

CLAIMS

1. A scanner (10) for a magnetic-tape apparatus, comprising an upper and a lower drum (11, 12) separated by a drum gap (13), and a head disc (14) carrying magnetic heads (15) and supported to be rotatable in the drum gap (13), a magnetic tape (16) being guided obliquely across the drum gap (13) by means of a ruler (17) on the lower drum (12), characterized in that the tape contact surfaces (20, 21) at both sides of the drum gap (13) have recesses (22, 23) adapted to the thickness of the air films (24, 25) formed underneath the tape (16) during rotation of the head disc (14).
2. A scanner as claimed in Claim 1, characterized in that the smaller tape contact surfaces (26', 27') obtained as a result of the recesses (22, 23) are formed in uniform radial raised portions (26, 27) having a constant radius at the drum edges at both sides of the drum gap (13), and the radial height (H) of said raised portions relative to the recesses (22, 23) is adapted to the thickness of the air film (24, 25) formed.
3. A scanner as claimed in Claim 2, characterized in that the radial raised portions (26, 27) have lips (28, 29) pointing towards the drum gap (13).
4. A scanner as claimed in Claim 1, characterized in that the triangular drum areas (18, 19) over which the tape (16) moves and situated at both sides of the drum gap (13) are provided with triangular trough-shaped recesses adapted to the thickness of the air films formed, the edges of said recesses at the location of the drum gap (13) and of the tape edges serving as supporting surfaces for the tape (16).
5. A scanner as claimed in any one of the Claims 1 to 4, characterized in that the height (H) of the radial raised portions (26, 27), or the height of the edges of the trough-shaped recesses (22, 23) relative to the bottoms of the recesses, is approximately 10 to 20 μm .

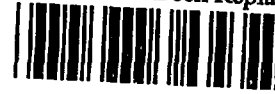
This Sheet Has Been Replaced



DESCRIPTION

Scanner for a magnetic-tape apparatus

This Sheet Has Been Replaced



The invention relates to a scanner for a magnetic-tape apparatus, comprising an upper and a lower drum separated by a drum gap, and a head disc carrying magnetic heads and supported to be rotatable in the drum gap, a magnetic tape being guided obliquely across the drum gap by means of a ruler on the lower drum.

- 5 A scanner of the type defined in the opening paragraph is known, for example from the BTS publication "DCR 100 Digitale 4:2:2 MAZ". In the known construction the head disc comprises a plurality of radially aligned head supports carrying magnetic heads at their radial outer ends. When the head disc rotates the magnetic heads contact the tape wrapped around and moving past the scanner, so that
- 10 the instantaneously scanning magnetic head forms a so-called tent whose top is in contact with the magnetic head and whose sides are in contact with the lateral supporting surfaces of the upper and the lower drum. If with such a construction comprising a plurality of magnetic heads a given speed is exceeded the rotating head disc will displace air, resulting in a non-uniform air cushion underneath the tape on the
- 15 scanner surface. The size and shape of this air cushion depends on the position of the tape edges relative to the drum gap. As a result of this non-uniform air cushion the shape of the tent formed by the instantaneously scanning head will change continually. The tape no longer runs on the ideal cylinder defined by the upper and the lower drum but on a cylinder defined by the fabricated geometrical shape and the local air cushion.
- 20 Owing to the deviation of the distorted active cylinder from the ideal cylinder the tape also tends to deviate and run off the track. However, this is prevented by the guide means for the tape, which urge the tape, which is thus deformed, back onto its guide edge. Cooperation of the tape with such a deformed cylinder is possible only if the tape is also deformed. This deformation results in a non-uniform stress distribution in the
- 25 tape, which has a negative effect on the recording/scanning quality. A non-uniform stress distribution in the tape before the scanner gives rise to a non-uniform read level and thus means a disturbance of the scanning process of the track.



US-PS 3,139,489 discloses a scanner for a magnetic-tape apparatus having an upper and a lower drum spaced from one another by a drum gap and a head disc carrying magnetic heads and arranged to be rotatable in the drum gap, in which in order to reduce the friction of the tape on the scanner compressed air is fed underneath the
5 tape from an external source through ducts. For this purpose there are provided air-supply ducts and two flanges secured to the two drums by means of screws at both sides of the drum gap, which flanges project a certain distance from the drum surface and provide a seal for the ducts and a seal between the tape and the flanges. Compressed air should penetrate the area between the cylindrical surface and the tape but should not
10 reach the drum gap; there compressed air would reduce or eliminate the head/tape contact. The compressed air serves to produce an air film between the tape and the two cylindrical surfaces. The two flanges projecting from the cylindrical surface tension the tape in the scanning area over a comparatively large distance of 13 mm. This construction leads to sagging and a poor lateral support of the tape. The combination of
15 the externally supplied air film and the small surface area of the two flanges is claimed to provide a substantially frictionless contact between the tape and the cylindrical surface. In the prior-art construction the flanges extend approximately 0.1 mm beyond the cylindrical surface.

It is an object of the invention to reduce, in a scanner of the type defined
20 in the opening paragraph, the influence of air films which are formed automatically underneath the tape at high speeds of the head disc and whose thickness leads to a deviation from the ideal cylindrical shape of the scanner drum.

