

1

The present invention concerns a magnetic head for cards having a magnetic track. The type of head used in the invention is a telescopic and oscillating head.

In the prior art, readers of magnetic cards have been created in which the magnetic card is introduced into a slot for reading/writing of the track which it carries. To carry out read/write operations, the reader is provided with at least one magnetic head, the active surface of which is arranged as close as possible to the path of the card. For this purpose, the card generally comes under friction on the read head, which therefore undergoes a displacement stress. The first fixed heads of the apparatus of the prior art were therefore subject to wear, due to a great pressure to take up the deformations of the cards, which sometimes even went as far as the deterioration of the card and of the head. In a second stage, telescopic and oscillating heads were used. Here, the head, provided with elastic return means, presents an operation of parasitic oscillations on passage of the card. In certain cases, the parasitic oscillations produce poor readings or poor recordings on the magnetic track. However, the majority of these heads present a fault of linearity, the movements of the card causing a reaction of the head created by a displacement outside the normal read/write axis.

Systems of telescopic and oscillating guidance are known such as those taught by the US patent 3,836,753 and the French patent application 2.503.907, in which a set of balls arranged in 4 directions are placed in housings belonging either to the head or to the head support, to position the latter. The devices of the US patent and the French patent application indeed permit telescopic movements and oscillation movements to a small extent, but without, however, ensuring a precise positioning of the head with respect to a reference face.

The patent US 3.413.627 teaches a system of guiding permitting a precise positioning of the head with respect to a reference face, permitting the telescopic movements which allow the head to more or less enter and leave the housing, without, however, permitting the oscillating movements with respect to a pivoting point such as that represented in figure 5. Moreover, this system does not allow one to have a constant telescopic force.

The present invention has the aim of remedying the disadvantages of the prior art by proposing a linear telescopic head permitting a correction of the telescopic and oscillation movements, whilst ensuring the positioning of the head in a precise manner with respect to a reference face and having a device which is simple to manufacture, requiring no intervention on the magnetic head.

This aim is achieved by the fact that the invention consists of a magnetic head for a reader of cards having a magnetic track of the telescopic type, of the type comprising a body (23) which is movable in a frame (26,27,28), the frame containing at least a first means (30) for rolling without sliding along a rolling path on at least one face (25) of the head and first elastic return means (300) intended to ensure the return of the head towards a reference face (25a) of the frame, said frame comprising a second face (26b), perpendicular to the reference face (25a) which carries second rolling means (31), characterised in that said frame also comprises a movable face (26) which carries third rolling means (33), this movable face (26) and these third rolling means (33) being constantly pressed on the body of the head by a second elastic return means (29), the second means for rolling without sliding arranged on the second face (26b) perpendicular to the reference face are on two levels (39,40), the frame comprises two parallel faces (27,28) in planes perpendicular to the air gap plane, a first fixed face (27) and a second movable face (28)

subjected to the action of the elastic return means (300), each face comprising at the same level (46) at least one means (30 or 32) for rolling without sliding, the frame is provided with a stop (38) arranged on the outlet of the second face (26b) so as to limit the course of telescopic retraction of the head, acted upon by a third elastic means (35;80) towards the card.

Other characteristics and advantages of the present invention will be better understood with the aid of the attached description and of the figures, which are:

- Figure 1 : a diagram of a card reader,
- Figures 2A, 2B, 2C : diagrams of the embodiment of a head according to the prior art,
- Figure 3 : a top view of a diagram of a head according to the invention,
- Figure 4 : a front view of a head according to the invention,
- Figure 5 : a side view of the head according to the invention,
- Figure 6 : a variant embodiment of the frame suitable for a head according to the invention,
- Figure 7 : an embodiment detail of a part of Figure 6,
- Figure 8 : a variant embodiment of a means of the invention,
- Figure 9 : a variant embodiment of the invention.

In Figure 1 a conventional system has been shown of a magnetic head in a reader of cards having a magnetic track. The head 1 comprises an air gap 2 which opens on a convex part 3 of the body of the head. This air gap is arranged in a special plane, known as the air gap plane, marked in the drawing by number 4. Opposite the head 1, in the reader, a pressure roller 5 is arranged which allows, on the one hand, a torque to be exerted on the card, once the latter has been introduced into the reader, and on the other hand allows the

sheet of air to be limited, which is interposed between the air gap 2 and the magnetic track which is to be read or written. For this purpose, the card 6 is introduced through the slot of the reader in the interval separating the pressure roller 5 from the air gap 2. The card passes in a direction known as the card passing direction 7. For example, in a first direction, that of the introduction of the card, the head writes on the track, and in the opposite direction, if the head is activated for reading, it reads the track.

