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This invention relates to a device for receiving and displaying rigid, flat articles, such as, for example, CD, audio or video cassettes, in a substantially upright position, comprising a base, in the region of which bearings for supporting the articles in an array one behind another and also slit-shaped guides for the pivotal support of the articles between a rearwardly inclined oblique position and a forwardly inclined oblique position are provided, the guides being equipped for this purpose with support areas, cooperating in pairs, on support walls and the support areas, cooperating in pairs, being so arranged in their mutual position and in their height that the articles are held in both the oblique positions only at locations lower than their horizontal centre-line.

From DE-C-715 042, a drawer device for storage of documents, files, card indexes or other written material is known, a box being provided, on the base of which a grating provided with transverse grooves is laid, in order to prevent sliding of the material stored in the box on its base. For supporting the stored documents, on the other hand, in the upper region of the box transversely disposed, spaced support rods are provided, which virtually effect a subdividing of the box into compartments and against each of which a packet of documents bears in the upper region. In this manner, "flicking through" of the documents contained in each "compartment" can be carried out in order to find a specific document or the like. A quite similar device with a profiled grating insert is furthermore described in US-A-1 900 148. If these known card filing devices were to be used for the storage of CD (Compact Disc)-cassettes, video cassettes, audio cassettes or similar, relatively thick, flat, stiff articles it would hardly be possible to prevent them slipping when "flicking through", and it would therefore be possible only with difficulty to accommodate such articles in orderly manner in these devices and arrange them for viewing, and in particular to ensure searching through without problems. It is just such a "searching through", however, that is essentially desired with the aforementioned articles when they are displayed in the relevant shops (record shops and the like), in a manner similar to that already possible with conventional records when these are stacked simply one behind another in box-like containers. Such box-like containers are, however, also not immediately suitable without further measures for accepting the aforementioned type of articles (cassettes) to allow flicking through, because these articles have a greater thickness and must be tilted to look through them, in which case they easily slip. Also, in the case of all these known devices if used for the aforementioned cassettes, it would be a disadvantage that the articles would rub against one another and become scratched, all the more so if some cassettes had already been removed, because the articles could then no longer be stored in orderly manner.

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In DE-A-2 801 567, an insert for box-shaped storage troughs has already been proposed, which is designed for subdividing these troughs, normally intended for storage of long playing records, into several longitudinal compartments alongside one another for audio cassettes. The audio cassettes must here be placed in separate packs, which comprise upright legend sheets, and these packs are arranged directly behind one another in each longitudinal compartment, the base of the compartment being constructed flat or with ascending steps. Accordingly, here again, the packs containing the tape cassettes easily slip, especially if a compartment is not completely filled, and thus "flicking through" for the better viewing of the individual cassettes is here again not possible.

From US-A-2 263 255 and DE-A-3 017 869 (and their corresponding GB-A-2 050 812), devices for receiving articles, such as audio cassettes or chewing gum packs, are known, wherein a base having a sawtooth profile in section is provided in a box-like receiving container. On the rear side of such a receiving compartment, an inclined support surface formed in one piece with the profiled base is provided, against which the articles, leaning backwards, bear at the rear, the sawtooth profiling of the base being intended to prevent slipping away of the articles, similarly to the profiled base in the above-named, known devices. A "turning over" or "flicking through" of the articles is here not intended, nor possible.

From US-A-3 200 957, a device for the display of packs of meat in self-service shops is described, the packs of meat, arranged behind one another in a flat inclined position, being supported by a profiled floor having retaining strips of triangular section. As a consequence, the partly overlapping packs of meat do not bear directly against one another, so that on the one hand good circulation of cooling air and on the other hand removal of one pack without affecting the others in the row is made possible. To hold the meat packs firmly in the front edge zone, this front edge zone of the packs is engaged by the backwardly, upwardly inclined rear face of the holding strips. Here again "flicking through" of the meat packs, stored as already mentioned obliquely flat, is not intended and is not possible.

As can then be seen from US-A-3 784 269 and FR-A-2 401 783 (to which GB-A-2 005 226 corresponds), a method of storing even thicker articles, such as particularly audio cassettes, pivotally in a box device is seen in providing, for these articles, their own holders, which are pivotally mounted in the box device and receive the articles. The holders may be tub-shaped, with pivots seated in corresponding recesses in the side walls (US-A-3 784 269) or box-shaped with bearing projections provided on the narrow sides, which engage with corresponding bearing recesses in lateral walls (FR-A-2 401 783). A similar mounting is described also in EP-A-85 911, in which magnetic tape cassettes are provided with their own cases, these cases being equipped on the narrow sides with bores, which cooperate as a hinge with bearing pins of a receiving trough. All these solutions are constructionally complicated and expensive, and furthermore they prevent good use of space, which is the objective to be aimed at, to enable the largest number of articles to be accommodated.

/ An improvement

An improvement has already been obtained here by a further proposal (DE-Gbm 84 08 388, to which the unpublished EP-A-155 258 corresponds), according to which for the pivotal support of the cassettes or similar articles transversely extending holding rods are provided in the lower region of same. According to this proposal also, therefore, a kind of three-point support for the articles is attained, but in the known device the mounting of the holding rods is still comparatively complicated and expensive and furthermore problems can also arise if several rows of articles are to be provided alongside one another in a display stand and the holding rods must then extend across the width of the stand; bending of these holding rods can then occur, unless they are made of correspondingly larger diameter, in which case once again there is a worse use of space because then the articles cannot be arranged so close to one another, but must have larger spaces between them.

From WO-A-82/01810, a container for storage of floppy discs is also known, which possesses on its lateral walls integrally formed bearing projections, triangular in elevation, which are provided for the lateral pivotal mounting of plate-shaped hinged dividers, which serve for separating and supporting the stored floppy discs; the bearing projections integrally formed on the lateral walls cooperate here with short, inclined support ribs provided in the two lower corner regions of the longitudinal sides, the hinged dividers comprising in their lower region lateral projections, by which they are held in the relevant pivoted position against the bearing projections and support ribs. These known containers also are thus relatively expensive to make and assemble. Furthermore, it is a disadvantage that when made of plastics, the bearing projections and support ribs easily break off.

A container for magnetic tape cassettes, comprising a lateral pivotal bearing similar in principle to the last-named construction, is finally shown in the unpublished earlier Application EP-A-162 999. Here, flange-like guide seatings are provided on lateral or intermediate walls of the container for the pushing-in of the cassettes from above, and these guide seatings are each provided, for forming a pivoting or tilting bearing, with a middle constriction and abutments diverging from this upwards and downwards, which determine the pivoted positions of the cassettes. For supporting the cassettes, separate lateral bearings are also provided in the region of the container base, these lateral bearings and the lateral guide seatings being in particular formed in one piece. In this known container, therefore, the cassettes are likewise journalled and held only at the sides, leaving free the greater part of the lower edge zone (where the usual thickened cassette portion with the opening for the magnetic tape is present), and having regard to a sufficiently stable fixing of the cassettes simply from the side, the guide seatings must, as illustrated, also be relatively high, apart from the need for a sufficiently firm, massive construction, in order to prevent premature wear or breaking-off of the seatings. Thus again, however, a relatively large distance between successive cassettes and thus bad space utilization results. Furthermore, in this case again as in the previously explained devices, it is a disadvantage that lateral walls and lateral boundaries are of necessity provided, so

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that the possibilities of variation in respect of several rows, alongside one another, of cassettes one behind another or the like are limited.

It is now the objective of the present invention to create a device of the initially named type, by which a plurality of flat, stiff articles, such as especially the aforementioned cassettes, can be displayed to allow "flicking-through" while retaining an orderly alignment and maximum space utilization, the objective being also to achieve simple construction and assembly.

