

PATENT SPECIFICATION (11)

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- (21) Application No. 37869/74 (22) Filed 29 Aug. 1974 (19)
(31) Convention Application No. 2 427 109
(32) Filed 5 June 1974 in
(33) Germany (DT)
(44) Complete Specification published 13 Jan. 1977
(51) INT. CL.² B65D 85/672
(52) Index at acceptance
B8P 8U



(54) IMPROVEMENTS IN OR RELATING TO HOLDERS FOR TAPE CASSETTES

(71) We, IDN INVENTIONS AND DEVELOPMENT OF NOVELTIES A.G., a Swiss Company, of CH-7078 Lenzerheide, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to holders for tape cassettes.

A tape cassette holder which has previously been proposed has a series of adjacent chambers each of which accommodates one cassette and into which the cassettes that are to be stored are pushed from the front. In order that the cassettes should be held firmly in the chambers and that the unwinding and take-up spools for the tape should be locked, a respective longitudinally-movable slider is supported on a side wall of each chamber, the slider carrying locking cams engageable in the core apertures of the cassette to lock the cassette spools. A leaf spring acts on an angled transverse shank of the slider to assist movement of the latter when the cassette is being removed from the holder as described below.

The stored cassettes project out of the holder so that each one can be grasped laterally with the fingers and pulled out when it is required to remove the cassette from the holder.

During removal of a cassette the slider also moves out of the holder for a short distance, assisted by the spring, until it reaches a position in which the cams pivot out of their locking position, whereupon the cassette can be pulled out without hindrance.

The object of the present invention is to create a cassette holder out of which the cassettes no longer partly project in the inserted state and are no longer exposed to the risk of dirt and other damage, and which in addition will offer the advantage that the cassette is particularly easy to remove.

The present invention provides a holder for a tape cassette, comprising a rectangular housing open on one long narrow side and

dimensioned to contain the cassette completely, and locking members for the tape spools of the cassette, the locking members being pivotable into the core apertures of the cassette when the latter is inserted in the housing and being pivotable out of the core apertures during movement of the cassette from the housing, the holder also including a transport slider for the cassette, which is movable within the housing in the direction of movement of the cassette and part at least of which is of L-shaped cross-section whereby, in use, each limb of the L-shaped portion lies adjacent a respective side of the cassette holding means operable to hold the cassette in the inserted position in the housing, and resilient means acting on one limb of the L-shaped portion of the slider whereby, when the holding means is released, the slider automatically conveys the cassette into a removal position.

By way of example only embodiments of the invention will now be described in more detail with reference to the accompanying drawings of which:

Figures 1 and 2 show respectively a first embodiment of the invention in longitudinal section and cross-section along the line II—II in Figure 1.

Figures 3 and 4 show respectively a second embodiment of the invention in longitudinal section and in cross-section along the line III—III in Figure 3.

Figures 5 and 6 show respectively a third embodiment of the invention in longitudinal section and in cross-section along the line IV—IV in Figure 5.

Figure 7 shows a fourth embodiment of the invention in a diagrammatic cut-off cross-section.

Figures 8 and 9 show respectively a fifth embodiment of the invention in longitudinal section and in cross-section along the line V—V in Figure 8.

The holder consists of three parts, i.e. a one-piece housing 1, a transport slider 2, and a pressure spring 3. The housing 1 has a base 4, opposite which the housing 1 is

substantially open to form an entrance for the insertion and removal of a cassette 5, narrow end walls 6 and 7, and side walls 8 and 9. On the outside of the wall 9 strips 10 are arranged which preferably have a dove-tail-shaped cross-section, whilst on the outside of the wall 8 there are grooves 11 shaped to receive the strips 10 of another similar holder. Several similar holders may thus be stacked and combined to form a unit by pushing together the interlocking elements 10, 11.

The end wall 6 is provided along a length 12 from the housing entrance and parallel to the walls 8, 9 with two parallel slots in the area between an adjoining rib mentioned below and the side wall 9. Part of the end wall 6 can therefore be flexibly deflected with respect to the remainder of the end wall so that a spring tongue 13 is produced. The spring tongue 13 has a lug 14 to keep the cassette 5 locked into the inserted position, whilst the key 15 facilitates deflection of the tongue.

In the embodiment shown in Figures 1 and 2, the thickness of the inside of the housing between the two walls 8 and 9 is greater than the width of the cassette 5 at its widest point. Space is then provided for ribs 19 (which project inwards from the inside of each end wall 6 and 7) so that when being inserted and removed the cassette 5 is guided between the ribs 19 and the wall 9 substantially parallel to the side walls.