In figures 2A to 2C, three forms of embodiment of telescopic and oscillating heads according to the prior art have been shown, which allow the taking up of possible deformations of the card used by exerting a pressure on the card. For this purpose, in figure 2A, provision has been made to mount the head 10 on a deformable parallelogram constituted on the one hand by a chassis 11 connected to the reader, and on the other hand by two elastic arms 12 and 13 connected on the one hand to the frame 11 and on the other hand to the head 10. When a stress is exerted on the head 10, the latter retracts in the dotted position by crushing and deforming the parallelogram. In such a system, on the one hand the telescopic displacement (the retraction) is not linear, on the other hand the conditions of alignment of the air gap on the track are not easily obtained. On the other hand, parasitic oscillations appear with intensive use, especially if the tightness of the parallelogram is reduced to lessen the friction on the card.

In figure 2B, a second form of embodiment of the prior art has been illustrated, according to which the head 14 is mounted on the frame 15 by means of a flexible sheet 16 made from flexible metal. The movable arm 16 allows on the one hand a vertical retraction by rotation according to the arc 17, and on the other hand a rotation about the axis 18, the axis of symmetry of the tape constituting the arm 16. This

arrangement is subject to the same disadvantages as those of figure 2A and, like the device of figure 2A, means that one is obliged to provide attachments of external parts like the arms 12,13 or 16 on the head. The problems of the head of figure 2a are found again.

In figure 2C there has been illustrated a head with telescopic retraction and linear displacement. On a frame 20, a case 20a is fixed which contains the actual magnetic head 19 and a sheet spring 21. This spring has an S-shaped geometry deformed at 90° so as to press simultaneously on the lower face by a helix 21b and a lateral face by a helix 21a. The spring 21 can be fixed by one end 21c on the case. The helix 21b ensures the telescopic return of the head 19 on the card which is to be read or written. The helix 21a allows the head 19 to be pressed constantly on a reference face of the case. The telescopic displacements are therefore properly linear. However, this is at the price of high frictions of the head 19 on the internal face and the spring 21. The mechanical efficiency of the head is low, limited by this friction. Moreover, this mounting does not allow the head to be turned easily about an axis perpendicular to the plane of figure 2C to allow the possible deformations to be "followed" of the card which is introduced into the reader.

Figure 3 is a top view of a magnetic head according to the invention. A magnetic head according to the invention comprises a body 23 in which there is provided an air gap, the plane of which is marked 24 in the drawing, and a frame which comprises a reference face 25a for its attachment to the reader in a plane perpendicular to the air gap plane 24. The manufacturers of the magnetic head sell products by classes of precision guaranteeing the perpendicularity of the air gap plane (24) with a face 25 of the body 23. Perpendicular to the air gap plane, the frame comprises a second fixed face 27 arranged opposite a face 25 of the body 23. The faces 26 and 28 of the frame are movable under the

action of springs 29, 300 which constitute elastic return means which allow the body 23 to be constantly pressed on its references. Each of the reference faces 26b and 27 comprise rolling means 31,33 which allow the desired movements to be produced without friction of the magnetic head in use.

The springs 29 and 300 have a double effect, on the one hand to ensure the thrust in the direction corresponding to each of them, and on the other hand to follow the movement without friction of the head under the action of the other spring. They admit the movement of telescopic retraction of the body 23 along the axis perpendicular to the plane of the card in the reader without hindering it or deflecting it. In a second form of embodiment, in order to facilitate the maintenance of the head, each rolling member is arranged in a cage which allows its excursion to be limited. Thus it is possible, for example, to dismantle the head without losing the rolling members.

In figure 4, a front view has been illustrated of the head according to the invention, illustrated in figure 3. The air gap plane 24 is seen on its edge. The rolling means 31,33 are seen according to their section on this view. The telescopic retraction is ensured by means of a spring operating in compression in the course of reading/writing. The reference number 35 designates this spring, one end of which rests on the bottom 36 of the body 23 and the other end of which is connected to the bottom 37 of the frame.

In another form of embodiment illustrated in figure 9, the elastic return of the telescopic retraction movement is carried out by means of a sheet spring 80 which operates in deflection and is arranged by one of its ends in a slot 83 of a face of the head and by the other end to a fixed face 81 of the frame. The spring 80 is mounted such that it permanently applies a bearing force 84 of the body 82 on the

reference face 26b of the frame and that it exerts an elastic return in the two directions 85 and 86 of the direction parallel to the axis of telescopic retraction. In one form of embodiment, the fixed wall 26b of the frame carries a stop 38 against which the convex part of the body 23 comes to press in its extreme course. This stop is intended to limit the course of the head for example to prevent any contact on the roller 5, see fig. 1. In figure 4, the rolling means are arranged according to two levels 39, 40 so as to ensure a linear displacement and a constant positioning of the convex face of the body 23 with respect to the frame.

