover 66 and the slide *98* in its closing position.

Figs. 24 and 25 schematically show a part of a magnetic-tape cassette which is largely identical to the magnetic-tape cassette in accordance with Figs. 6 to 12, but in which

there are provided resilient means for loading the cassette cover and the slide member relative to each other. A cassette cover 166 is shown, of which a pivoting arm 167 is journalled on a side wall 168 of the magnetic-tape cassette. Furthermore, there is provided a slide 169, on which a pin 170 is located. The side wall 167 of cassette cover 136 carries a pin 171. Between the two pins a tension spring 172 is mounted. The bearing arrangement of the pivoting arm 167 comprises two bearing journals 173 and 174, bearing recesses 175 and 176, as well as guide slots 177 and 178. In the situation shown in Fig. 24 the cassette cover 166 is in the closed position and the slide 169 is in the closing position. The slide 169 is pulled towards the cassette cover 166 by the tension spring 172, the assembly being in a stable balanced position. Also in the situation of Fig. 25, in which the cassette cover 166 in one of its open positions and the slot 169 has been moved into its more retracted position, the cassette cover 166 is in a stable position under the influence of the forces exerted on it. The connecting line between the pins 170 and 171 extends on such a side of the bearing journal 173 that the cassette cover tends to swing open further. However, this is prevented by co-operation of the bearing journal 174 with the end of its guide slot 178. By suitably dimensioning the spring 172, allowance being made for the weight of the cassette cover 166, the cassette cover is in a stable balanced position for any orientation of the magnetic-tape cassette relative to the force of gravity.

CLAIMS

1. A magnetic-tape cassette of the kind described in which, at least when the cassette is not mounted on a cassette apparatus, a portion of the tape extends along the front of the cassette housing, and in which in the front portion of the housing, openings or recesses are provided through which elements of the cassette apparatus can engage said portion of the tape when the cassette is mounted in either of its two operative positions on the apparatus, wherein at the front of the cassette housing cover means are provided comprising a single pivotable front cover which in a closed position covers substantially the entire front of the housing and which has two arms which are located one adjacent each of the two side walls of the housing and in the closed position of the cover extend towards the rear of the housing, and which are connected to the side walls by pivotal bearing means which permit pivotal movement of the cover relative to the housing from the closed position selectively to one or the other of first and second open positions, the front cover being pivotable from the closed position to the first open position in a first pivoting direction about an axis parallel to the main walls of the housing, and from the closed position to the second open position in a second pivoting direction about an axis parallel to the main walls of the housing, which second direction is opposite to the first pivoting direction.

2. A magnetic-tape cassette as claimed in Claim 1, wherein the pivotal bearing means are disposed centrally between the two main walls of the cassette housing and the front cover is pivotable in the first and second pivoting directions about a single pivoting axis located midway between the two main walls.

3. A magnetic-tape cassette as claimed in Claim 1, wherein the pivotal bearing means comprise first pivotal bearing means which are disposed nearer a first one of the two main walls of the cassette housing than the second of these walls, for pivotal movement of the front cover in the first pivoting direction about a first pivoting axis which is parallel to said main walls and which is situated nearer the first main wall than the second main wall, and second pivotal bearing means which are disposed nearer the second main wall than the first main wall, for pivotal movement of the front cover in the second pivoting direction about a second pivoting axis which is parallel to said main walls and which is situated nearer the second main wall than the first main wall.

4. A magnetic-tape cassette as claimed in Claim 3, wherein the first pivotal bearing means comprise first bearing journals and first bearing recesses which receive the first bearing journals, and the second pivotal bearing means comprise second bearing journals and second bearing recesses which receive the second bearing journals, each of the first bearing recesses having an opening in its boundary wall through which the associated first bearing journal leaves that first bearing recess when the front cover is pivoted in the second pivoting direction, and each of the second bearing recesses having an opening in its boundary wall through which the associated second bearing journal leaves the second bearing recess when the front cover is pivoted in the first pivoting direction.

5. A magnetic-tape cassette as claimed in Claim 4, wherein arcuate first guide tracks are provided which terminate in the openings in the boundary walls of the first bearing recesses, for guiding the first bearing journals with play when the front cover is pivoted in the second pivoting direction, and arcuate second guide tracks are provided which terminate in the openings in the boundary walls of the second bearing recesses, for guiding the second bearing journals with play when the front cover is pivoted in the first pivoting direction.