The end walls 6 and 7 have slots 16 which are aligned with one another and run parallel to the walls 8, 9, and the length of which limits the ejection movement of the transport slider 2 which is restrained by pin line extensions 17 of the transport slider 2 are guided in the slots 16.

The transport slider 2 has an approximately L-shaped cross-section with triangular reinforcing lugs 18. Between its transverse limb 20 and the base 4 of the housing the pressure spring 3 is stressed and is positioned so that it is off-set towards the wall 9. The transverse limb 20 on which the pressure spring 3 acts operates as a lever arm which is pivotable about the axis of the pin extensions 17. The other limb 21 of the transport slider has two projections 22, each of which carries an inwardly-pointing cam 23. When the cassette is pushed in, these cams engage in the core apertures of the cassette 5 and lock them. Between the projections 22 there is a tongue 24 which—as is apparent from Figure 2—is inclined outwardly from the plane of the limb 21. The limb 21 as a whole rests on the side of the ribs 19 furthest from the cassette 5 so that it can execute the tilting movement mentioned previously.

In order to store the cassette, after displacing the spring tongue 13 laterally from the long edge of the cassette where the tape is

exposed and must be protected, the cassette is pushed into the space between the wall 9 and the ribs 19. Lateral strips 25 are provided as side guides on the inside of the end walls but these are not essential. When the cassette meets the transverse limb 20 of the transport slider 2, the spring 3 is compressed and the transport slider is tilted into the position shown by solid lines in Figure 2; the cams 23 are thereby pivoted into the core apertures. As soon as the cassette has been pushed into the position shown by solid lines in Figure 1, the spring tongue 13 springs back and holds the cassette firmly with its lug 14. The spring 3 remains compressed.

If the spring tongue 13 is deflected laterally, perhaps with the finger, the spring 3 pushes the transport slider outwards, and with it the cassette 5. As soon as the pin extensions 17 reach the end of the slots 16, the transport slider cannot be pushed any further, and tilts about the axis of the pin extensions, so that the cams 23 emerge from the core apertures of the cassette. The tilting movement is limited by the tongue 24 meeting the inside of the covering wall 8. The tongue 24 is displaced just so far out of the plane of the shank 21 that when the tongue rests against the covering wall 8 the cams 23 do in fact free the cassette 5 but still rest against it with some friction. This prevents the cassette from being hurled out; due to this frictional retardation it is instead lightly clamped in a convenient position to be grasped. Removal causes no difficulty, since the tongue 24 can yield resiliently when the thickened part of the cassette is pulled over the cams 23.

Both the housing 1 and the transport slider 2 consist of a thermoplastic plastics material. It will be understood that both elements can be produced by means of injection moulds and that the tools involved can be of comparatively low-cost.

In the embodiment shown in Figures 3 and 4, the wall 8 has two groups of two slots each, parallel to the direction of movement of the cassette 5. The first group comprises the guide slots 26, which are intended to limit the travel of the transport slider 2, whilst the second group comprises the control slots 27. In the embodiment, a slot 26 is provided in line with each slot 27, but this is not essential.

The transport slider 2 is in the shape of a drawer with a base 28, impact wall 29 and lateral guide walls 30. In order to save material, the base 28 is provided with a cut-out 31. Counter-slots 32 are formed in the base 28 of the transport slider, aligned with the control slots 27. Located in the base 28 and extending across the slots 32, near the end nearest the impact wall 29, is a thin spindle 33 on which are mounted retaining levers 34 which are pivotable through 90° and are

aligned with the control and counter-slots 27 and 32.

The longer lever arms of the retaining levers 34 engage in the core apertures of the tape coil spools of the cassette 5 when the latter is pushed in, as indicated by solid lines in Figure 4. The shorter lever arms project into the control slots 27 associated with them and are slightly angled. Finally, stops 35 are moulded on the base 28 of the transport slider which are aligned with the guide slots 26 of the wall 8 of the housing.