For achieving this objective, the device according to the present invention of the initially stated type is characterized in that the base itself constitutes the bearing for the articles and possesses transverse, groove-shaped recesses, which form the pivotal supports for the articles and hold the articles only at their lower edge. In this construction, therefore, the groove-shaped recesses of the base not only prevent slipping of the articles, as is the case with the known devices having a profiled base, but they also form directly on the base a pivotal support for the article, which both in its rearwardly inclined oblique position and in its forwardly tilted position is "clamped" or "tilted" and thus firmly held in its lower edge region, substantially across its entire width, in the groove-shaped depression in the manner of a three-point support (as seen in cross-section), although the centre of gravity of the article is above the recess and, as viewed in plan, also lies outside the recess. The width of the groove-shaped depressions is chosen to suit the thickness of the articles, the effective distance between the relevant support regions, which do not need to be horizontally opposite one another but can be obliquely opposite one another and thus act upon the articles at different heights, being only slightly greater than the thickness of the articles and in particular being determined according to the desired angle of the articles in their inclined positions. In this manner, "turning-over" of the articles is made possible, without problems, such as flipping of the articles out of the groove-shaped depressions, slipping or the like occurring. As a consequence, furthermore, the advantage is achieved that the articles, even when being "flicked through" are carefully treated and in particular do not rub against one another, because they are held at fixed spacings apart. An orderly, sorted storage of the articles is also always assured, regardless of whether some articles from a row are missing or not. Furthermore, a simple construction is made possible by only one appropriately profiled base needing to be provided, in order to make possible the described pivotal capability of the articles.

From the foregoing it is already apparent that for a closely packed accommodation of objects it is especially advantageous if the transverse groove-shaped recesses of the base support and hold the articles in the two different inclined positions by means of different support regions cooperating in pairs for each position.

/ In particular,

In particular, in order to hold the articles especially securely in their two different inclined positions, it is furthermore of advantage according to this invention if the base has back-cut grooves along its two edges as transverse groove-shaped recesses.

Although the grooved base itself may be plane, it is nevertheless particularly advantageous for a low-friction movement when tilting the articles if the groove-shaped recesses possess at least one section of circular arc shape in cross-section for guiding an edge of the relevant article in its pivotal movement.

An advantageous further embodiment is here furthermore characterized in that the groove-shaped recesses possess two sectors of circular arc form in cross-section, which are separated from each other by a median, rounded-off projection, approximately triangular in cross-section. By these median rounded-off projections, on the one hand a support for the articles during pivoting in the median region of their bottom narrow faces and also, if the lateral faces of the rounded-off projections are appropriately formed, an additional fixing of the articles in their inclined positions is made possible.

It is also favourable in this case if the two circular arc shaped sections are parts of one and the same imaginary cylindrical surface and thus have a common axis. The common cylinder axis then advantageously constitutes also the pivoting axis, for the articles to be tilted over when "flicking through" them, so that with this form of construction the articles are guided with their lower edges in every phase of the movement when tilting or flicking through.

To enable the positioning of the articles in the individual inclined positions to be especially exactly determined, allowing also for manufacturing tolerances, it is advantageous if the support regions for the articles possess, in the region of the groove edges, contact areas and abutment areas extending parallel to each other in pairs, the contact areas being inclined to face upwards and the abutment areas being inclined to face downwards. Between these contact areas and abutment or holding-down areas, the article is exactly located in its forward or rearward inclined position and if several articles are arranged in a row - even densely - behind one another all these articles are substantially parallel to one another with their principal planes, so that even if they are relatively high they cannot interfere with one another.

For achieving an advantageous angle of viewing when viewing the articles from the front sides, it has proved favourable if the contact areas and abutment areas make an angle of approximately 30° with the median plane or plane of symmetry of the relevant groove.

One especially advantageous form of construction of the device according to this invention is characterized in that the grooves are provided in an array rising or falling by steps, the consecutive

/ undercuts of

undercuts of adjacent grooves being mutually offset in height. With this form of embodiment, an especially dense compact arrangement of articles in a row behind one another can be achieved, although sufficient material remains for the walls or ribs separating the grooves to assure sufficient strength even over fairly large lengths.

To enable the device to be better adapted to the particular conditions when mounted in a display case (at least a rising or descending arrangement of the articles of a row being desired to enable the articles to be better viewed), and especially in the case of the aforementioned, mutually offset undercuts, it is advantageous if the grooves are arranged along an imaginary plane which extends inclined at about 8° to a plane perpendicular to the median plane or plane of symmetry of each groove. As a result it is possible, for example, to arrange the grooves to ascend or descend along a plane inclined at 8° to the horizontal, but with the median planes or planes of symmetry of the grooves running vertically, and as a consequence the angles that the articles make to the vertical with their principal planes in both the inclined positions are of equal size and, for example, are 30° . If, in this form of embodiment, however, the aforementioned imaginary plane is arranged horizontally, so that the articles are all at one and the same height, then for the two inclined positions of the articles there are different angles, for example 22° ($30^\circ - 8^\circ$) and 38° ($30^\circ + 8^\circ$), respectively, which depending upon the height of the base of the device, that is upon the height of the device relative to a viewer, can be used for the most favourable viewing possible.

For an arrangement of the device at approximately body height, it is frequently advantageous to arrange the grooves on a horizontal plane, and it may also often be desired to provide equal angles in the forward and rearward inclined positions respectively of the articles. For this case it is favourable if the grooves are disposed along an imaginary plane which extends perpendicularly to the median plane or plane of symmetry of each groove. An identical, symmetrical construction of all the grooves and of the walls bounding these grooves is then made possible, so that the production of a thus profiled base can be simplified. It is therefore furthermore advantageous here if the grooves are separated from one another by symmetrical cross-pieces, initially tapering from bottom to top according to cylindrical area sectors and thereafter thickened to a beading form.

The forms of embodiment so far described are suitable in the same manner advantageously for the display or presentation of CD cassettes, video cassettes and also audio cassettes, it being possible for the different types of video cassettes to be readily accepted and arranged in rows in the groove-like recesses. For the type of video cassettes which are shaped like a book and possess front and rear walls projecting like flanges beyond the actual cassette body, a form of embodiment has also been found advantageous which is characterized in that each of the recesses is divided by medially disposed, hump-shaped fillets, forming two mutually parallel partial grooves, each for receiving one of the overhanging cassette walls. In this form of construction, the

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hump-shaped fillets thus project, at the lower narrow face of the video cassettes, between the front and rear walls and thus provide additional stabilization.

The possibility here also exists of fixing these video cassettes in the inclined position only by one of the two walls, for example in the rearwardly inclined position by the rear or back wall and in the forwardly inclined position by the front wall. Accordingly, it is advantageous according to this invention if each lateral wall of the fillet and the lateral wall, opposite thereto, of the recess define the support areas for the video cassettes in one of their two oblique positions.

To enable, in this case also, the relevant wall of the video cassette to be securely held down in its lower region, it is furthermore favourable if at least the lateral walls of the fillet are constructed with undercuts.

In order furthermore, in this form of embodiment, to guide the video cassettes during their tilting, it is advantageous if the upper face of the hump-shaped fillet is arched to a cylindrical shape to form a slide-guide surface for the lower face of the video cassette between the overhanging front and rear walls.

To achieve the simplest possible construction, it is certainly conceivable for the lateral walls limiting the recesses to be made vertical. The lateral walls of the recesses can then be formed simply by the one flange of angle profiles, which are secured by their other flanges to a base plate. The hump-shaped fillets can, furthermore, also be formed simply by U-profiles secured to a base plate.

For the securing of video cassettes, especially when the lateral walls of the fillets or recesses must not be undercut, it has also been found favourable if at least the lateral walls of the fillet are provided with a friction-increasing facing, for example a foam plastics facing. In these cases it is, of course, also possible to apply a friction-increasing facing or a foam plastics facing over the entire surface of the groove-like recesses, including the hump-shaped fillets.

Normally, the aforementioned book-like video cassettes with overhanging front and rear walls also have an overhanging spine extending beyond the actual cassette body and connecting front and rear wall together. To allow for this construction of cassette and create sufficient space for the downwardly projecting spine in the groove-like recesses, it can be arranged for the hump-shaped fillets to extend only over a portion of the length of the recesses. In the case of the aforementioned construction with angle profiles and U-profiles secured to a base plate, this can be simply arranged by the U-members which form the hump-shaped fillets being made shorter than the angle members which form the lateral walls of the recesses.

/ An interrupted

An interrupted construction of the medially disposed, hump-shaped fillets can also be provided in other ways, such as when the base is made as a plastics moulding, and furthermore cut-outs can be formed in the hump-shaped fillets. Such a construction is especially of advantage when several cassettes are arranged alongside one another in one continuous recess extending across a width of about 1 m or 120 cm, and accordingly one advantageous form of construction of the device according to this invention is here characterized in that the hump-shaped fillets are interrupted at intervals approximately corresponding to the width of the video cassettes, for example are undercut, in order to receive the downwardly extending portions of the spines of the video cassettes.

