

Apparatus for writing and/or reading information, said apparatus comprising a frame (1) and a writing and/or reading element (3) and being arranged for cooperation with a cassette provided with an information medium. The cassette comprises a housing with a window and an associated closing element, via which window the writing and/or reading element can cooperate with the information medium. The apparatus comprises a slide (5) bearing-mounted in the frame for receiving the cassette. The slide is displaceable between a first position (P1) located at a distance from the writing and/or reading element and a second position (P2) located closer to the writing and/or reading element, and comprises a drive means (9) for cooperating with the cassette, a means (13) for opening the closing element of the cassette and a means (15) for retaining the cassette relative to the slide. The apparatus has a simple construction and is easy to operate.

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Title: Apparatus for writing and/or reading information

The invention relates to an apparatus for writing and/or reading information, which apparatus comprises a frame and a writing and/or reading element and is arranged for cooperation with a cassette provided with an information medium and comprising a housing with a window and an associated closing element, via which window the writing and/or reading element can cooperate with the information medium.

Such system, comprising a recording/reproducing apparatus and an associated magnetic tape cassette, is known from US-A 5,315,462. The known apparatus comprises a frame, a magnetic head unit and a loading mechanism for guiding said cassette to and from the magnetic head unit. The cassette, in particular a data cartridge, has a housing with a front side containing a window and having a closing element which is bearing-mounted for pivoting relative to the housing and which covers the window in non-operative condition of the cassette. Located in the housing are winding cores having wound thereon a magnetic tape running along the window. The loading mechanism of the known apparatus comprises two guide rails for cooperating with the housing of the cassette, which guide rails extend from a cassette insertion opening of the apparatus and are bearing-mounted in stationary position in the frame. The loading mechanism further comprises two gripping elements for locking the cassette in a loading position of the cassette, in which the magnetic tape is in a scanning position relative to the magnetic head unit. The gripping elements each comprise a gripping arm and a cone-shaped roller rotatably bearing-mounted on the gripping arm. The gripping elements, extending into recesses and bearing-mounted for movement relative to the guide rails, are pulled by springs in directions directed towards each other, while in the absence of a cassette, the gripping elements are in contact with rails of the guide rails.

When the cassette is slid into the apparatus via the insertion opening, an end part of the closing element is pressed against a front end of one of the rails, whereby the closing element is opened. Said front end is located relatively close to the magnetic head unit, as a result of which, during opening of the closing element, there is a risk of the vulnerable magnetic head unit being damaged. When the cassette is slid further inwards, it contacts the cone-shaped rollers of the gripping elements, with the rollers moving away from the rails against spring force and subsequently moving under spring force into locking openings of the housing of the cassette. The inward sliding movement of the cassette comes to an end when the cassette strikes stopping elements on the guide rails and thus reaches its loading position. During sliding of the cassette into, and indeed also out of, the loading position, the movements of the various parts of the loading mechanism, which mechanism is in itself relatively complicated, and the interaction of those parts and the cooperation with parts of the housing of the cassette produce relatively much noise, which for particular applications is experienced as a nuisance. In the loading position of the cassette, the springs present press the cone-shaped rollers against edges of the locking openings of the housing of the cassette in order to hold the cassette in that position. The measure of locking achieved thereby is largely determined by the spring force produced by the springs present. Due to the movements which the gripping elements must be able to perform during moving the cassette into and out of the loading position, this spring force is rather limited, as a consequence of which only a relatively weak locking is realized. In the loading position of the cassette, a part of the housing still projects from the apparatus, to enable the cassette to be manually pulled out of its loading position. As a matter of fact, the cassette is also manually pushed into the loading position. The cooperation between the various parts of the loading apparatus and parts of the

cassette carrier does not add to the ease of operation of the apparatus.

The object of the invention is to provide an apparatus of the type described in the preamble, which apparatus has a simple construction, is easy to operate and is reliable during use.

To that end, the apparatus according to the invention is characterized in that the apparatus comprises a slide for receiving the cassette, which slide is bearing-mounted in the frame and is displaceable between a first position located at a distance from the writing and/or reading element and a second position located closer to the writing and/or reading element, and which slide comprises a drive means for cooperation with the cassette, a means for opening the closing element of the cassette and a means for retaining the cassette relative to the slide.

In the apparatus according to the invention, during use, the cassette is moved into and out of its loading position via the slide. The apparatus may form part of a magnetic tape apparatus, with the writing and/or reading element comprising a single-channel or multi-channel magnetic head. In that case, the cassette comprises a magnetic tape. The frame of the apparatus comprises a guide, preferably a straight guide for guiding the slide between the first and the second position. In such embodiment, during its displacements, the slide performs only simple linear movements between the first and the second position. Preferably, for realizing a maximally compact construction, the arrangement is such that in the first as well as in the second position, the slide is located at least almost entirely within the contours of the frame. By keeping the slide within the frame, it is further provided that the guidance of the slide requires only a relatively simple and light guide construction.