To assemble the holder, first the spring 3 is inserted into the housing 1; guides (not shown) may be provided for the spring to prevent it from kinking. The levers 34 are then moved over with their long lever arm counter to the insertion direction, so that they substantially disappear in the counter-slots 32 of the transport slider, the position of the spindle 33 and the length of the levers and of the slots being chosen with this in view. The transport slider 2 can now be introduced into the housing with slight pressure, with the wall 8 of the housing being flexibly deformed towards the outside and the base 28 of the transport slider 2 towards the inside to a certain extent. This is possible since both parts are made of a suitable thermoplastic plastic material—preferably polystyrol. This deformation is caused by the stops 35, the oblique surfaces of which facilitate the insertion of the transport slider.

When the transport slider is pushed in far enough, the stops 35 drop into the guide slots 26. The stop surfaces 36 of the stops 35 running normal to the plane of the base 28 prevent the transport slider from being pulled out again without the above mentioned flexible deformation being produced by hand. Since the short lever arm of the retaining levers 34 is slightly angled, they also project somewhat out of the counter-slots during assembly and drop into the associated control slots 27. This position of the transport slider is indicated by dash-dotted lines in Figure 4.

A cassette 5 can now be pushed in, it being necessary to displace the spring tongue 13 laterally to provide access. The cassette first meets the inside of the impact wall 29 of the transport slider. When a slight pressure is exerted inwards on the cassette the transport slider is now pushed in further, compressing the spring 3, until the short lever arms of the retaining levers 34 run onto the end edge of the control slots 27. The retaining levers are thereby pivoted out of the upright position out of the base 28 so that the long lever arms engage in the core apertures and secure the tape spools. In this position of the transport slider 2 with the cassette 5, the spring 3 is almost fully compressed, and the cassette has reached a position in which the lug 14 can spring back and over the outer edge of

the cassette. The cassette is thus held and the spring 3 remains compressed for the ejection operation.

In order to initiate the latter, the key 15 is pressed outwards a little by hand. The spring 3 can then push the transport slider 2 outwards, with the cassette 5, whereupon the short lever arms of the retaining levers 34 meet the other end edge of the control slots 27 and thereby pivot the levers back into a position which is approximately parallel to the direction of movement and recessed into the base 28. The cassette is not catapulted out, since its movement is retarded by lateral strips 37; it can however be completely pulled out. The strips are moulded on the inside of the guide walls 30 of the transport slider.

In the embodiment shown in Figures 5 and 6, two slots 46 with an approximately U-shape are formed in the covering wall 8. The two tongues 47 acting like leaf springs which are thus formed are obliquely angled in the direction of the inside of the housing, and assume the rest position shown by dash-dotted lines in Figure 6.

In addition, the wall 8 has two guide slots 48 parallel to the insertion direction of the cassette 5 and a stop tooth 49 of the transport slider 2 is guided in each slot.

The transport slider 2 has a base 50 which is approximately T-shaped, and at each end of the limbs 52 and 54, 55 of the T angled support sections 53 and 51 are provided. That portion of the slider comprising the longitudinal limb 52 and its support section 53 is of L-shaped cross-section.

The stop teeth 49 are moulded on the longitudinal limb 52, and the helical spring 3 presses on the support section 53 of this limb. The transverse limbs 54, 55 of the slider base effect the lateral guiding of the transport slider and the retention of the cassette 5. In addition, they each have, near the central longitudinal limb 52, an oblique control surface 56, the cutting edge 57 of which faces towards the covering wall 8 of the housing 1.

Assembly is carried out by first inserting the spring 3 into the housing 1. The transport slider is then pushed into the housing 1, with the base 50 being deformed slightly inwards and the wall 8 deformed slightly outwards. This flexible deformation is ensured by the choice of a suitable plastics material for both parts. As soon as the stop teeth 49 reach the guide slots 48 they drop into the latter and the flexible deformation disappears. The transport slider is then in the position indicated by dash-dotted lines in Figure 6.

The holder is now ready to receive a cassette; the transport slider cannot be pushed out by the spring 3 since the stop surfaces 58 of the stop teeth 49 rest against the end edge of the guide slots 48. If a

cassette 5 is now pushed in (whilst gently pushing the spring tongue 13 away sideways as in the previous embodiments) the cassette first meets the inside surface of the support section 53 facing the cassette. When it is pushed in further, the transport slider is pushed further into the housing 1, compressing the spring 3. The oblique control surfaces 56 thereby engage behind the tongues 47, lift the latter inwards out of the base 8, and push them into the core apertures of the cassette, with which the tongues 47 are aligned. The tape spools are thus locked. The tongues are thereby flexibly deformed and return to their rest position when the cassette is removed. For this purpose it is sufficient if the lug 14 of the tongue 13, which has hitherto held the cassette in the inserted position and the spring 3 tensioned, is lifted away from the cassette 5 by exerting slight lateral pressure on the key 15, so that the spring 3 can expand, whereupon the transport slider 2 returns to the position indicated by dash-dotted lines. In order that the cassette should not be catapulted out, braking springs (not shown) can be provided.