As already mentioned, the base of the device of this invention itself may be made as a plastics moulding or by the fixing of profiles to a flat base plate. However, in order to make the production especially simple and inexpensive, it has proved advantageous for the base to be formed of an extruded section, especially of aluminium. Base elements of this type, which are formed of lengths of aluminium extrusion, are especially suitable for use in display cases for CD cassettes.

For the larger and heavier video cassettes, on the other hand, a construction has proved favourable which is characterized in that the base is formed of one or more sheet metal profiles, e.g. of steel. It is further advantageous in this connection to join together metal sheets that are not excessively wide to form a bookcase-like display stand for the video cassettes, lengths of metal sheet disposed one behind another being connected together by the engagement of hook-shaped, bent edges.

The aforementioned construction of the base elements as extruded profiles may also be used where the device is intended for domestic furniture, such as in the case of the fitting of such a base into a drawer of a chest of drawers, to make possible a sorted, easily inspected storage of the CD cassettes or similar articles for the private user as well.

In particular for presentation purposes in record or cassette shops, it is on the other hand of particular advantage if the length of the recesses is designed for a plurality of articles adjacent to one another and at least one bar-shaped or rail-shaped divider for separating the thus obtained, adjacent rows of articles disposed one behind another is fixed to at least some of the walls limiting the groove-shaped recesses.

As dividers, however, separating plates between the rows of articles could also be used for instance, which plates are secured, for example, to one end wall and one rear wall of a box-shaped container or trough, in which the device of this invention is provided. In particular, however, in order to be independent of such storage containers and their particular construction and to enable uniform dividers to be provided, it is favourable if the divider, as mentioned, is of bar-shaped or rail-shaped construction and is fixed to at least some of

/ the walls

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the walls which limit the groove-shaped recesses.

It is further advantageous, for simple mounting, if the divider, for example of plastics material, is provided in known manner with elastically deflectable snap projections, projecting from it in pairs, for clamping on the walls. This construction is especially favourable when the device is intended for receiving CD cassettes, so that a reduced loading of the dividers may be expected.

In the case where video cassettes are to be accommodated in the device, a fixed connection of the dividers may prove more advantageous, and one favourable form of embodiment of the device according to this invention is accordingly characterized in that the divider is connected firmly to the walls by welding or sealing, soldering or gluing.

On the other hand, however, it is also possible, for separating articles provided adjacent to one another in the groove-shaped recesses, to provide stop projections e.g. of knob shape for the articles inside the groove-shaped recesses. In this form of construction, the articles thus bear laterally against projections forming stops for them, so that a further lateral displacement and "coming out of line" is avoided. Such a form of construction is favourable when the base is made as a plastics moulding.

As already mentioned, the device of this invention can be accommodated in drawers or pull-out trays, if intended for accommodating cassettes for private persons. The device of this invention may also be provided as an insert (insert base) for conventional seating troughs or the like in shops. The device of this invention may, however, be used with special advantage in cupboard-like display stands, in which case several devices can be arranged one behind another and possibly one above another. In particular, that form of embodiment of the device of this invention has proved favourable, in which the grooves are provided in a step-shaped, ascending or descending arrangement, because this ascending or descending arrangement can at the same time be used for an optimum space utilization in the display case, while still allowing easy inspection by the viewer.

Accordingly, the invention also relates to an arrangement comprising a plurality of devices according to this invention in a display case, and such an arrangement is characterized according to this invention in that the devices are provided one behind another in the lower region of the display case, shaped in known manner in side view substantially as a concave mirror, each device having its base inclined with a rearwardly descending arrangement of the grooves of each of the bases commencing at the same height, the articles in their forward inclined position being at a smaller angle to the vertical than in their rear inclined position and the difference in height between the rear end of the base of one device and the front end of the base of the device next behind being approximately equal to the height of an article in the rearwardly inclined position.

/ It may be

It may be mentioned here that a display case shaped in side view approximately like a concave mirror and having horizontal rows of storage compartments arranged like shelves in the upper part of the case, has already been proposed (DE-GbM 84 19 448), but in that arrangement box-shaped, horizontal receiving compartments are provided ascending by steps behind one another in the lower part of the case. This arrangement of the case has proved very effective, and by the construction according to the present invention with the inclined position of the rows of compartments formed each by one device of this invention, which is based upon the stated step-shaped, ascending or descending arrangement of the grooves, there are now achieved, on the one hand, the advantage of a still better space utilization with the accommodation of still more cassettes and, on the other hand, the advantage of a further improved accessibility to the CD cassettes in the compartments.

In addition, space utilization can be still further improved if above the rearmost device there are provided two further devices, of which the lower is also disposed with its base descending towards the rear and the upper one with its base ascending towards the rear.

It has already been mentioned above that the base of the present device may be made not only from aluminium extrusions or profiled metal sheets but also as a plastics component. Deep-drawing or vacuum moulding of a sheet of thermoplastics material is appropriate here, but this does present problems in the case of the aforementioned construction of the groove-shaped recesses with undercut edges. In general, in vacuum moulding, a sheet or plate of thermoplastics material is first heated and then brought to the mould and moulded according to the approximate shape of the mould. The plastics material receives the final shape by closely pressing it onto the mould surface by applying a vacuum to the mould or suction ducts provided therein, so that the plastics material is sucked intimately onto the mould surface. After the plastics material has been allowed to cool and set, the article obtained can be removed from the mould. In order to produce articles with undercut zones, the mould is usually divided, it being possible for the mould parts to be adjusted independently of one another when removing the shaped moulding, in order to release the undercut zones of the article, so that "locking" of the undercut in the mould is released. Divided moulds of this type are, however, cumbersome and expensive to make and to use.

The subject of the present invention is therefore also a method of making devices according to this invention, as stated, by which in a simple manner undercuts at the groove edges of vacuum-moulded devices, i.e. base components, can be produced, while nevertheless the articles can be easily removed from the mould. Furthermore, account shall be taken of the circumstance that vacuum-moulded base components of this type must possess sufficient strength to enable them to accept several rows of, for example, video cassettes.

/ Accordingly,

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Accordingly, the method according to this invention is characterized in that a sheet of thermoplastics material is heated and is pressed by means of vacuum onto a mould provided with suction ducts, on which mould support fillets, for example of steel sheet or plastics, shaped, for example cranked, to correspond to the undercut groove edges, have previously been releasably mounted, the sheet being shaped around these support fillets during its suction onto the mould, and that, thereafter, the shaped sheet is cooled and, together with the support fillets, is removed from the mould. In this production technique, a support fillet conforming to the back-cut groove edge is thus used as "lost mould part" and the sheet is moulded around these lost mould parts as it is sucked onto the mould, the sheet being deformed to the shape of these support fillets and thus acquiring the desired undercut shape. Certainly, care must be taken to ensure that the vacuum or partial vacuum is applied in the vicinity of the support fillets, to suck the sheet onto the support fillets as well, and accordingly it is advantageous if at least some of the suction ducts in the mould open onto the mould surface adjacent to the recesses for the shaft regions of the support fillets.

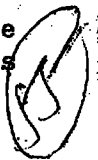
After the plastics material has set, the vacuum-moulded base component is removed from the mould together with the support fillets, which now form a part of this component. In addition to the advantage that a simple mould can be used for the production of the base components with undercut groove edges, the further advantage is achieved that the support fillets constitute a "reinforcement" of the base component, so that the base components made in this way exhibit improved strength, stiffness etc. As a consequence, dimensions of, for instance, 100 x 40 cm are readily possible for these base components.

It would be conceivable to clamp the support fillets by their ends to the mould or to attach them releasably to the mould by means of a releasable bonding agent, such as a wax. For an especially simple fitting and removal, however, it is advantageous for the support fillets to be inserted each with a shaft region into a recess in the mould.

If the shaft region on the lower face of the thus produced base component is not a nuisance, it can readily be left in place without further work. It may, however, also be useful for the projecting shaft regions of the support fillets to be cut off after the vacuum-moulded component has been removed from the mould. Cutting off can be effected by cutting through or grinding away.