An embodiment of the apparatus according to the invention is characterized as defined in claim 5. The stop

element used can be designed as one or more fixed projections.

An embodiment of the apparatus according to the invention is characterized as defined in claim 6. In this
5 embodiment, the opening element can be of simple design as a fixed projection on the slide, present in a suitable location, while during the provision of the cassette on the slide, the operating member of the closing element contacts the opening element, whereupon this element moves the closing
10 element into its open position. Preferably, the opening element is located adjacent a part of the slide facing the writing and/or reading element.

An embodiment of the apparatus according to the invention is characterized as defined in claim 8. In this
15 embodiment, a simple yet effective measure is used for retaining the cassette on the slide during the displacements between the first and the second position, and in the second position.

An embodiment of the apparatus according to the invention in which the frame comprises the straight guide for
20 guiding the slide between the first and the second position is characterized as defined in claim 9. In this embodiment, the means for retaining the cassette relative to the slide during displacements between the first and the second
25 position and in the second position is of a constructionally simple yet effective design.

The embodiment mentioned last hereinabove is preferably also characterized as defined in claim 10. In this manner, an effective locking of the cassette relative to the
30 frame is possible in the second position of the slide. This is important, because in the second position of the slide, the information medium in the cassette should be accurately positioned relative to the writing and/or reading element to be able to guarantee a reliable writing and/or reading
35 process.

Preferably, in the apparatus according to the invention, an electric drive mechanism is present for displacing the slide along the guide present, in particular a straight guide. In this case, a practical embodiment is characterized as defined in claim 12. An embodiment in which a smooth, noise-poor displacement between the first and the second position of the slide is realized on the one hand and a great pressing force can be produced for locking the cassette relative to the frame in the second position on the other, is characterized as defined in claim 13. A firm locking of the cassette is guaranteed if the last-mentioned embodiment also has the features defined in claim 10.

In a practical design, the embodiment of the apparatus according to the invention as defined in claim 13 preferably comprises the features defined in claim 14.

In addition to the above-mentioned advantages, the drive mechanism for the slide used in the apparatus according to the invention offers the possibility of readily bringing and keeping the slide in any intermediate position located between the first position and the second position. Such intermediate position is in particular important in situations where a temporary interruption of the contact between the writing and/or reading element and the information medium is desired, for instance in a pause mode.

The invention further relates to a system comprising the apparatus according to the invention and a cassette which comprises an information medium and which is suitable for cooperating with the apparatus. Such system is, for instance, a system for storing data in linear magnetic tracks. In that case, the apparatus forms part of a magnetic tape apparatus and the cassette comprises a magnetic tape.

In respect of the claims, it is further observed that various combinations of features defined in the dependent claims are possible.

Hereinafter, the invention will be specified by way of example, with reference to the accompanying drawings. In these drawings:

Fig. 1 is a schematic top plan view of an embodiment
5 of the apparatus according to the invention;

Fig. 2 is a schematic bottom view of a portion of the embodiment of the apparatus;

Fig. 3 schematically shows the embodiment in a section according to III-III in Fig. 1, with the slide of the
10 apparatus being in the first position;

Fig. 4 schematically shows the embodiment according to III-III in Fig. 1, with the slide in the second position;

Fig. 5 is a schematic bottom view of an embodiment of the slide;

15 Fig. 6 is a schematic top plan view of an embodiment of a cassette suitable for cooperation with the apparatus according to the invention;

Fig. 7 is a schematic top plan view of the bottom plate of the embodiment of the cassette; and

20 Fig. 8 is a schematic front view of the embodiment of the cassette, with the closing element being in the closed position.

The apparatus according to the invention shown in Figs. 1-5 comprises a writing and/or reading element and is
25 intended for cooperation with a cassette of a type as shown in Figs. 6-8.

Such type of cassette, being a magnetic tape cassette, is known per se and, for instance, shown in WO-A 94/29863.

The cassette 2 shown in Figs. 6-8 has a housing 4 with
30 a bottom plate 4a and, attached thereto, a cover part 4b. The housing 4 comprises a front wall 4c containing an opening 6 and a window 8. The cassette 2 has, adjacent the front wall 4c, a closing element 10 which is pivotally bearing-mounted in the housing 4 and which, in inoperative condition of the
35 cassette 2, assumes a closing position under spring pressure and, accordingly, covers the window 8. In Fig. 6, the closing

element 10 is also shown in an open position by dotted lines. The closing element 10 comprises an operating member 10a. The bottom plate 4a of the housing 4 is provided with a recess 12 on either side of the cassette 2. Located in the housing 4 are two cores 14, a magnetic tape 16 wound on the cores 14 and partially running from one core to the other, guide rollers and/or pins 18 for guiding the magnetic tape 16, which includes guiding it along the window 8, and a drive mechanism for driving the cores 14. This drive mechanism comprises a drive capstan 20 extending into the opening 6 and a drive belt 22 cooperating therewith, which drive belt is guided along the cores 14, touching said cores, by means of belt guides 24, the arrangement being such that when the capstan 20 is driven, the cores 14 rotate and the magnetic tape 16 is guided along the window 8.