Figure 7 shows how, in the kinematic inversion of the embodiment just described, the tongues 47¹ can be provided on the transport slider and the control surfaces 56¹ on the base 8¹ of the housing. In this case it is necessary, as is easily apparent, to reverse the direction in which the tongues extend, and thus they here point away from the insertion aperture of the holder.

In the embodiment shown in Figures 8 and 9 the spring 3 rests on the one hand against the inside of the base 4, and on the other hand on the transverse limb 67 of the transport slider 2 nearest the base 4, and is compressed in the storage position shown. The transport slider 2 is substantially L-shaped in cross-section, with a longitudinal limb 66, the transverse limb 67 and lateral guide surfaces 68. From the surface of the longitudinal limb 66 two stop teeth 69 extend in the direction of the wall 8 of the housing 1 into guide slots 70 which are formed in the wall 8. The end edge 71 of the slots 70, nearest the housing entrance, serves as a stop for the ejection movement of the transport slider. In addition, in the longitudinal limb 66 of the transport slider 2 two approximately U-shaped slots 72 extending lengthwise in the ejection direction are provided, defining tongue-like retaining levers 73. These retaining levers are bent out of the plane of the shank 66 and assume the rest position indicated by dash-dotted lines in Figure 9, out of which they can be flexibly bent into the position shown by solid lines.

In order to assemble the holder explained this far, first the spring 3 is inserted into the housing 1; in order that the spring should not kink, guides (not shown) are preferably

provided. The transport slider is then pushed in, for which purpose the lug 14 is bent aside, until the stop teeth 69 meet the front edge of the wall 8. Since the teeth 69 have an oblique surface, the transport slider can be pushed in further with increased pressure. As soon as the teeth 69 reach the guide slots 70 they fall into the latter.

The holder is now ready to receive a cassette 5. The cassette is placed on the transport slider and pushed into the housing with slight pressure. The retaining levers thereby meet an oblique surface 64 on the free edge of the wall and are pushed inside the housing, whereupon they engage in the core apertures of the cassette and lock the tape spools. When the cassette 5 is pushed in far enough (Figure 8) the lug 14 snaps over the edge of the cassette and holds the cassette firmly. To remove the cassette, the lug is pushed aside with the key 15 so that the spring 3 ejects the transport slider with the cassette; the retaining levers 73 thereby return to their rest position and free the cassette 5. The ejection movement of the cassette 5 can be retarded by means which are not shown. The transport slider is pushed out until the stop teeth 69 engage with the end edges 71.

It should be emphasised that with this embodiment no additional space is required in the housing for the pivoting out of the retaining lever.

WHAT WE CLAIM IS:—

1. A holder for a tape cassette, comprising a rectangular housing open on one long narrow side and dimensioned to contain the cassette completely, and locking members for the tape spools of the cassette, the locking members being pivotable into the core apertures of the cassette when the latter is inserted in the housing and being pivotable out of the core apertures during movement of the cassette from the housing, the holder also including a transport slider for the cassette, which is movable within the housing in the direction of movement of the cassette and part at least of which is of L-shaped cross-section whereby, in use, each limb of the L-shaped portion lies adjacent a respective side of the cassette, holding means operable to hold the cassette in the inserted position in the housing, and resilient means acting on one limb of the L-shaped portion of the slider whereby, when the holding means is released, the slider automatically conveys the cassette into a removal position.

2. A holder according to Claim 1, in which the housing is divided, by means of ribs projecting inwards from walls of the housing, into two chambers, one of which forms a space for accommodating the cassette and the other of which allows room for movement of the transport slider which is



cassette 5 is now pushed in (whilst gently pushing the spring tongue 13 away sideways as in the previous embodiments) the cassette first meets the inside surface of the support section 53 facing the cassette. When it is pushed in further, the transport slider is pushed further into the housing 1, compressing the spring 3. The oblique control surfaces 56 thereby engage behind the tongues 47, lift the latter inwards out of the base 8, and push them into the core apertures of the cassette, with which the tongues 47 are aligned. The tape spools are thus locked. The tongues are thereby flexibly deformed and return to their rest position when the cassette is removed. For this purpose it is sufficient if the lug 14 of the tongue 13, which has hitherto held the cassette in the inserted position and the spring 3 tensioned, is lifted away from the cassette 5 by exerting slight lateral pressure on the key 15, so that the spring 3 can expand, whereupon the transport slider 2 returns to the position indicated by dash-dotted lines. In order that the cassette should not be catapulted out, braking springs (not shown) can be provided.