It has furthermore proved advantageous according to this invention if a bonding or binding agent, for example adhesive, is applied to the support fillets before the sheet is sucked onto them, in order to reinforce the bond between the support fillets and the plastics material of the sucked-on sheet.

/ It is also

It is also advantageous if the bond between the support fillets, made of plastics, and the plastics material of the vacuum-moulded sheet is reinforced by welding or sealing. 

One favourable possibility of doing this is to reinforce the bond by ultrasonic welding.

In the mould to be used for the method of this invention, the recesses advantageously extend from the mould surface into the mould, substantially corresponding to the direction in which the vacuum-moulded base component is withdrawn from the mould. In this manner an especially simple, easy removal of the base component produced from the mould is assured, although it would certainly also be possible, if support fillets elastic within certain limits were used, to allow the recesses to run at an angle to the direction of removal of the base components from the mould, in which case the support fillets, that is their shaft regions, would be elastically bent on removal of the base components.

Brief description of the drawings

The invention is explained in greater detail below by reference to examples of embodiment thereof illustrated in the drawing.

In detail, the Figures in the drawing show:

Fig. 1 a schematic front view of a device for accommodating and displaying CD cassettes;

Fig. 2 to larger scale, a longitudinal section through this device along the line II-II in Fig. 1;

Fig. 3 a part section through this device to larger scale, to illustrate the construction of the grooves that accommodate the CD cassettes;

Fig. 4 a cross-section through a bar-shaped divider, as provided in Figures 1 and 2, on the line IV-IV in Fig. 2;

Fig. 5 a sectional view corresponding to Fig. 3 of a different form of embodiment;

Figures 6 to 8, sectional views corresponding to the views of Figures 3 and 5 of three further forms of embodiment, intended especially for accommodating video cassettes;

Fig. 9 a partial plan on the form of embodiment of Fig. 8;

Figures 10 and 11, each a schematic elevation of a display case with an arrangement of devices constructed according to this invention for receiving CD cassettes (Fig. 10) and video cassettes (Fig. 11);

/ Fig. 12

Fig. 12 in a highly schematic illustration of principles, a known arrangement for the vacuum moulding of plastics sheets; and

Fig. 13 a detail sectional view of a part of a mould with support fillets removably mounted thereon and a thermoplastics sheet vacuum moulded around them for producing a device in the shape of a profiled base component according to Fig. 6.

In the especially preferred device referenced generally 1 illustrated in Figures 1 to 3, several rows of CD (Compact Disc) cassettes as stiff, flat articles, accommodated behind one another, are displayed in substantially upright inclined positions. In Fig. 1, two rows of CD cassettes 2 are indicated schematically in a part elevation, wherein according to Fig. 2 each row may contain eleven CD cassettes 2 behind one another; however, further rows, for example ten or twelve rows adjacent to one another, are of course conceivable in a display case, stand or box or similar device. These rows are advantageously kept separate from one another by rail-shaped or bar-shaped dividers 3, indicated schematically in Figures 1 and 2, extending between the rows; these dividers 3 are explained in more detail later.

The device 1 consists essentially of a base 4, possessing a specific profile seen in Fig. 2, which base preferably extends across the entire width of all the rows and thus for example may have a longitudinal extent, according to the view in Fig. 2 perpendicular to the plane of the drawing, of for example 120 cm. It may be mentioned here that the view in Fig. 2 shows approximately the natural size of the cross-sectional dimensions of the base 4 and of the CD cassettes 2 (of which only the lower region is visible). The base 4 comprises several, in the present example eleven, groove-shaped recesses 5 behind one another, hereinafter termed grooves 5, which serve for accommodating the lower narrow sides and edge zones of the CD cassettes 2 and serve as pivotal mountings for these CD cassettes 2 and for supporting them simply at their lower edge zone, the grooves holding the CD cassettes firmly both in a backwardly inclined, normal inclined position, which is illustrated in Fig. 2 in full line, and also in a forwardly pivoted inclined position, illustrated by broken line in Fig. 2, and securing the cassettes not only against slipping but also against tipping out. In the inclined position, a support for the relevant CD cassette 2 is provided at three points, namely in the base region of the groove 5 on the one hand and in the upper edge regions of the mutually opposite side or support walls 6, which limit the grooves, on the other hand, different support regions coming into action in the backwardly inclined position and in the forwardly inclined position of the CD cassettes, as will be explained in greater detail below by reference to Figure 3.

As can be seen from Fig. 2 and especially from Fig. 3, the grooves 5 are separated from one another by walls in the form of cranked cross-pieces 7, these cross-pieces 7 constituting the aforementioned support walls 6, which bound the grooves 5. At each longitudinal side of a

/ groove 5,

groove 5, two support zones are provided one above another, namely a lower abutment area 8, inclined to face downwards, which can also be designated holding-down area, and, above this, a contact area or support area 9, inclined to face upwards, on which the CD cassette 2 bears obliquely. In each case the abutment area 8 on one longitudinal side of a groove 5 lies parallel to the contact area 9 on the opposite longitudinal side of this groove, these areas 8, 9 or imaginary extension planes passing through them each making an angle of 30° with a median plane or plane of symmetry 10, shown vertically in Fig. 3, of the grooves 5. This median plane 10 can, therefore, also be designated plane of symmetry, because in the present example of embodiment, as can be seen from Fig. 3, the grooves 5, starting from the groove base, are symmetrically formed about this plane 10 as far as the contact area 9, only the right-hand contact area 9 in each case being extended compared with the left-hand contact area. This extension results from the fact that, in the example according to Figures 2 and 3, the grooves 5 are arranged ascending in stepped manner one behind another, so that the undercuts or undercut edges of the grooves 5, which are defined by the abutment areas 8 inclined to face downwards, are offset in height from one another at adjacent grooves 5. As a consequence, the cross-pieces 7 separating the grooves 5 from one another also have a cranked appearance. The grooves 5 ascend along an imaginary plane 11, which in the present case constitutes, for example, the lower face of the base component 4 and is inclined to the horizontal plane 12 at 8° , the horizontal plane 12 being perpendicular to the aforementioned median plane 10. With this arrangement, therefore, it follows that the CD cassettes 2 both in the rearward, normal inclined position and also in the forwardly tilted inclined position make an angle of 30° to the vertical. If the base 4 were to be arranged with the plane 11 aligned horizontally (so that according to the view of Fig. 3 the median plane 10 would be inclined to the right at 8° to the vertical), the CD cassettes 2 would, in the one inclined position, for example the rearward inclined position (if the right side according to the view of Figures 2 and 3 is regarded as the rear side of the device 1), make an angle of 38° with the vertical, i.e. somewhat more steeply inclined, whereas in contrast in the other (e.g. forward) inclined position they would make an angle of simply 22° with the vertical, i.e. would be more upright. Such an arrangement can, for example, be provided when the device 1 is accommodated at a relatively low position in a case or box, where viewing takes place from a higher level, but in contrast a reverse arrangement (in the last-mentioned example, the left side in Fig. 3 would then be the rearside of the device 1) could be chosen if the device were situated at a higher level, especially at eye level, in which case it is then advantageous for the CD cassettes 2 which are tilted forwards "out of the way" to be arranged flatter, to provide a better view of the backwardly inclined, but more upright CD cassettes 2 situated behind them. Of these special characteristics of the described device 1, use can be made with advantage in the arrangements in the display case according to Fig. 10 to be explained later.

/ According to

According to Fig. 3, the grooves 5 have a substantially circular arc shaped base in cross-section, more accurately two circular arc shaped sectors 13, 14 being provided, which have a common axis 15 and are separated from each other by a triangular raised projection 16. This projection 16, provided centrally in the groove 5, constitutes a rounded-off projection for supporting and guiding the CD cassette 2 on its narrow face during the pivotal movement from the one inclined position into the other, and at the same time it constitutes an abutment for the lower edge 17, 18 respectively of the CD cassette 2 in the respective inclined position, thus ensuring an additional securing of the CD cassette 2 in its inclined position. These rounded-off projections 16, as indicated in broken line in Fig. 3, could also be omitted, in which case the grooves would then each be formed with a single portion or base of circular arc form in cross-section (that is a cylindrical surface sector). For quiet, friction-free movement in the tilting of the CD cassettes 2, it is also of importance for the aforementioned common axis 15 also to be (at least approximately) the axis of pivoting for the CD cassette 2, which is characterized in that the groove base, of circular arc form in cross-section, forms a guiding or sliding surface for the two lower edges 17, 18 of the CD cassettes 2.