The apparatus according to the invention shown in Figs. 1-5 forms, together with the cassette 2, a magnetic system for writing and/or reading magnetic data in or from the magnetic tape 16 respectively. These data can be stored in the magnetic tape 16 in any format, depending on the embodiment of the writing and/or reading element of the apparatus. The system may or may not be provided with an erasing element.

The apparatus as shown in Figs. 1-5 comprises a frame 1 and, as writing and/or reading element, a magnetic head 3. This magnetic head 3 can be a single-channel or multi-channel head. The apparatus further comprises a slide 5, bearing-mounted in the frame 1, for receiving and carrying the cassette 2. For bearing-mounting the slide 5 there is provided a guide, in particular a straight guide, comprising two guideways, in particular straight guideways 7, attached to the frame 1 and hence forming part of the frame 1, between which guideways the slide 5 extends. The slide 5 is displaceable along the guideways 7 according to the translation directions m1 and m2 between a first position P1

and a second position P2 located adjacent the magnetic head 3.

In the first position P1 of the slide 5, the slide is in a condition suitable for receiving the cassette 2, and the cassette 2 can be moved on a main surface 5a of the slide 5 through a manual displacement in the direction m1.

Generally, the frame 1 is located in a housing of an apparatus or the frame 1 constitutes the housing of an apparatus. The apparatus according to the invention allows the slide 5, when the slide is in its first position P1, to be located entirely or almost entirely within the contours of the frame 1 and, accordingly, within the housing present of the apparatus. In this example, the slide 5 has a projecting lip 5b for operating of a flap that covers an insert opening the apparatus.

The slide 5 comprises a number of essential means, viz. a drive means for cooperating with the cassette 2, a means for opening the closing element 10 of the cassette 2 and a means for retaining the cassette 2 relative to the slide 5. The drive means comprises a stop element 9, present adjacent a side 5c of the slide 5 facing the magnetic head 3 and designed as a projection. When the cassette 2 is being slid onto the slide 5, it will at a given moment contact the stop element 9, whereupon, during a continued movement of the cassette 2, the slide 5 is displaced in the direction m1 together with the cassette 2. In this example, the apparatus comprises an electric drive mechanism for displacing the slide 5 along the straight guide. The drive mechanism is energized as soon as the slide 5 is manually pushed from the first position P1, which takes place when the cassette is being placed. To this end, a switch, not shown in the drawing, is present in the path of the slide 5, just outside the first position P1.

The means for opening the closing element 10 of the cassette 2 comprises an opening element 13 which is mounted on the slide 5 as projection and which, in this example, is

located adjacent a part 5d of the slide 5 facing the magnetic head 3. The opening element 13 is situated on the slide 5 in such a position that when the cassette 2 is slid onto the slide 5, the operating member 10a of the closing element 10 of the cassette 2 strikes the opening element 13, whereupon, during continued movement of the cassette 2 relative to the slide 5, the closing element 10 is opened and held in an open position, so that the magnetic tape 16 in the cassette 2 is accessible via the window 8.

The means for retaining the cassette 2 relative to the slide 5 comprises, on either side of the slide 5 and adjacent each of the guideways 7, a retaining element 15 which is pivotally bearing-mounted in the slide 5. The retaining elements 15 are each pivotable about a pivotal axis 15a relative to the slide 5. The guideways 7 are each provided with a recess 17. The recesses 17 are shaped and positioned such that in the first position P1 of the slide 5, the retaining elements 15 extend in or are located in the recesses 17 and are thus in recessed position relative to the main surface 5a of the slide 5, to allow the cassette 2 to slide along the main surface 5a without any problem when the cassette is being placed on the slide 5. When the slide 5 is being moved out of the first position P1, the retaining elements 15 pivot from the recesses 17 and pivot, in the presence of the cassette 2, into the recesses 12 of the cassette 2, causing this cassette to be retained relative to the slide 5. To facilitate the pivoting of the retaining elements 15 during the displacement of the slide 5 from its first position P1, inclined surfaces 17a are present, via which surfaces the recesses 17 blend with guide surfaces 7a of the guideways 7, on which surfaces the retaining elements 15 rest when the slide 5 is out of its first position P1.

When the cassette 2 is present, the magnetic head 3 projects into the window 8 of the cassette 2 when the slide 5 is in its second position P2. In this example, the magnetic head 3 is mounted on an actuator unit 19 for displacing the

magnetic head 3 over a limited distance in directions transverse to the main surface 5a of the slide 5. In this position, the drive capstan 20 of the cassette 2 is in contact with a drive roller 21 of the apparatus. To cause the cassette 2 itself to adopt an accurately defined position in the second position of the slide 5, the frame 1 is provided with positioning surfaces 23, whereagainst edge parts 26 of the housing 4 of the cassette 2, in particular parts adjacent the front wall 4c of the housing 4, are pressed when the slide 5 is in its second position P2. For pressing the cassette 2 against the positioning faces 23, the retaining elements 15 are used, which, for that purpose, are each provided with an inclined surface 15a which outside the first position P1 of the slide 5, viewed in the direction m1, slopes down relative to the guide surfaces 7a of the guide and the main surface 5a of the slide 5. In the second position P2 of the slide 5, the surfaces 15a cooperate with edge parts 28 of the bottom plate 4a of the cassette 2, which edge parts bound the recesses 12 of the cassette 2, while forces from the slide 5 are transmitted to the cassette 2 for pressing it against the positioning faces 23.