In figure 4, the rolling means are illustrated diagrammatically. On the one hand, they comprise a recess like the recess 41 machined in the wall 26b, and on the other hand a circular body like the body 42. For a maximum displacement of length H, a recess of half height $H/2$ is provided, the body of circular section 42 rolling without sliding in the recess or groove 41 and on the face opposite the actual head. The depth of the recess is provided such that the body of the head constantly bears on a rolling member, i.e. in the section of figure 4, that the depth is less than the diameter of the section of the rolling member. Finally, the bottom of the recess remains constantly parallel to the displacement of the head to guarantee its linearity, the rolling means 31, 33 of the level 39 being duplicated 31a, 33a at the level 40.

According to the invention, the bearing force which is exerted by the spring 29 arranged opposite the bearing face 26b on the head allows a rolling to be ensured without sliding of the rolling members, on the one hand on the body 23, and on the other hand on the recesses like the recess 41 in the rolling means. The spring 29 comprises an end 29a connected to a fixed point of the frame and an active end 29b on a movable wall 26 which also carries rolling means.

In figure 5, a side view of the head seen in figure 4 has been illustrated. In this view, the fixed wall 27 is perpendicular to the air gap plane which is the plane of the figure (see the top view, figure 3). The opposite face 28 of the frame is movable under the action of the spring 300 which lays the body 23 on the reference rolling member 30. In stable position, the axis of the head is according to the median direction 43. Rolling means are provided to allow angulations in a restricted limit between two positions like positions 44, 45. These oscillations allow the possible take-up of bucklings of the surface of the card in a plane perpendicular to the direction of passing. Typically, the variations of the plane are in the order of a few minutes of the arc.

In order to permit this rotation, means for rolling without sliding are provided on a single level 46. Preferably, this level is arranged as close as possible to the air gap and hence to the card.

In a solely telescopic version (without oscillation) a supplementary needle can be added on each face 27 and 28. To prevent jamming of the body 23 in the frame, it is possible to repeat on the faces 27 and 28 the devices represented on the faces 26 and 26b. One will then have in particular a placement of rolling members and means on the two levels 39, 40. Only a spring acting like the spring 35 applies the head 23 on the track of the card. One therefore has a head with 8 needles. In order to reduce the costs, one may also only retain the means of the invention on the faces parallel to the air gap plane 24, the two perpendicular faces, however, not having to receive any contact on the frame.

In a preferred form of embodiment, the rolling members like that of 42 are each constituted by at least one elongated cylindrical needle. The recess like the recess 41 is then

constituted by a housing in the face concerned of the frame, the thickness of which is less than the diameter of the circular section of the needle on the one hand, and the height of which depends on the course of the head. In this arrangement, the needles on mounting are arranged in any manner in their housing. In the course of the first use, it suffices to exert a first strong pressure on the head so that, owing to the return springs like the springs 29 and 30, the needles assume their place of balance. Such a device therefore has the particular interest of avoiding laborious regulating operations of the rolling means which ensure the general regulation of the head.

In a first preferred variant, the needle is held between the bottom of the recess in the wall of the frame and the face opposite the movable head. As the recess has a height greater than the diameter of the needle, the latter, on being put into service, is arranged across, its axis of rotation not, in general, being arranged in the direction of the largest dimension of the recess. Whilst the movement remains telescopic, the needles each tend to place themselves in this latter direction where the reactions of the needle on its rolling faces are minimal. Thus, the head is automatically "armed" on the first reading. However, if azimuthal oscillations about the axis 43 of figure 5 are caused by deformations of the card, the rotation of the head involves a deviation of the axis of rotation of each of the needles which is placed across the recess.

In one form of embodiment, to prevent the azimuthal oscillations from being braked by the friction of the needles in their displacement, their length is reduced and their number is doubled in each recess. Thus, the surfaces in contact are reduced and hence the extent of the frictions.

In another form of embodiment in which one wishes to obtain

10

the elimination of these frictions, the needles are replaced by spherical balls. In figure 8, three views have been illustrated of rolling means using one ball per recess. On the left of the drawing, the recess 41 is in the form of an oblong hole, the large axis of which is directed in the direction of preferred movement : that of telescopic retraction. The ball 42 is in upper position corresponding to an extreme course of the head. In the centre of the drawing, the recess 41 is a circular dish 41a which, itself, permits a rolling displacement without sliding of the ball 42 for example in a position represented in broken lines 42a which corresponds to an azimuthal reaction in the course of a telescopic retraction. The reference faces of the frame must, on each level of contact of the rolling members, comprise at least two balls so that the conditions of equilibrium are respected.