The radius R of the circular arc shaped sectors or of the base 13, 14 of the relevant groove 5 is, for example, 7.2 mm, and the distance d between the mutually parallel planes passing through the abutment area 8 on the one lateral wall 6 of the groove 5 and the contact area 9 at the opposite lateral wall 6 of the groove is accordingly approximately 10 to 10.5 mm, especially 10.4 mm, according to the thickness of the CD cassettes 2. For the effective distance D between the two support areas of each pair i.e. the width of the opening of each groove 5, there is thus in the case of an angle of 30° for the CD cassettes in their inclined positions a value of approximately 12 mm.

Finally, it should also be mentioned regarding the form of embodiment according to Figures 1 to 3 that, as can be seen from Fig. 3, for each groove 5 the common axis 15 which, as already mentioned, is also the pivot axis for the CD cassettes 2, lies in the plane passing through the two intersection lines of the abutment areas 8 and contact areas 9 which is parallel to the plane 12.

As already mentioned, the rows of CD cassettes 2 are separated from one another by the dividers 3 disposed between them. One such divider 3 is indicated also in Fig. 2 schematically by dot-and-dash lines, and it can be seen that this divider 3 is bar-shaped or rail-shaped. The divider 3 possesses downwardly projecting, elastically deflectable, fin-like snap projections 19, arranged in pairs, by which it is elastically clamped on the cross-pieces 7. It is possible for the divider 3 to be provided with snap projections 19 in such a manner that it can be fixed on all the cross-pieces 7, but it is also possible, as shown in Fig. 2, for fewer pairs of snap projections 19 to be provided, in order to fix the divider 3 on only some of the cross-pieces or walls 7 between the grooves 5. In Fig. 4, the bar-shaped divider 3 is

/ illustrated

illustrated schematically in section, from which the resilient snap projections 19 can be seen as fin-like to finger-like (and they can be glued or welded on). Preferably, the dividers 3 are of plastics. 89

The base 4, in contrast, is advantageously a piece of aluminium extrusion of the desired length, e.g. as mentioned 120 cm. This elongate extrusion can be fixed at its two ends in conventional manner to lateral walls of a case or frame, which can be carried out readily by the skilled person and therefore is not illustrated in the drawing.

A form of embodiment similar in principle to the device according to Figures 1 to 3 is shown in Fig. 5 in a sectional view corresponding to that of Fig. 3. The embodiment according to Fig. 5 differs from that of Fig. 3 in that the grooves 5 are now arranged all at the same level, or in other words the grooves 5 are arranged along an imaginary plane 11 (the lower face of the base 4) which extends perpendicularly to the median plane or plane of symmetry 10 of the grooves 5. Accordingly, the undercuts of the grooves 5 defined by the inclined, downwardly facing abutment surfaces 8 are not offset from one another in height as in Fig. 3, and this leads to the dividing of the grooves 5, i.e. the distance between the grooves, being somewhat larger than in the example according to Fig. 3, because for reasons of strength a certain minimum thickness of material is necessary for the cross-pieces or walls 7 between the grooves 5, and this minimum thickness is determining at the level of the undercut, that is to say where the abutment areas 8 adjoin the groove base sector 20, likewise for instance of circular arc form in section. The abutment areas 8 are, for example, again flat, and they may be inclined especially at 30° to the vertical. For the contact areas 9, as indicated in full lines in Fig. 5, plane surfaces may also be provided, similarly to in Fig. 3, but it is also possible to form these contact areas or support zones 9 by the cross-pieces 7 being rounded off on their upper face, as indicated in Fig. 5 in broken lines, giving rise to narrower contact areas 9, in the extreme case linear contact zones. As viewed in cross-section, the cross-pieces 7 thus have a conical appearance, with converging cylinder surface sectors in the lower zone and an adjoining, beading-like thickened head. It should also be mentioned here that, as a difference from Fig. 3, the cross-pieces 7 can be and are formed symmetrically about a vertical median plane. In addition, it is also true for the form of embodiment of Fig. 5, that the effective distance D between the relevant support zones is chosen according to the desired angle of the CD cassettes 2 in their inclined position and is slightly greater than the thickness d of the cassettes 2. Furthermore, it is also true for Fig. 5 that the axis 15 of the cylinder surface sector 20 (i.e. the groove base) also defines the axis for the pivotal movement of the CD cassettes 2, the two lower edges 17, 18 of the CD cassettes 2 being slidably guided in the pivotal movement by this cylinder surface sector 20. In the embodiment according to Fig. 5 it is, of course, also possible if desired for a median, rounded-off

/ projection,

projection, triangular in section, to be provided similarly to the projection 16 of Fig. 3 in each groove 5, as indicated by broken line schematically in the central groove 5 in Fig. 5. Furthermore, the base 4 and the device 1 can be provided, as shown in Fig. 3, for reasons of material saving on the lower face with removed groove-shaped zones 21, and a similar construction of the lower face is indicated in Fig. 5 in broken lines. The base 4 according to Fig. 5 may favourably consist of an aluminium extruded section.

The forms of embodiment so far described of the device of this invention are predominantly intended, as mentioned, for accommodating CD cassettes, which are relatively thin (approx. 10 mm) and have a relatively low mass. The devices described may be used for presentation equipment in shops and also for domestic furniture. In particular, for the latter case it is possible to connect the base 4, preferably an aluminium extruded profile forming this base, to a pull-out accommodated in a cupboard or dresser, to enable CD cassettes to be stored in private use easy for sorting and easily visible. For this application also the construction according to Figures 1 to 3 is suitable with particular advantage, the already described arrangement, in which the imaginary plane 11 which follows the arrangement of the grooves 5 lies horizontally, being used, so that the CD cassettes 2 in the at-rest position are arranged flatter and thus require a lower height, whereas in the pulled-out condition of the device, when flipping through them, they can be set up more steeply without difficulty, i.e. can be tilted into the forward inclined position.

The forms of embodiment now to be described according to Figures 6, 7 and 8 and 9 are, in contrast, suitable especially for accommodating video cassettes 22 or the so-called video book boxes (i.e. book-like video cassettes with flange-like front and rear walls, overhanging the actual cassettes or box body on the upper, one longitudinal and the lower sides and with a spine connecting these two walls together, which also projects at top and bottom beyond the cassette body). The principle of the pivotal support of the cassettes or boxes simply in the lower edge zone in groove-shaped recesses, possessing appropriate support zones, described in detail above in relation to Figures 1 to 3, applies also in corresponding manner to these forms of embodiment, so that a repetition of that description is unnecessary. In the dimensioning of the grooves 5 and walls 6; 7, allowance must of course be made for the greater thickness dimension of the video cassettes, a thicker dimension at the undercut resulting, in the case of an embodiment (Fig. 6) equivalent to Fig. 3, with the result that if a similarly dense arrangement of the video cassettes 22 is desired, this results in a greater offset in height of the grooves 5, i.e. the grooves 5 ascend along a steeper imaginary plane 11. It can also be seen from Fig. 6 that here again support regions in the form of contact areas or surfaces 9, associated in pairs, and abutment areas or holding-down areas 8, inclined to face downwards, are provided. Once again, also, the groove base is favourably formed as a cylindrical surface sector 20 or in the form of two part sectors 13, 14, which are separated from each other by a rounded-off projection 16, tri-

/ angular in

angular in cross-section, as indicated in Fig. 6 in broken lines. (61)

The embodiment according to Fig. 6 is suitable in the same manner for compactly constructed, that is box-shaped, video cassettes 22 as for the aforementioned book-shaped cassettes, see also the dot-and-dash line 22a, which indicates the form of cassette with the downwardly projecting, flange-like extensions of front and rear wall.