The electric drive mechanism used in the apparatus according to the invention for translating the slide 5 along the guideways 7 comprises an electric drive unit present on the slide 5, in particular an electromotor 25, and a pivot arm 27 which is pivotally bearing-mounted in the frame 1 and coupled to the slide 5. The pivot arm 27 substantially extends in a plane parallel to the main surface 5a of the slide 5 and is pivotable about a pivotal axis 29 oriented transversely to the main surface 5a. For the coupling between the slide 5 and the pivot arm 27, the pivot arm 27 is provided with a groove 31 and the slide is provided with a following element 33 shaped in the form of a pin or the like and extending into the groove 31. The pivot arm 27 has a rack which in fact comprises two parts, viz. a first rack part 35a and a second rack part 35b forming an angle therewith, while

in the first position P1 of the slide 5, the first rack part 35a extends substantially parallel to the directions of movement according to m1 and m2. In this example, said angle between the two rack parts 35a and 35b is about 90°. The electric drive unit 25 is connected to the rack 35a, 35b via a transmission 37 with a gear 39 meshing with the rack 35a, 35b. In this example, the transmission 37 comprises a pair of rope wheels, a rope and a few gears. When the drive unit 25 is energized, the gear 39 runs along the rack 35a, 35b in one direction or the other, with the slide 5 being displaced in one direction, for instance according to m1, or the other respectively. The end positions of the slide 5 are formed by the first position P1 and the second position P2, but intermediate positions, for instance intermediate position Pi, are possible as well. From the constructions shown, it will be understood that the pivot arm 27 performs the largest pivoting movements at displacements of the slide 5 adjacent the second position P2.

It is observed that the invention does not only relate to the apparatus mentioned and described hereinabove, but also to a system of such apparatus with an associated cassette. It is further observed that the invention is not limited to the exemplary embodiments shown. Thus, for instance the cassette may have a different shape or be of different design, the slide may be shaped differently and another type of transmission may be used. It is further observed that the apparatus according to the invention may be an optic apparatus and, accordingly, the cassette may be a cassette having an optic registration medium, for instance an optic tape. In such apparatus, the writing and/or reading element is an optic sensor.

Claims

1. An apparatus for writing and/or reading information, said apparatus comprising a frame and a writing and/or reading element and being arranged for cooperation with a cassette provided with an information medium and comprising
5 a housing with a window and an associated closing element, via which window the writing and/or reading element can cooperate with the information medium, **characterized in that** the apparatus comprises a slide bearing-mounted in the frame, for receiving the cassette, said slide being
10 displaceable between a first position located at a distance from the writing and/or reading element and a second position located closer to the writing and/or reading element, and said slide comprising a drive means for cooperating with the cassette, a means for opening the
15 closing element of the cassette and a means for retaining the cassette relative to the slide.
2. An apparatus according to claim 1, characterized in that the writing and/or reading element comprises a
20 magnetic head, said cassette being a cassette provided with a magnetic tape.
3. An apparatus according to claim 1, characterized in that the frame comprises a straight guide for guiding the
25 slide between the first position and the second position.
4. An apparatus according to claim 1, characterized in that in the first position as well as in the second position, the slide is located at least almost entirely
30 within the contours of the frame.
5. An apparatus according to claim 1, characterized in that the drive means for cooperation with the cassette

comprises at least a stop element for cooperation with an edge part of the housing of the cassette, said stop element being present adjacent a side of the slide facing the writing and/or reading element.

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6. An apparatus according to claim 1, characterized in that the means for opening the closing element of the cassette comprises an opening element, mounted on the slide, for cooperation with an operating member of the closing element which is bearing-mounted for movement relative to the housing of the cassette.

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7. An apparatus according to claim 6, characterized in that the opening element is located adjacent a part of the slide facing the writing and/or reading element.

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8. An apparatus according to claim 1, characterized in that the means for retaining the cassette relative to the slide comprises a retaining element which is pivoted to the slide and which in the first position of the slide is in recessed position relative to a main surface of the slide, but which outside the first position of the slide is in elevated position relative to said main surface for cooperation with a recess in the housing of the cassette.

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9. An apparatus according to claim 3, characterized in that the straight guide comprises two guideways between which the slide extends and that the means for retaining the cassette relative to the slide comprises on either side of the slide, adjacent each of the guideways, a retaining element pivoted to the slide, which retaining elements in the first position of the slide extend in recesses of the guideways while they are in recessed position relative to a main surface of the slide, but which retaining elements outside the first position of the slide rest on the guideways and are in elevated position relative to said

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main surface for cooperation with recesses in the housing of the cassette.