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In order to assemble the holder explained this far, first the spring 3 is inserted into the housing 1; in order that the spring should not kink, guides (not shown) are preferably

provided. The transport slider is then pushed in, for which purpose the lug 14 is bent aside, until the stop teeth 69 meet the front edge of the wall 8. Since the teeth 69 have an oblique surface, the transport slider can be pushed in further with increased pressure. As soon as the teeth 69 reach the guide slots 70 they fall into the latter.

The holder is now ready to receive a cassette 5. The cassette is placed on the transport slider and pushed into the housing with slight pressure. The retaining levers thereby meet an oblique surface 64 on the free edge of the wall and are pushed inside the housing, whereupon they engage in the core apertures of the cassette and lock the tape spools. When the cassette 5 is pushed in far enough (Figure 8) the lug 14 snaps over the edge of the cassette and holds the cassette firmly. To remove the cassette, the lug is pushed aside with the key 15 so that the spring 3 ejects the transport slider with the cassette; the retaining levers 73 thereby return to their rest position and free the cassette 5. The ejection movement of the cassette 5 can be retarded by means which are not shown. The transport slider is pushed out until the stop teeth 69 engage with the end edges 71.

It should be emphasised that with this embodiment no additional space is required in the housing for the pivoting out of the retaining lever.

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2. A holder according to Claim 1, in which the housing is divided, by means of ribs projecting inwards from walls of the housing, into two chambers, one of which forms a space for accommodating the cassette and the other of which allows room for movement of the transport slider which is

supported so that it is tiltable, the locking members being carried by the slider.

3. A holder according to Claim 2, in which the L-shaped portion of the slider has, in the region of the apex thereof, pin extensions which are associated with slots formed in the housing and running in the direction of movement of the cassette to limit movement of the transport slider when conveying the cassette into the removal position, which pin extensions simultaneously form the pivot axis for the tilting movement of the transport slider.

4. A holder according to Claim 3, in which the resilient means is off-set towards one of the side walls of the housing, and in which the other limb of the L-shaped portion of the slider has a tongue which is bent outwardly of the L-shape and two inward-pointing projections each of which carries a cam and forms a locking member for a tape spool of the cassette.

5. A holder according to Claim 1, in which a pair of slots are formed in the transport slider, in which slots retaining levers are pivotably supported forming the said locking members, the slots being in alignment with control slots in the adjacent wall of the housing.

6. A holder according to Claim 5, in which stops are moulded on the slider and co-operate with aligned guide slots in the adjacent wall of the housing to limit the ejection movement of the slider.

7. A holder according to Claim 1, in which the other limb of the slider is T-shaped in a plane parallel to the said adjacent side of the cassette and has, moulded on the longitudinal limb of the T, stop teeth which are associated with guide slots in the adjacent wall of the housing, and in which the lock-

ing members are tongues cut out of the said adjacent wall and angled towards the inside of the housing, the tongues being associated with oblique control surfaces on the said other limb of the transport slider.

8. A holder according to Claim 1, in which the other limb of the slider is T-shaped in a plane parallel to the said adjacent side of the cassette and has, moulded on the longitudinal limb of the T, stop teeth which are associated with guide slots in the adjacent wall of the housing, and in which the locking members are tongues cut out of the said other limb of the transport slider and angled towards the inside of the housing, the tongues being associated with control surfaces on the said adjacent wall.

9. A holder according to Claim 1, in which the transport slider has, on its other limb, stop teeth which are associated with guide slots in the adjacent wall of the housing, and in which the locking members are levers cut out of, and bent out of, the plane of the said other limb.

10. A holder according to any one of Claims 1 to 9, in which the holding means is arranged on a wall of the housing at the open end thereof to engage over an inserted cassette.

11. A holder for a tape cassette substantially as herein described with reference to and as illustrated by Figures 1 and 2 or Figures 3 and 4 or Figures 5 and 6 or Figure 7 or Figures 8 and 9 of the accompanying drawings.

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