In figure 6, a diagram has been illustrated illustrating a head frame according to the invention, provided with an adjustable orientation member of the bearing zone of a rolling means. In fact, it is of the utmost importance to guarantee that the read head will present an external face 58a which is strictly perpendicular to the air gap plane 54. The face of the body of the head which is perpendicular to the air gap plane now presents, according to the manufacturers, tolerances which are variable for example between 10 and 40 minutes of the arc. These variations must therefore be corrected when the body is installed in the frame of the complete head. The invention proposes a simple means with a very rapid implementation. On a reference face like face 58b, the rolling means which each comprise a needle 62 in a recess 61 are arranged on a movable finger 60. The movable finger is constituted by a cut-out of the wall 58. The cut-out itself is deformed in a permanent manner well beyond the values which are to be corrected, for example 1° of the arc. The cut-out comprises a free end directed towards the interior of the frame and an end

11
connected to the wall 58 of the frame. This connection may be an elastic articulation constituted by a channel perpendicular to the plane of the correction by the cut-out which creates a line of least resistance and hence a site to initiate folding.

In a perpendicular wall 59, and perpendicular to the cut-out, a smooth perforation is carried out in which a partially threaded screw 63 is installed. The threaded part is screwed in a tapped hole pierced at the free end of the movable finger. The regulating is carried out by unscrewing, which has the effect of reducing the deviation of the finger and allows the disadvantage to be remedied which derives from the deformation of the head.

In one form of embodiment, the articulation is constituted by a channel, for example on each face of the cut out 60, the channel constituting a weakening of the material and hence a facilitated folding axis for the cut out 60, which therefore serves for regulation. The cut out in a preferred form of embodiment is obtained by moulding the frame, the finger being, through the shape of the mould, bent towards the interior of the frame. The folding channel, which provides a flexible articulation of determined rigidity is, itself, obtained by moulding.

In figure 7, a diagram has been illustrated of the embodiment of a variant of figure 6. The head is viewed from the top. It is composed of a frame having four faces 64, 65, 66, 67. The face 67 is selected as the reference face with a view to the attachment of the head to the reader. In order to bring the plane 54 of the air gap 69 to the perpendicular of the plane of the outer wall 67 to the frame, an adjustable orientation member is created, composed of a finger 72 which is articulated in a flexible manner towards the interior of the frame. The articulation 72a presents a determined rigidity so as to balance the opposed correction

spring 73. This articulation may be created by a weakening of the folding line between the finger and the remainder of the actual wall 67. The finger 72 therefore originates from a window cut out 70 of the wall 67. The rolling means on the movable wall 73a will be noted, which are constituted by a needle 73b in a suitable recess of this wall 73a. The needle 73b is arranged appreciably at the same level as the needle 71 arranged in a recess of the finger 72, for the reason already mentioned in figure 5. The finger 72 therefore, like that of figure 6, is of reduced height, sufficient to arrange therein a recess of half height to the retraction excursion of the body 68.

The two faces of the body 68 parallel to the air gap (69) roll without sliding between the movable wall 74a equipped with two needles like the needle 74b seen in figure 7 and the fixed wall 66 equipped with two needles like the needle 66a of figure 7. A correction of geometry is less necessary because the manufacture of the bodies like the body 68 permits a much closer tolerance on the parallelism of the faces with the air gap than that of the perpendicular faces. However, the invention may be perfectly applicable for faces in parallelism with the questionable air gap plane by equipping the wall 66 with two cut out fingers at the level of each needle.

Finally, in a preferred manner, the spring 300 is of a greater tightness than that of 29, allowing the body 23 to be pressed on the face 26b of the frame. Likewise, the needle of the rolling means on the face 27 of figure 5 or figure 3 is longer than that of the other means, so as to promote the azimuthal pivoting. The same arrangement may apply, mutadis mutandis, to the head of figures 6 or 7. In particular, when the invention is put into operation with balls as rolling members, and in the case where the body is produced from a material which is liable to be marked by the rolling, the invention makes provision that rolling strips,

the surface state of which may further improve the mechanical qualities, are deposited by known means of the prior art opposite the rolling members. The life of the head is increased by preventing its wear by marking.