10. An apparatus according to claim 9, characterized in
5 that the retaining elements are each provided with an inclined surface, which, at least adjacent the second position of the slide and viewed in a direction from the first to the second position of the slide, slopes down relative to the main surface of the slide 5, while in the
10 second position of the slide, in the presence of the cassette, the inclined surfaces cooperate with edge parts of the housing of the cassette which bound said recesses in the housing, for pressing the cassette against positioning faces of the frame.

15 11. An apparatus according to claim 3, characterized by the presence of an electric drive mechanism for displacing the slide along the straight guide.

20 12. An apparatus according to claim 11, characterized in that the drive mechanism comprises a rack bearing-mounted relative to the frame, an electric drive unit present on the slide and a gear present on the slide, meshing with the rack and connected to the drive unit.

25 13. An apparatus according to claim 12, characterized in that the rack in at least the first position of the slide comprises a first rack part extending at least substantially parallel to the direction of movement of the
30 slide, and a second rack part forming an angle therewith and located more adjacent the writing and/or reading element, a means being present for keeping the gear in mesh with the rack.

35 14. An apparatus according to claim 13, characterized in that the rack is present on a pivot arm bearing-mounted in

the frame, while the means for keeping the gear in mesh with the rack comprises a groove provided in the pivot arm and extending at least substantially parallel to the rack, and further comprises a follower present on the slide and
5 extending into the groove.

15. A system comprising the apparatus according to any one of the preceding claims and further comprising a cassette provided with an information center and suitable for
10 cooperation with the apparatus.

16. A system according to claim 15, the apparatus being a magnetic tape apparatus and the cassette comprising a magnetic tape.