In order to achieve an additionally improved guidance for video book boxes of this type during the pivotal movement, the pivotal mounting according to Fig. 6 can be modified, see Fig. 7, a median, hump-shaped fillet 23 being provided, which divides the groove-shaped recess 5 into two part grooves 27, parallel to one another, the lateral walls 24 of which are also formed undercut, in order to secure and clamp the cassettes 22 in the respective inclined position by means of only one of the flange-like, overhanging wall projections, e.g. that of the rear wall 25 of the cassette 22. Accordingly, the respective support zones for the cassette 22 are formed by the lateral wall 24 of the fillet 23 and the lateral wall 26, opposite to it, of the groove-shaped recess 5. These support zones for the cassettes 22 thus once again correspond in principle to the contact areas 9 and abutment areas 8 described above, and are accordingly given the same references in Fig. 7. The cassettes 22, in their respective inclined positions, in which as above they are fixed simply by one wall projection in one part groove 27, can bear with their lower edge zone of the other wall against the opposite lateral wall of the groove-shaped depression 5, but this is not absolutely necessary, and they may also bear, in the limiting inclined position, in the central region of their lower, narrow face, against the upper side of the hump-shaped fillets 23, but this is not essential.

In the forms of embodiment according to Figures 6 and 7, it has been found that it is more favourable to form the base 4, not as in the examples of Figures 1 to 5 of aluminium extruded profiles, but instead of profiled steel sheets in order to achieve, having regard to the heavier video cassettes, a higher strength. Another advantageous method of manufacture is vacuum moulding from plastics, as will be explained in greater detail below with reference to Figures 12 and 13. With the production from profiled steel sheets, narrower units are also advantageously produced, such as for three to four video cassettes 22 one behind another, and in order to obtain a kind of inclined set of shelves corresponding to the steeper arrangement of the groove-shaped recesses 5 over a greater height, several such pieces of metal sheet may be connected to one another in their longitudinal edge zones to enable, for example, twenty or thirty video cassettes to be accommodated in a row behind one another. This connection can, as indicated at 28 in Figures 6 and 7, be made by the upper longitudinal edge 29 of a lower sheet metal portion being bent over like a hook in cross-section, so that this lower sheet metal portion or base part 4 can be hooked over the lower longitudinal edge of the portion or base part next above. In order to obtain a corresponding contact area 9 for the video cassettes 22 in this connecting zone 28 also, the lower longitudinal edge of each sheet metal portion or base may also be correspondingly angled or cranked, as can be seen from Figures 6 and 7.

/ In Figures

In Figures 8 and 9, a form of embodiment is illustrated which is also intended for accommodating book-shaped video cassettes, and which consists simply of a base plate 30, on which, spaced apart and facing in opposite directions in pairs, angle members 31 are secured by their one horizontal flange 32, whereas the other, vertical flanges 33 form the lateral walls of groove-shaped recesses 5, in which the cassettes 22 once again are housed with their lower edge regions. The hump-shaped fillet 23 is here formed by a U-section profile 34, which is also secured to the base plate 30. (Instead of this, a closed box section could also be used.) The fixing of the aforementioned profiles 31, 34 respectively may be effected, for example, by screwing or riveting, or by gluing. In order, furthermore, to enable the video cassettes 22 to be securely held without difficulty, in spite of the simple vertical support zones (vertical flanges 23 of angle members 31 or vertical flanges 35 of U-member 34), it is favourable to fit to these vertical flanges or lateral walls a friction-increasing facing or foam plastics facing, as indicated in Fig. 8 at 36 by broken lines.

The basic method of functioning of the form of embodiment according to Fig. 8 corresponds, as can be readily seen, to that of the form of embodiment according to Fig. 7. It only needs to be mentioned that the video cassettes 22 do not here execute a pure pivotal movement during "flicking over" but also move slightly up and down, when they tilt from one lower edge (e.g. rear edge) onto the other (e.g. front edge).

In order, in the case of the aforementioned book-shaped video cassettes, to enable the downwardly projecting spine also to be accommodated, in spite of the hump-shaped fillets 23 (which according to Fig. 8 are formed by the U-profiles 34), these hump-shaped fillets must be interrupted, i.e. these fillets extend only over a part of the width of the device or over a part of the length of the groove-shaped recess 5. In the case where several rows of video cassettes are arranged alongside one another, similarly to the arrangement according to Fig. 1, it then follows as indicated in Fig. 9 that the hump-shaped fillet 23 must be interrupted at intervals corresponding to the width of the video cassettes (and allowing a slight clearance), for example must be cut out. Such a cutting-out would be conceivable, for example, in the embodiment according to Fig. 7. The form of embodiment according to Figures 8 and 9 with the profiled bars here affords the possibility of simply fitting shorter U-bars 34 at intervals from one another, thus creating gaps 37, in which the book spines of the video cassettes 22 can be accommodated, compare the arrangement of such a book-like video cassette 22, indicated quite schematically with broken lines in Fig. 9.

In a presentation apparatus for CD cassettes, already proposed earlier, in the form of a display case, an arrangement of upper rows of compartments and of lower, stepped rows of horizontal, box-shaped compartments and of a median row of compartments mounted against the rear wall of the case, has substantially in side view the form of a concave mirror. In such a display case, which for example may have a width of

/ 100 or 120 cm

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100 or 120 cm and commences with its lowest row of compartments at approximately hip height, a relatively large number of CD cassettes can be achieved in a easily viewed manner, and also with good access for "flicking through" and removal of CD cassettes. The particularly preferred embodiment of this invention according to Figures 1 to 3 with the automatically ascending or descending arrangement of CD cassettes in a row, now gives rise here, as indicated schematically in Fig. 10, to an especially favourable possibility of further increasing the number of CD cassettes that can be accommodated in a display case 38 of this type. Here, again starting at hip height, several, for example three, compartment rows 39, formed by the devices 1 according to Figures 1 to 3, are arranged with bases 4 descending towards the rear, wherein the bases 4 may also be more steeply descending than in Fig. 2 (where the base descends from right to left). In particular, it is advantageous here, with the same construction of the devices 1 as shown in Fig. 2, i.e. with an angle of 8° between the planes 11 and 12, to arrange the bases 4 in such a manner that the plane 11, along which the grooves 5 (Fig. 2) descend, is inclined more steeply to the horizontal, such as at an angle of 15° , so that the CD cassettes 2 accommodated are flatter in their normal, rearward inclined position than in their forwardly tilted inclined position, so that better viewing from above in spite of the relatively low arrangement is achieved. The devices 1 can, as a difference from the known presentation apparatus, be arranged according to Fig. 10 each with their front edge starting at the same height, and the difference in height between the rear edge of a base 4 and the front edge of the base 4 of the device next behind corresponds substantially to the height needed by a CD cassette 2 in the rear (flatter) inclined position.

Above the furthest back device 1 of this arrangement, corresponding to a middle row of compartments in the known display case, a row of compartments 40 can be provided in the form of a further device 1 with base descending towards the rear. Above this device or row of compartments 40, in the display case arrangement of Fig. 10, it is possible as a consequence of the described inclined position of the lower devices 1 and the space thus saved, for yet a further additional row of compartments 41 to be formed by a device 1 according to this invention, this device now being arranged with the base ascending towards the rear. Above this, in conventional manner, rows of compartments 42 are present each for one CD cassette 2 in one compartment.

In Fig. 11, a different display case 43 is illustrated, which is intended for easily viewed presentation of video cassettes 22, also in an arrangement substantially shaped like a concave mirror as viewed from the side. Here, similarly to the arrangement according to Fig. 10, once again rows of compartments 44 are provided in the upper part of the case for the video cassettes, step-shaped in conventional manner and projecting forwards towards the top. In the lower region of the case, the video cassettes are arranged in an inclined set of shelves 45, which is formed in the manner explained above in connection with Figures 6 and 7, for example from profiled pieces of sheet metal connected together by hanging one on another. In the light of the foregoing explanations in relation to Figures 6 and 7, a further discussion of the form of this inclined set of shelves 45 is unnecessary here.

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For the illustrations in Figures 10 and 11, it is true that these indicate only schematically the relevant devices 1 with the bases 4, a detailed illustration of the profiles of the bases being omitted, having regard to the preceding Figures.

The devices 1 or base components 4 according to Figures 6 or 7 may be made, instead of from profiled metal sheets, by the deep drawing or vacuum moulding of a thermoplastics sheet, as will now be explained by reference to Figures 12 and 13.