Claims

1. A magnetic head for a reader of cards having a magnetic track of the telescopic type, of the type comprising a body (23) which is movable in a frame (26, 27, 28), the frame containing at least a first means (30) for rolling without sliding along a rolling path on at least one face (25) of the head and first elastic return means (300) intended to ensure the return of the head towards a reference face (25a) of the frame, said frame comprising a second face (26b), perpendicular to the reference face (25a) which carries second rolling means (31), characterised in that said frame also comprises a movable face (26) which carries third rolling means (33), this movable face (26) and these third rolling means (33) being constantly pressed on the body of the head by a second elastic return means (29), the second means for rolling without sliding arranged on the second face (26b) perpendicular to the reference face are on two levels (39, 40), the frame comprises two parallel faces (27, 28) in planes perpendicular to the air gap plane, a first fixed face (27) and a second movable face (28) subjected to the action of the elastic return means (300), each face comprising at the same level (46) at least one means (30 or 32) for rolling without sliding, the frame is provided with a stop (38) arranged on the outlet of the second face (26b) so as to limit the course of telescopic retraction of the head, acted upon by a third elastic means (35; 80) towards the card.

2. A magnetic head according to claim 1, characterised in that the cavity (41) of each rolling means has a dimension equal to half the maximum course in the direction of telescopic retraction.

3. A magnetic head according to claim 1 or 2, characterised in that, to take up errors of geometry of the head, the frame comprises on at least one fixed part (58) and at least



facing a rolling path, an adjustable orientation member (60) of the support zone of the rolling means (61, 62), and the initial deformation of which is at least equal to the greatest error in geometry of the body which is to be corrected.

4. A magnetic head according to claim 3, characterised in that the adjustable orientation member is constituted by a window cut-out (66) perpendicular to the support between the rolling member (67) and the body (68) of the head, a first end of which is free and movable under the effect of a means (63) for adjustment of deformation, and a second end is integral with the frame.

5. A head according to claim 4, characterised in that the means for adjustment of orientation is constituted by a screw (63) which is movable in a tapped hole of the frame (59), the end (65) of which comes to repel the free end of the cut-out (66) towards the exterior of the frame.

6. A magnetic head according to claim 4, characterised in that the means for adjustment of orientation is constituted by a screw (63) which is movable in a smooth bore of the frame (59) and the end of which repels the free end of the cut-out articulated in an elastic manner towards the interior of the frame.

7. A head according to claim 4, 5 or 6, characterised in that the articulation of the second end connected to the frame of the cut-out (60) is constituted by at least one groove of a direction perpendicular to the plane of displacement of the cut-out (60 or 66).

8. A head according to one of the preceding claims, characterised in that each rolling member is constituted by at least one cylindrical needle arranged in a housing of the frame perpendicular to the rolling path provided on the body



of the head.

9. A head according to claim 8 and claim 5, characterised in that to promote the azimuthal movements, only the needle arranged on the fixed face of the frame and perpendicular to the air gap plane extends over the greatest part of the face opposing the body of the head, and in that the return spring (29) which is opposed thereto is less tight than the spring (35) intended for return of the telescopic correction.

10. A magnetic head according to claim 1, characterised in that the rolling member is constituted by a ball (42) so as to bring about a rolling both in telescopic retraction and in azimuthal correction.

11. A magnetic head according to claim 10, characterised in that the cavity intended for the ball is an oblong hole (41b), the large axis of which is in the direction of telescopic retraction and the length of which is equal to half the amplitude of retraction provided.

12. A magnetic head according to claim 11, characterised in that the cavity intended for the ball is a cylindrical dish (41a), in which the ball may, without sliding, take all the positions in the course of the movements of telescopic retraction and azimuthal correction.

13. A magnetic head according to claim 1, characterised in that each rolling member is held by a cage connected to the frame.

14. A head according to claim 1, characterised in that the movement of telescopic retraction is ensured by a spring (35) which operates in compression between a face (36) of the head and the bottom (37) of the frame.

15. A magnetic head according to claim 1, characterised in



17

15. A magnetic head according to claim 1, characterised in that the third elastic means ensuring the movement of telescopic retraction is ensured by a spring (80) which operates in deflection between a first free end engaged in a slot (83) of a face of the body (82) and a second end fixed to a fixed face (81) of the frame.

16. A magnetic head according to claim 1, characterised in that to avoid the marking of the rolling paths on the body, rolling strips of hard material are arranged facing the rolling members on the outer surface of the body.

17. A magnetic head according to claim 1, characterised in that the frame is obtained by moulding.

18. A magnetic head according to claims 17 and 3, characterised in that the cut-out and the adjustable orientation member are also obtained by moulding.