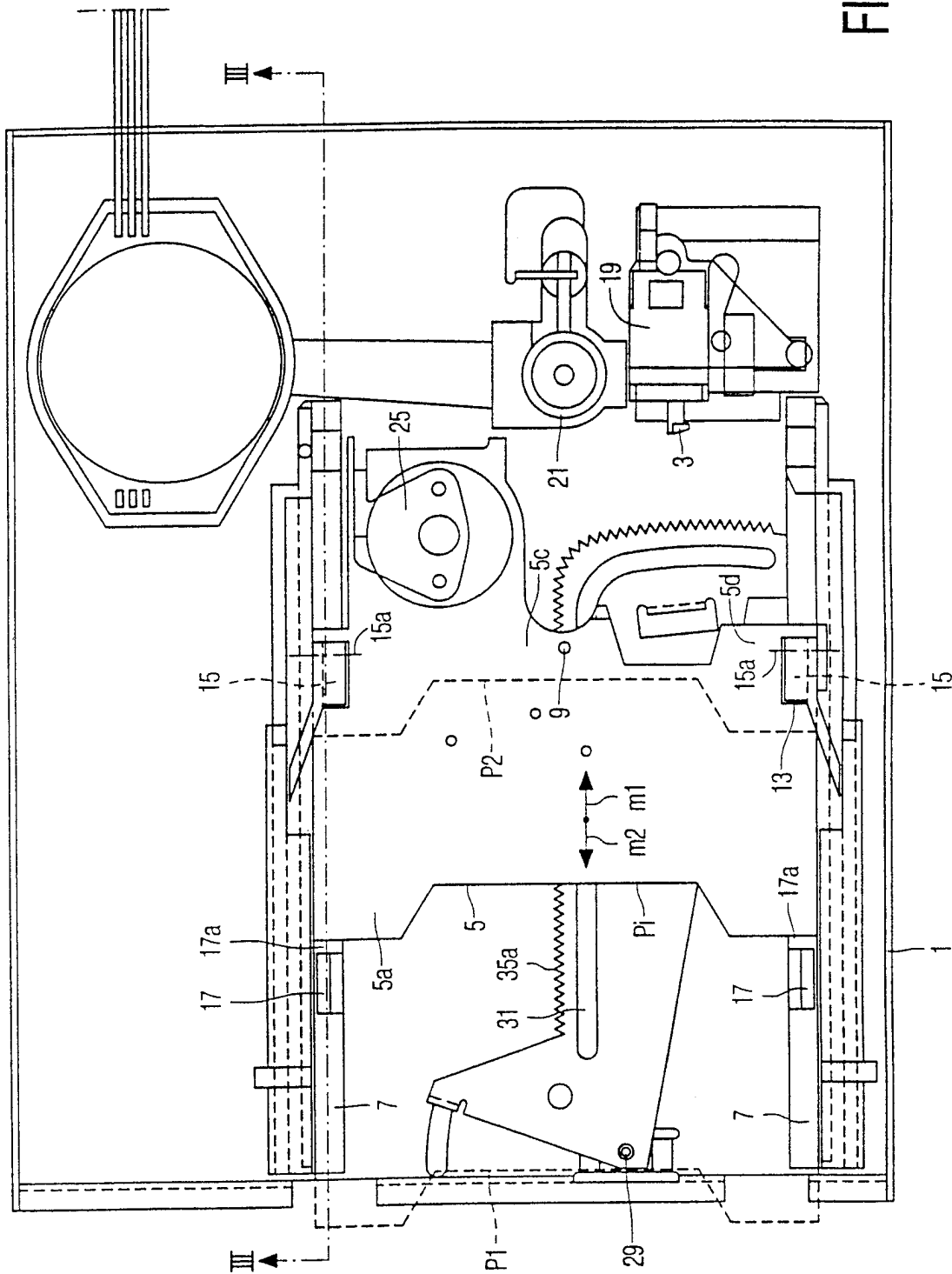


FIG. 1

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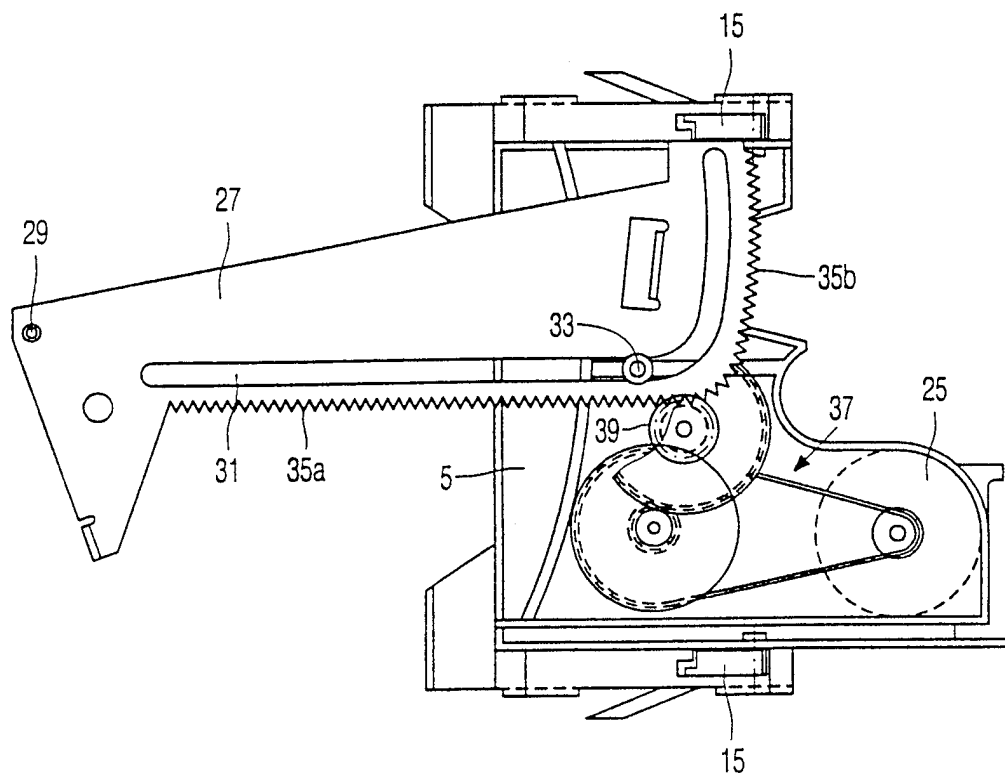