According to the invention this object is achieved in that the tape contact surfaces at both sides of the drum gap have recesses adapted to the thickness of the air
25 films formed underneath the tape during rotation of the head disc. This enables the air films formed as a result of the rotation of the head wheel to divert to the recesses, so that no bulges can be formed in the tape. The tape thus again cooperates with a cylinder having the ideal geometrical shape. Since no more bulges are formed no stresses will be produced in the tape and, consequently, no non-uniform recording and read conditions
30 will arise. A drum shape of this kind thus allows the tape tension in a direction transverse to the transport direction to be equalized *via* air-film thickness compensation.

In an embodiment of the invention the smaller tape contact surfaces obtained as a result of the recesses are formed in uniform radial raised portions (ridges)



having a constant radius at the drum edges at both sides of the drum gap, and the radial height relative to the stepped drum surface is adapted to the thickness of the air film formed. The width of the radial raised portions in the axial direction should be adapted to the tip projection. The edges of the "tent" formed by the heads should be situated
5 within the area of the raised portions. Such radial raised portions (ridges) at the drum edges at the location of the drum gap can be manufactured comparatively simply, the radial raised portions adjoining the adjacent drum surface, for example, with a shoulder. This embodiment does not require any further machining.

In a further embodiment of the invention, in order to obtain a narrower
10 drum gap, the radial raised portions may be provided with lips pointing towards the drum gap.

In a further embodiment of the invention the triangular drum areas over which the tape moves and situated at both sides of the drum gap are provided with recesses adapted to the thickness of the air gap formed, the edges of said recesses at the
15 location of the drum gap and of the tape edges serving as supporting surfaces for the tape. In this embodiment a trough-shaped recess corresponding to the thickness of the air film is formed in the drum surface in said triangular areas. The tape is then supported by the edges of this recess both at the location of the drum gap and at the location of the gap edges, the recess itself providing the air-film thickness
20 compensation.

In a further embodiment of the invention the height of the radial raised portions relative to the adjacent stepped drum surface, or the height of the edges of the triangular recesses is approximately 10 to 20 μm . This enables air films produced underneath the tape at higher speeds of the head disc to be compensated for, so that the
25 tape is not vaulted and, consequently, no stresses are produced in the tape.

In the drawing Fig. 1 shows diagrammatically an example of a prior-art construction.

Figs. 2 and 3 show an exemplary embodiment of the invention,
30 Fig. 2 being a diagrammatic side view of a part of a scanner with a developed scanner surface, and

Fig. 3 showing the part Z3 of Fig. 2 in detail.



16.03.94

5

PHD 93-047 EP

Fig. 1 shows a developed surface of a scanner 10 comprising an upper drum 11, a lower drum 12 and a head disc 14, which is supported to be rotatable in a drum gap 13 and which carries magnetic heads 15 at its periphery. A magnetic tape 16 extends obliquely across the drum gap 13 and is guided by a ruler 17 and guide rollers, not shown. Details Z1 and Z2 are shown to an enlarged scale at the left and the right of Fig. 1. In operation the rapidly rotating head disc 14 produces air cushions underneath the tape 16 in substantially triangular areas 18, 19 on the scanner surface. As is illustrated by the details Z1 and Z2 these air cushions have irregular shapes depending on the positions of the tape edges relative to the drum gap 13. The tape 16 consequently runs on a deformed cylinder defined by the fabricated geometrical shape and the local air cushion 20, 21. The active cylinder thus formed is no longer the ideal deliberately constructed cylinder to which the helix relates. Cooperation of the tape 16 with this deformed cylinder is possible only if the tape 16 is also deformed. This means a disturbance of the scanning process of the track. As is illustrated by the details Z1 and Z2 the shape of the tent formed by the scanning heads 15 changes continually. The above considerations lead to the inventive idea of providing steps to preclude the formation of such non-uniform air cushions.

Figs. 2 and 3 show a construction in accordance with the invention to which said steps have been applied. Fig. 2 again shows a scanner 10 comprising an upper drum 11 and a lower drum 12 separated by a drum gap 13 in which a head disc 14 carrying radially disposed magnetic heads 15 is rotatable. The magnetic tape 16 guided obliquely across the drum gap 13 *via* a guide ruler 17.

Fig. 3 a detail Z3 of Fig. 2. The tape contact surface has been provided with recesses 22, 23 in the areas 18, 19 in which the air films were formed. The air displaced as a result of the rotation of the head disc 14 collects in these recesses and forms uniform air films 24, 25. The recesses 22, 23 have been adapted to the thickness of the air films 24, 25, so that the tape 16 no longer exhibits any bulges. The smaller tape contact surfaces 26', 27' obtained as a result of the recesses 22, 23 are formed on radial raised portions 26, 27. These raised portions have lips 28, 29 projecting into the drum gap 13 to reduce the width of the drum gap 13. The lips enable a correct engagement of the tape and ensure that no sagging occurs. Fig. 3 shows that, in contrast with the situation in Fig. 1, a uniform tent 30 is formed above the drum gap 13 during passage of a magnetic head 15. Thus, the adverse effects of air films have been



16.03.94

6

PHD 93-047 EP

eliminated. The raised portions 26, 27 have for example approximately a width of 1 mm and a height H of 10 to 20 μm . Moreover, relative to the orbit of the head disc 14 they have a constant radius at the upper and the lower drum 11, 12. If now the stress distribution differs across the tape width the air film in the recesses 22, 23 will be

5 compressed to a different extent. This results in a stress compensation and a uniform head-to-tape contact.