6. A magnetic-tape cassette as claimed in Claim 5, wherein the first and second bearing

there are provided resilient means for loading the cassette cover and the slide member relative to each other. A cassette cover 166 is shown, of which a pivoting arm 167 is journalled on a side wall 168 of the magnetic-tape cassette. Furthermore, there is provided a slide 169, on which a pin 170 is located. The side wall 167 of cassette cover 136 carries a pin 171. Between the two pins a tension spring 172 is mounted. The bearing arrangement of the pivoting arm 167 comprises two bearing journals 173 and 174, bearing recesses 175 and 176, as well as guide slots 177 and 178. In the situation shown in Fig. 24 the cassette cover 166 is in the closed position and the slide 169 is in the closing position. The slide 169 is pulled towards the cassette cover 166 by the tension spring 172, the assembly being in a stable balanced position. Also in the situation of Fig. 25, in which the cassette cover 166 in one of its open positions and the slot 169 has been moved into its more retracted position, the cassette cover 166 is in a stable position under the influence of the forces exerted on it. The connecting line between the pins 170 and 171 extends on such a side of the bearing journal 173 that the cassette cover tends to swing open further. However, this is prevented by co-operation of the bearing journal 174 with the end of its guide slot 178. By suitably dimensioning the spring 172, allowance being made for the weight of the cassette cover 166, the cassette cover is in a stable balanced position for any orientation of the magnetic-tape cassette relative to the force of gravity.

CLAIMS

1. A magnetic-tape cassette of the kind described in which, at least when the cassette is not mounted on a cassette apparatus, a portion of the tape extends along the front of the cassette housing, and in which in the front portion of the housing, openings or recesses are provided through which elements of the cassette apparatus can engage said portion of the tape when the cassette is mounted in either of its two operative positions on the apparatus, wherein at the front of the cassette housing cover means are provided comprising a single pivotable front cover which in a closed position covers substantially the entire front of the housing and which has two arms which are located one adjacent each of the two side walls of the housing and in the closed position of the cover extend towards the rear of the housing, and which are connected to the side walls by pivotal bearing means which permit pivotal movement of the cover relative to the housing from the closed position selectively to one or the other of first and second open positions, the front cover being pivotable from the closed position to the first open position in a first pivoting direction about an axis parallel to the main walls of the housing, and from the closed position to the second open position in a second pivoting direction about an axis parallel to the main walls of the housing, which second direction is opposite to the first pivoting direction.

2. A magnetic-tape cassette as claimed in Claim 1, wherein the pivotal bearing means are disposed centrally between the two main walls of the cassette housing and the front cover is pivotable in the first and second pivoting directions about a single pivoting axis located midway between the two main walls.

3. A magnetic-tape cassette as claimed in Claim 1, wherein the pivotal bearing means comprise first pivotal bearing means which are disposed nearer a first one of the two main walls of the cassette housing than the second of these walls, for pivotal movement of the front cover in the first pivoting direction about a first pivoting axis which is parallel to said main walls and which is situated nearer the first main wall than the second main wall, and second pivotal bearing means which are disposed nearer the second main wall than the first main wall, for pivotal movement of the front cover in the second pivoting direction about a second pivoting axis which is parallel to said main walls and which is situated nearer the second main wall than the first main wall.

4. A magnetic-tape cassette as claimed in Claim 3, wherein the first pivotal bearing means comprise first bearing journals and first bearing recesses which receive the first bearing journals, and the second pivotal bearing means comprise second bearing journals and second bearing recesses which receive the second bearing journals, each of the first bearing recesses having an opening in its boundary wall through which the associated first bearing journal leaves that first bearing recess when the front cover is pivoted in the second pivoting direction, and each of the second bearing recesses having an opening in its boundary wall through which the associated second bearing journal leaves the second bearing recess when the front cover is pivoted in the first pivoting direction.

5. A magnetic-tape cassette as claimed in Claim 4, wherein arcuate first guide tracks are provided which terminate in the openings in the boundary walls of the first bearing recesses, for guiding the first bearing journals with play when the front cover is pivoted in the second pivoting direction, and arcuate second guide tracks are provided which terminate in the openings in the boundary walls of the second bearing recesses, for guiding the second bearing journals with play when the front cover is pivoted in the first pivoting direction.