FIG. 2

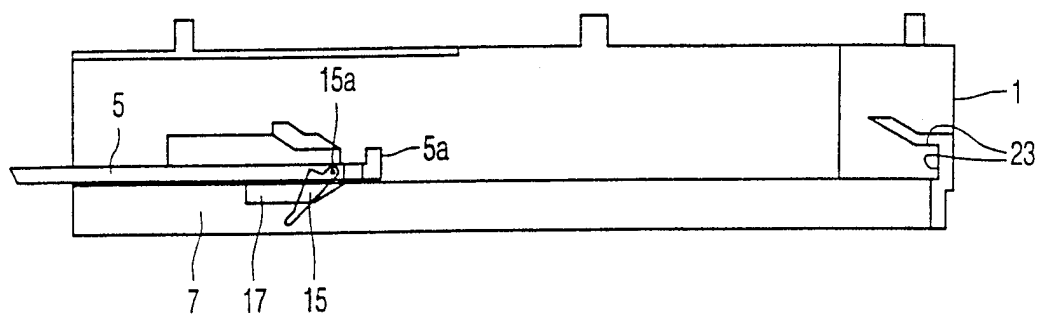


FIG. 3

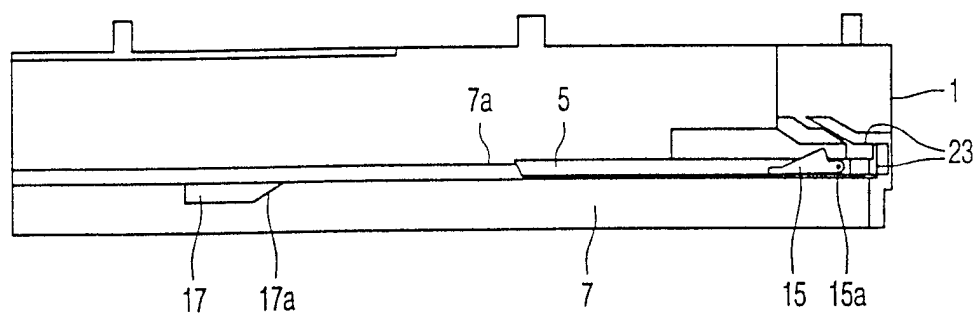


FIG. 4

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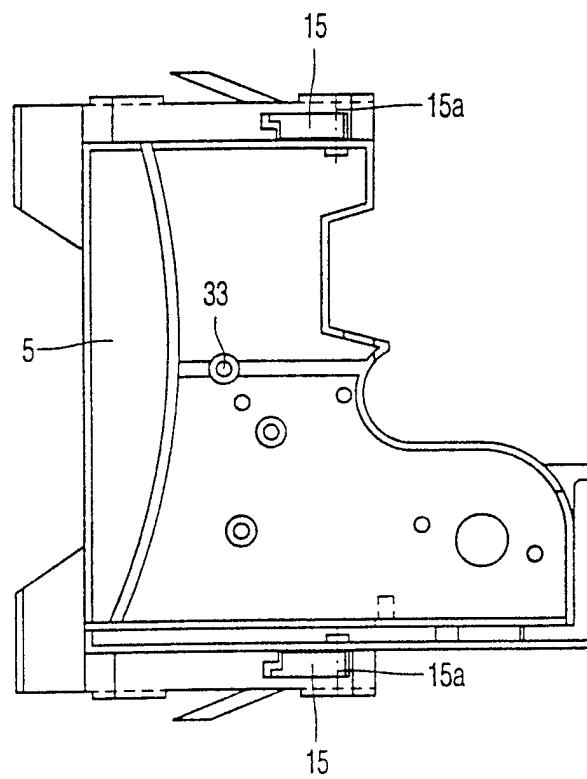