In Fig. 12 there is shown quite schematically a conventional arrangement for deep-drawing of plastics objects under vacuum moulding, a mould 46 being provided, over which a sheet or plate 47 of thermoplastics material to be moulded is placed. This sheet 47 may, for example, be held by means of spindles 48, indicated quite schematically, and after being heated by heating lamps 49 may be moved onto the mould 46. The sheet 47, as it adapts approximately to the mould 46, is tightened over this mould, without adapting to the exact contours of the mould surface 50. If necessary, as indicated by broken line at 51, the sheet 47 may then be pressed by means of a plunger or the like into recesses of the mould surface 50. The final shaping is produced by application of a vacuum or sub-atmospheric pressure between the mould surface 50 and the sheet 47, stretched over the mould, by means of suction ducts 52 leading out at the mould surface 50, of which one is illustrated in Fig. 12 as an example. As a consequence, the sheet 47 lies closely against the mould 46 and its mould surface 50 and thus adopts its form, after which the sheet is cooled and allowed to harden. Thereafter the thus formed object can be removed from the mould 46, and a next object can be produced with the same mould.

This known vacuum forming method is highly suitable for producing thin-walled articles, such as containers, dishes, cups etc., in large numbers. Difficulties arise, however, if the articles to be produced are to have undercut zones, such as the base 4 according to Fig. 6. The mould 46 then itself must also be undercut, as indicated schematically in Fig. 12 at 53. To enable the article then to be removed from the mould 46, however, the mould 46 could be divided and the individual parts of the mould would be moved separately by means of sliders or the like, to enable the mould and moulded object to be separated from each other. This technique is, however, frequently cumbersome, difficult and cost-intensive.

As shown in Fig. 13, instead of this, support components 54 are fitted to the mould 46, these components being shaped correspondingly to the form of the desired undercut zones, less of course the material thickness of the sheet 47, and being removably fitted. In detail, in the example of embodiment illustrated, cranked support fillets of steel sheet are used as the support components 54, these fillets being inserted with a lower shaft zone 55 into recesses 56, which are provided in the mould 46 and extend into the mould 46 from the mould surface 50 in the form of straight grooves. The mould 46 furthermore

/ comprises the

comprises the already mentioned suction ducts 52, some of which lead out quite near the recesses 56 at the mould surface 50. If a vacuum is now applied via the suction ducts 52, the sheet 47 not only hugs closely against the mould surface 50 but also against the surface of the support fillets 54, so that the form illustrated in Fig. 13 is obtained, in which the sheet 47 is left to harden. Thereafter, the base component thus obtained, together with the support fillets 54, now largely enclosed by the plastics material, are removed from the mould 46, the support fillets 54 now projecting, with their lower shaft zone 55, out beyond the plastics base component at its underside. This shaft region 55 could, if desired, be cut or ground off or removed in some other manner. In the case of the base components according to Fig. 6 (or 7), these projecting shaft regions 55 as a rule are not a nuisance, and they can be left in position.

In this way, in the vacuum moulding of the base components, the undercut regions 53 can be obtained, although a simple mould 46 can be used. A further advantage in the method of manufacturing described is that the support fillets 54, which remain on the vacuum moulded base component, also constitute a reinforcement or stiffening of the base component produced, so that its strength and stiffness can be substantially increased. This is of great importance in the aforementioned base components according to Figures 6 or 7, because it thereby becomes possible to produce cup-shaped base components having a length of, for example, 1 m and the width of 1/2 m, and to fill these cup-shaped base components with cassettes 22, such as video cassettes, while sufficient strength is obtained to carry the weight of the cassettes 22, with the base component supported simply at its edges. It is of further advantage here that the support fillets 54 are also cranked.

In order to increase the bond between the support fillets 54 and the moulded plastics sheet 47, the support fillets 54 may be provided with a bonding or binding agent, before the plastics sheet 47 is sucked onto them. In particular, it is favourable to apply a sufficiently heat-resistant adhesive onto the support fillets 54. If the support fillets 54 are also made from plastics material, an advantageous possibility consists, after the vacuum moulding, of firmly bonding the deformed plastics sheet to the support fillets 54 at least locally by ultrasonic welding or sealing or by local heating.

Although the invention has been described above in greater detail by preferred examples of embodiment, nevertheless other modifications and variants are possible, without thereby departing from the scope of the invention. Thus, for example, it is also essentially conceivable, in the devices described, to make the base 4 as a plastics moulding by blowing. In the case of smaller units, especially for domestic use, sections of a plastics extruded profile could, of course, be used for the base components 4. Although, furthermore, in connection with Figures 8 and 9 a friction-increasing facing or plastic foam facing has been mentioned, such a facing can also be provided, of

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course, with advantage for instance in the form of a glued-on fabric covering, in the other examples of embodiment also. In particular, such a covering, even if an increase in friction for the secure fixing of the articles in their respective inclined positions were not necessary, would provide the advantage of an especially careful treatment of the articles, especially when "flicking through" them, because the articles would then slide with their lower faces on a soft, resilient underlay. Apart from a glued-on material covering, other covering or coating techniques are also conceivable, such as spraying-on of a plastics covering or the like.

In order, furthermore, to keep the rows of articles disposed behind one another, especially cassettes, separated from one another, it is not only possible for the bar-shaped or rail-shaped dividers according to Figures 1, 2 and 4 to be used, but instead also plate-shaped separating or divider elements could be disposed between the rows, and furthermore the dividing may also be realized by projections, for example shaped as humps or knobs, provided in the groove-shaped recesses 5, as indicated in Fig. 5 by the dot-and-dash line 57. These projections 57 act as lateral stops for the articles 2 (Figures 1 to 5) or 22 (Figures 6, 7) and thereby prevent an undesired lateral displacement of same. In this effect, the stop projections 57 are comparable also with the fillets 23 according to Fig. 9, formed of U-members 34 with gaps, the U-profiles 34 preventing, by their end faces, a lateral displacement of the cassettes 22, because they constitute an abutment surface for the downwardly projecting spine of the cassettes 22, which is accommodated in the aforementioned gap 37. In the case of an inclined set of shelves for video cassettes, as indicated in Figures 6, 7 and 11, a bar-shaped or rail-shaped divider similar to the divider 3 according to Figures 1 and 2 may also advantageously be provided, but it is of advantage here, instead of the snap fixing of the divider 3, to provide a fixed connection to the walls or cross-pieces 7 (or at least to some of them) by welding, soldering or gluing.

With regard to the profiling of the grooves or groove-shaped recesses 5, it is also possible in principle, as a variant from the forms of embodiment according to Figures 1 to 7, to provide a plane groove base and/or straight (vertical) groove side walls (similarly to Fig. 8 but without the fillet 23), in particular with straight side walls of this type a friction-increasing surface (covering or surface treatment) being of advantage. On the other hand, the groove base may also be constructed in such a manner, compare the arrangement indicated in dot-and-dash line in Figure 6 at 58, that a median supporting and rounded-off projection similar to the projection 16 is present, on either side of which, however, the groove base is deepened in such a manner that the cassettes do not rest there with their lower face (but simply on the median supporting and rounded-off projection, which guides them).

In respect of the method of production described in relation to Fig. 13, it may finally be mentioned that it is also possible, to use as

/ support

support fillets, lattice-shaped structures, provided that these structures possess a sufficient stiffness for the plastics sheet 46 to be able to be pressed against them in vacuum moulding. The spacings between the suction ducts 52 in the mould 46 will, of course, be chosen according to the circumstances, plasticity and thickness of the plastics sheet, as is already known; the only important aspect is that at least some of the suction ducts must lead out at the mould surface near the support fillets, so that in the region of these support fillets a vacuum is also generated, in order to draw the plastics sheet onto the support fillets. The technique described can, furthermore, be used in the production of base components from a wide variety of thermoplastics, such as for instance polypropylene, polymethacrylate, ABS (acrylonitrile-butadiene-styrene), unplasticized PVC (polyvinyl chloride), polyethylene or polycarbonate.