6. A magnetic-tape cassette as claimed in Claim 5, wherein the first and second bearing

journals are formed on the arms of the front cover and the first and second bearing recesses and first and second guide tracks are formed in the side walls of the cassette housing.

7. A magnetic-tape cassette as claimed in Claim 5, wherein the first and second bearing journals are formed on the side walls of the cassette housing and the first and second bearing recesses and first and second guide tracks are formed in the arms of the front cover.

8. A magnetic-tape cassette as claimed in Claim 5, 6 or 7, wherein each of the first and second bearing journals has an elongate cross-section in a plane perpendicular to the respective pivoting axis, and the boundary wall of each of the first and second bearing recesses is at least partly circular with a diameter substantially equal to the maximum dimension of the elongate cross-section of the associated bearing journal, and wherein the first and second guide tracks are each formed by a slot or groove having a width which corresponds to the width of the associated bearing journal plus said play and which is smaller than said diameter of the boundary wall of the associated bearing recess so as to inhibit movements of the front cover other than pivotal movements about the first or the second pivoting axis respectively in every position of the cover.

9. A magnetic-tape cassette as claimed in Claims 6 and 8, wherein each of the two side walls of the cassette housing is formed with grooves through which the first and second bearing journals on the adjacent arm of the front cover can be inserted in the first and second bearing recesses in the respective side wall by a translational movement of the front cover in a direction perpendicular to the pivoting axes, each of these insertion grooves being open at one end and terminating at the other end in the opening in the boundary wall of a respective one of the first and second bearing recesses, and the bottom of each insertion groove having a portion which slopes to vary the depth of the groove in such a manner that during the initial part of the insertion movement of the front cover there is play between the cover and the cassette housing in the direction of the pivoting axes, and during a subsequent part of the insertion movement the cover is deflected by forces acting between the bearing journals and the bottoms of the insertion grooves.

10. A magnetic-tape cassette as claimed in Claim 4, wherein the first and second bearing journals are disposed on the arms of the front cover and the first and second bearing recesses are formed in the side walls of the cassette housing, and wherein stops are provided on said side walls for co-operation with the second bearing journals so as to limit the pivotal movement of the front cover in the first pivoting direction, and further stops are provided on said side walls for co-operation with the first bearing journals so as to limit the pivotal movement of the front cover in the second pivoting direction.

11. A magnetic-tape cassette as claimed in Claim 6 or Claims 6 and 8 or Claim 9, wherein at the ends of the first guide tracks remote from the first bearing recesses, stops are provided on the side walls of the cassette housing for cooperation with the first bearing journals to limit the pivotal movement of the front cover in the second pivoting direction, and at the ends of the second guide tracks remote from the second bearing recesses, stops are provided on said side walls for cooperation with the second bearing journals to limit the pivotal movement of the front cover in the first pivoting direction.

12. A magnetic-tape cassette as claimed in Claim 1, in which the two main walls of the cassette housing each have a cut-out or cut-outs which opens or open towards the front of the cassette housing and which forms or form an opening or openings in the respective main wall through which elements of a cassette apparatus can engage the rear side of the portion of the magnetic tape which extends along the front of the housing, wherein adjacent a first one of the two main walls there is disposed a first side plate and adjacent the second main wall there is disposed a second slide plate, each slide plate being movable between a closing position in which it at least partly closes the opening or openings in the adjacent main wall and a retracted position which is nearer the rear of the cassette housing than the closing position and in which the slide plate leaves the opening or openings in the adjacent main wall free.

13. A magnetic-tape cassette as claimed in Claim 12, wherein the two slide plates form parts of a single slide member which is bodily movable between retracted and closing positions corresponding to the retracted and closing positions of the slide plates and which comprises the two slide plates and two side walls which extend along the side walls of the cassette housing and which interconnect the slide plates.

14. A magnetic-tape cassette as claimed in Claim 13, wherein the slide member consists of a single component which is manufactured in one piece from a plastics material.

15. A magnetic-tape cassette as claimed in Claim 13, wherein the slide member comprises two identical parts which are each manufactured in one piece from a plastics material and which are provided with snap-connection means for securing the two parts together.

16. A magnetic-tape cassette as claimed in Claim 13, 14 or 15, wherein the two arms of the front cover are disposed on the outer sides of the side walls of the cassette housing,

and in the closed position of the front cover the side walls of the slide member cover said arms on the outer sides thereof.