FIG. 5

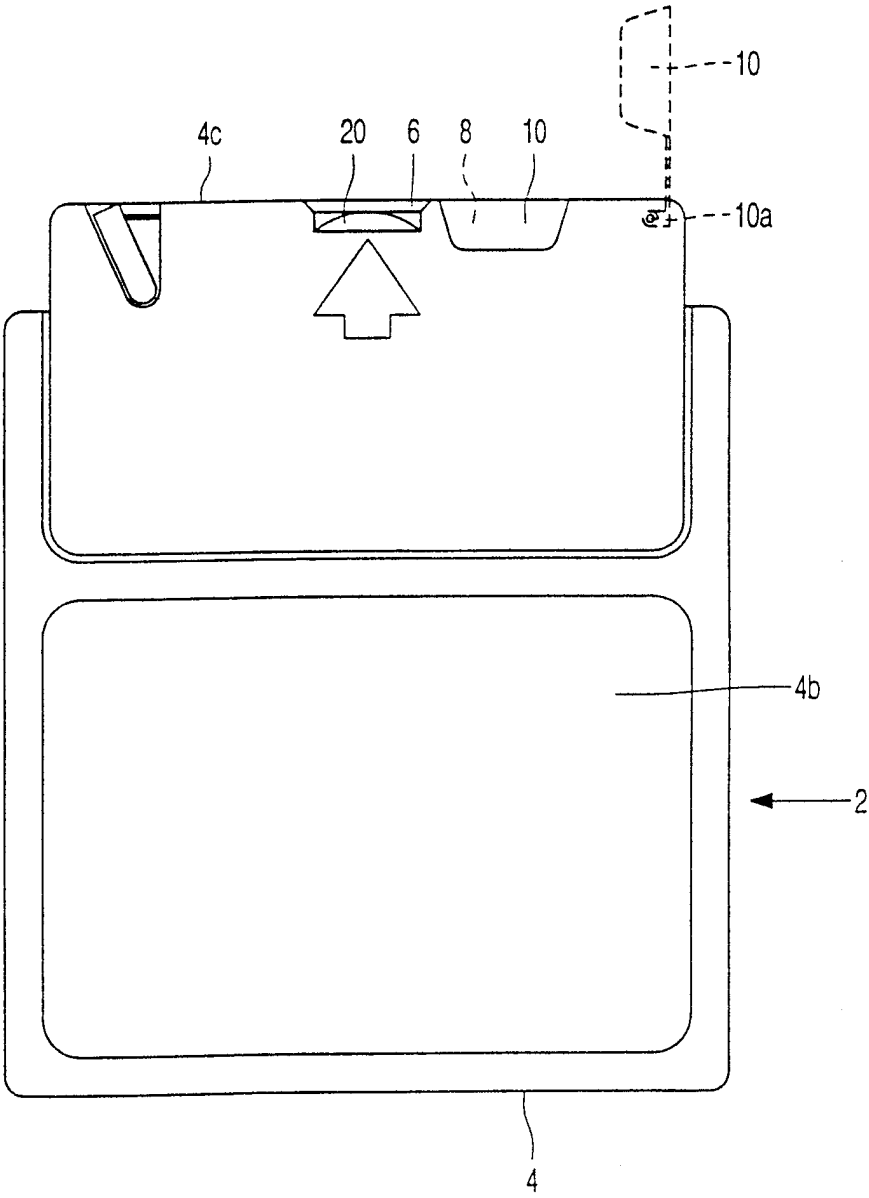


FIG. 6

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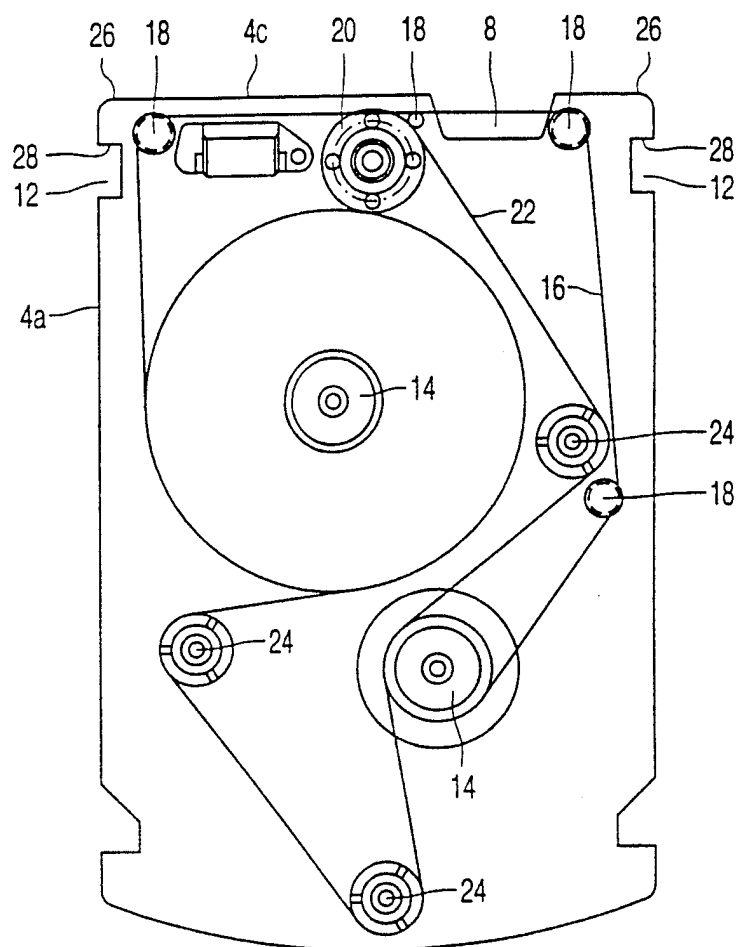


FIG. 7

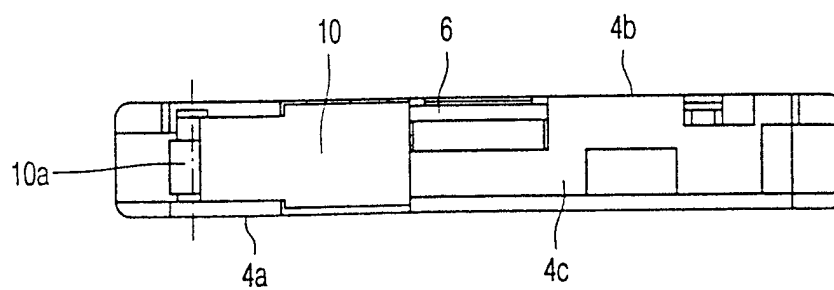


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 99/00563

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G11B15/675

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 18124 A (PHILIPS ELECTRONICS NV ;PHILIPS NORDEN AB (SE)) 30 April 1998 (1998-04-30) abstract; figures page 5, line 5 -page 7, line 26 ---	1-16
X A	US 5 448 432 A (SAGA HIDEAKI ET AL) 5 September 1995 (1995-09-05) abstract; figures column 3, line 25 -column 4, line 13 column 4, line 61 -column 11, line 53 ---	1-11, 15, 16 12-14
X A	US 5 373 406 A (JANSEN ORNULF) 13 December 1994 (1994-12-13) column 1, line 43 -column 2, line 20 column 2, line 52 -column 5, line 41; figures --- -/--	1-11, 15, 16 12-14



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 371 642 A (BRYER PHIL) 6 December 1994 (1994-12-06) column 2, line 64 -column 5, line 28; figures ---	1-11,15, 16 12-14
X	EP 0 562 390 A (WANGTEK INC) 29 September 1993 (1993-09-29) column 17, line 30 -column 22, line 20; figures ---	1,2,4-8, 15,16
X	EP 0 394 581 A (ARCHIVE CORP) 31 October 1990 (1990-10-31) column 4, line 54 -column 5, line 29 column 24, line 43 -column 29, line 17; figures ---	1,2,4-8, 15,16
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