/ Claims

Claims

- (88)
1. A device (1) for receiving and displaying rigid, flat articles (2; 22), such as for example, CD, audio or video cassettes, in a substantially upright position, comprising a base (4), in the region of which bearings for supporting the articles in an array one behind another and also slit-shaped guides for the pivotal support of the articles (2; 22) between a rearwardly inclined oblique position and a forwardly inclined oblique position are provided, the guides being equipped for this purpose with support areas (8, 9), cooperating in pairs, on support walls (6; 24, 26) and the support areas (8, 9), cooperating in pairs, being so arranged in their mutual position and in their height that the articles (2; 22) are held in both the oblique positions only at locations lower than their horizontal centre-line, characterized in that the base (4) itself constitutes the bearing for the articles (2; 22) and possesses transverse, groove-shaped recesses (5), which form the pivotal supports for the articles (2; 22) and hold the articles (2; 22) only at their lower edge.
 2. A device according to Claim 1, characterized in that the transverse, groove-shaped recesses (5) of the base (4) support the articles (2; 22) in the two different oblique positions with different support areas (8, 9) cooperating in pairs.
 3. A device according to Claim 1 or 2, characterized in that the base (4) possesses undercut grooves along its two edges as transverse, groove-shaped recesses (5).
 4. A device according to Claim 1, 2 or 3, characterized in that the groove-shaped recesses (5) possess at least one section (13, 14; 20) of circular arc shape in cross-section for guiding an edge (17, 18) of the relevant article (2; 22) in its pivotal movement.
 5. A device according to Claim 4, characterized in that the groove-shaped recesses (5) possess two sectors (13, 14) of circular arc form in cross-section, which are separated from each other by a median, rounded-off projection (16), approximately triangular in cross-section.
 6. A device according to Claim 5, characterized in that the two circular arc shaped sectors (13, 14) are parts of one and the same imaginary cylindrical surface and thus have a common axis (15).
 7. A device according to one of Claims 3 to 6, characterized in that the support regions for the articles (2; 22) possess, in the region of the groove edges, contact areas (9) and abutment areas (8) extending parallel to each other in pairs, the contact areas (9) being inclined to face upwards and the abutment areas (8) being inclined to face downwards.

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8. A device according to Claim 7, characterized in that the contact areas (9) and abutment areas (8) make an angle of approximately 30° with the median plane or plane of symmetry (10) of the relevant groove (5).
 9. A device according to one of Claims 3 to 8, characterized in that the grooves (5) are provided in an array rising or falling by steps, the consecutive undercuts of adjacent grooves being mutually offset in height.
 10. A device according to Claim 9, characterized in that the grooves (5) are arranged along an imaginary plane (11) which extends inclined at about 8° to a plane (12) perpendicular to the median plane or plane of symmetry (10) of each groove (5).
 11. A device according to one of Claims 3 to 8, characterized in that the grooves (5) are disposed along an imaginary plane which extends perpendicularly to the median plane or plane of symmetry (10) of each groove (5).
 12. A device according to Claim 11, characterized in that the grooves (5) are separated from one another by symmetrical cross pieces (7), initially tapering from bottom to top according to cylindrical area sectors and thereafter thickened to a beading form.
 13. A device according to Claim 1 or 2, for book-like video cassettes (22) with flange-like overhanging front and rear walls, characterized in that each of the recesses (5) is divided by medially disposed, hump-shaped fillets (23), forming two mutually parallel partial grooves (27), each for receiving one of the overhanging cassette walls (e.g. 25).
 14. A device according to Claim 13, characterized in that each lateral wall (24) of the fillet (23) and the lateral wall (26) opposite thereto of the recess (5) define the support areas (8, 9) for the video cassettes (22) in one of their two oblique positions.
 15. A device according to Claim 14, characterized in that at least the lateral walls (24) of the fillet (23) are constructed with undercuts.
 16. A device according to one of Claims 13 to 15, characterized in that the upper face of the hump-shaped fillet (23) is arched to a cylindrical shape to form a slide-guide surface for the lower face of the video cassette (22) between the overhanging front and rear walls.
 17. A device according to one of Claims 13 to 16, characterized in that the lateral walls (33) limiting the recesses (5) extend vertically.
 18. A device according to Claim 17, characterized in that the lateral walls of the recesses (5) are formed of the one flange (33) of

/ angle members



angle members (31), which are secured with their other flange (32) each to a base plate (30).

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19. A device according to one of Claims 13 to 18, characterized in that at least the lateral walls (33) of the fillet (23) are provided with a friction-increasing coating (36), for example a foam plastics coating.
 20. A device according to Claim 12, 13 or 14, characterized in that the hump-shaped fillets (23) are formed of U-section members (34) fixed to a base plate (30).
 21. A device according to one of Claims 13 to 20 for book-like video cassettes with a likewise overhanging spine connecting the front and the rear walls, characterized in that the hump-shaped fillets (23) extend over only a part of the length of the recesses (5).
 22. A device according to Claim 21, for the arrangement of a plurality of video cassettes next to one another in a through recess, characterized in that the hump-shaped fillets (23) are interrupted at intervals approximately corresponding to the width of the video cassettes (22), for example are undercut, in order to receive the downwardly extending portions of the spines of the video cassettes.
 23. A device according to one of Claims 1 to 17, 19 or 22, characterized in that the base (4) is formed of an extruded profile, e.g. of aluminium.
 24. A device according to one of Claims 1 to 17, 19 or 22, characterized in that the base (4) is formed of one or more sheet metal profiles, e.g. of steel.
 25. A device according to one of Claims 1 to 24, characterized in that the length of the recesses (5) is designed for a plurality of articles (2; 22) adjacent to one another and at least one bar-shaped or rail-shaped divider (3) for separating the thus obtained, adjacent rows of articles disposed one behind another is fixed to at least some of the walls (7) limiting the groove-shaped recesses (5).
 26. A device according to Claim 25, characterized in that the divider (3) for example of plastics material, is provided in known manner with elastically deflectable snap projections (19), projecting from it in pairs, for clamping on the walls.
 27. A device according to Claim 25, characterized in that the divider (3) is firmly attached to the walls by welding, soldering or gluing.
 28. A device according to one of Claims 1 to 24, characterized in that, for separating articles provided adjacent to one another in the groove-shaped recesses (5), stop projections (57) e.g. of knob shape are provided for the articles (2; 22) inside the groove-shaped recesses (5).



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29. An arrangement comprising a plurality of devices according to one of Claims 9, 10 or 25 to 28, in a display case (38), characterized in that the devices (1) are provided one behind another in the lower region of the display case (38), shaped in known manner in side view substantially as a concave mirror, each device having its base (4) inclined with a rearwardly descending arrangement of the grooves and each of the bases commencing at the same height, the articles (2) in their forward inclined position being at a smaller angle to the vertical than in their rear inclined position and the difference in height between the rear end of the base (4) of one device and the front end of the base of the device next behind being approximately equal to the height of an article (2) in the rearwardly inclined position.
30. An arrangement according to Claim 29, characterized in that above the rearmost device there are provided two further devices (40, 41), of which the lower (40) is also disposed with its base descending towards the rear and the upper one (41) with its base ascending towards the rear.
31. A method of making devices according to Claim 3, characterized in that a sheet (47) of thermoplastics material is heated and is pressed by means of vacuum onto a mould (46) provided with suction ducts (52), on which mould support fillets (54), for example of steel sheet or plastics, shaped, for example cranked, to correspond to the undercut groove edges, have previously been releasably mounted, the sheet (47) being shaped around these support fillets (54) during its suction onto the mould (46), and that thereafter the shaped sheet (47) is cooled and, together with the support fillets (54), is removed from the mould (46).
32. A method according to Claim 31, characterized in that the support fillets (54) are each inserted with a shaft region (55) into a recess (56) in the mould (46).
33. A method according to Claim 32, characterized in that after the vacuum-moulded sheet (47) has been removed from the mould, the projecting shaft regions (55) of the support fillets (54) are cut off.
34. A method according to one of Claims 31 to 33, characterized in that a bonding or binding agent, e.g. an adhesive, is applied onto the support fillets (54) before the sucking-on of the sheet (47), in order to reinforce the bond between the support fillets and the plastics material of the sucked-on sheet.
35. A method according to one of Claims 31 to 34, characterized in that the bond between the support fillets (54), made of plastics material, and the plastics material of the vacuum-moulded sheet (47) is reinforced by welding.

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36. A method according to Claim 35, characterized in that the bond is reinforced by ultrasonic welding.
37. A method according to Claim 32, characterized in that at least some of the suction ducts (52) in the mould (46) open onto the mould surface (50) adjacent to the recesses (56) for the shaft regions (55) of the support fillets (54).

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