17. A magnetic-tape cassette as claimed in any preceding Claim, wherein resilient means are provided which load the front cover relative to other parts of the cassette in such a manner that when the front cover is in either of its open positions it remains in a stable balanced condition in this position under the influence of the resilient load for any orientation of the cassette relative to the direction of the force of gravity.

18. A magnetic-tape cassette as claimed in any of Claims 13 to 16 in combination with Claim 17, wherein the resilient means act both on the front cover and on the slide member to urge these components towards each other.

19. A magnetic-tape cassette as claimed in any of Claims 12 to 16, or in Claim 17 when read as appendant to any of Claims 12 to 16, or in Claim 18, wherein resilient means are provided which act both on the cassette housing and on the slide plates so as to urge the slide plates towards their closing positions.

20. A magnetic-tape cassette as claimed in Claim 19, wherein the first and second slide plates of the slide member are interconnected by a connecting member midway between the two side walls of the slide member and at the rear of the portion of the magnetic tape which extends along the front of the cassette housing, and the resilient means for loading the slide plates towards their closing positions comprise a compression spring arranged to act between the connecting member and the cassette housing.

21. A magnetic-tape cassette as claimed in Claim 14 or any of Claims 16 to 19 when read as appendant to Claim 14, and Claim 20, wherein the slide member and the connecting member together constitute a single component which is manufactured in one piece from a plastics material.

22. A magnetic-tape cassette as claimed in Claim 15 or any of Claims 16 to 19 when read as appendant to Claim 15, and Claim 20, wherein the slide member and the connecting member together form a unit which comprises two identical parts which are each manufactured in one piece from a plastics material and which are provided with snap-connection means for securing the two parts together.

23. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 22 when read as appendant to Claim 13, wherein the slide member and the front cover are provided with co-operating parts which, when the cover is in either of its open positions and the slide member is moved from the retracted position towards the closing position, cause the front cover to pivot towards its closed position.

24. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 23 when read as appendant to Claim 13, wherein the slide member and the front cover are provided with interlocking means which inhibit movement of the front cover in either of the first and second pivoting directions when the slide member is in the closing position.

25. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 24 when read as appendant to Claim 13, wherein that edge of each of the side walls of the slide member which is remote from the rear of the cassette housing, at least at parts of this edge which are situated adjacent the main walls of the cassette housing, is arranged for cooperation with stop means in a cassette holder of a cassette apparatus for moving the slide member to its retracted position when the cassette is inserted into the cassette holder.

26. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 25 when read as appendant to Claim 13, wherein that edge of each of the side walls of the slide member which is remote from the rear of the cassette housing is formed with a recess midway between the slide plates of the slide member, and the front cover is provided with lateral projections which engage in said recesses when the cover is closed.

27. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 26 when read as appendant to Claim 13, wherein a portion of the outer surface of each of the side walls of the cassette housing along which the adjacent side wall of the slide member travels during movement of this member between the closing and retracted positions is convexly curved with a radius of curvature substantially equal to the distance between the side walls of the cassette housing so that the slide member is free to turn to a limited extent about an axis parallel to the axes of rotation of the reel hubs during its movement between the closing and retracted positions.

28. A magnetic-tape cassette as claimed in Claim 13, 14, 15 or 16 or any of Claims 17 to 26 when read as appendant to Claim 13, wherein the side walls of the slide member are so dimensioned that in the closing position of the slide member they extend rearwardly beyond the position which the rear edges of the slide plates of the slide member occupy in the retracted position of the slide member.

29. A magnetic-tape cassette as claimed in Claim 12, 14, 15 or 16 or any of Claims 17 to 28 when read as appendant to Claim 13, wherein the slide member and the cassette housing are provided with co-operating

stop means which prevent the slide member, when it has been mounted on the cassette housing, from sliding off the housing when the front cover has not yet been mounted on the housing or has been removed therefrom.

30. A magnetic-tape cassette as claimed in Claim 29 when read as appendant to Claim 19, wherein said co-operating stop means on the slide member and the cassette housing are so arranged that when the slide member is in its closing position the stop means transmit to the cassette housing at least the greater part of the resilient load exerted by the resilient means which urge the slide plates towards their closing positions.

31. A magnetic-tape cassette substantially as herein described with reference to Figs. 1 to 5 or Figs. 6 to 30.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1982.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.