9606931-5
IPAS copy
REPLACED SHEETS SG
ORIGINAL 3
☑ Description : paged 1 to paged 3
☑ Claim(s) : paged 4 to paged 13
☑ Drawing(s) : paged 13 to paged 13
☐ Abstract : paged ..... to paged .....

Low Profile Disc Clamp

The present invention relates to the field of disc drives and more particularly to, but not exclusively to, spindle motor disc clamps therefor.

A primary function of a spindle motor disc clamp is to clamp the stack of discs to a flange on the "bottom" of the disc drive's spindle motor. Unless the force applied is sufficient, the discs will move under shock and vibration, rendering the drive useless. Further, unless the force applied is uniform, the discs themeselves will "waffle," creating unacceptable "runout" conditions.

One type of disc clamp known to small form factor drives is a substantially circular "leaf spring" clamp affixed to the top of the spindle with one screw for "rotating shaft" spindle motors, and with a plurality of screws for "fixed shaft" spindle motors. An example of the latter is illustrated in Figures 1 and 2 of U.S. 4,896,231, which patent is hereby incorporated by reference as if set forth fully herein.

There are two problems with the latter configuration as disc drives become both smaller and the need for shock resistance increases. First the screws have to be larger to provide increased torque on the "spring." And second, the distance from the outermost edge of the screw contact and the location of clamp-disc contact is shortened as disc inside diameters become smaller and the screws larger. This magnefies the variable spring-rate problem caused with plural screws. The variable spring rate problem induces a non uniform clamping force about the periphery of the clamp, which in turn induces the waffling problem.

An object of the present invention is therefore to provide a clamp which overcomes these problems.

The present invention thus comprises forming the sundry disc clamp screw holes of a circular, leaf spring disc clamp into an oval shape such that the point of contact of the disc clamp screw flange lies toward the center of the clamp.

This Sheet Has Been Replaced

This Sheet Has Been Replaced ORIGINAL

An embodiment of the present invention will now be described with reference to the accompanying drawings, of which:

Fig. 1 is a top plan view of a disc clamp according to a preferred embodiment of the present invention.

Fig. 2 is a side cross sectional view of the disc clamp of Fig. 1 in a "clamped" position.

Fig. 3 is a partial cross sectional view of the disc drive having a prior art disc clamp in an "unflexed" condition to illustrate the vertical space saved with the present invention..

Referring to Fig. 1, disc clamp 10 is substantially circular having an OD 12 and an ID 10. The clamp has several bends, illustrated in this figure and also in Figure 2, which generally creates a leaf spring effect. The spring is provided with a plurality of screw holes 16 and a plurality of torque holes 18. The latter are used by tools which need to grasp the spindle and either hold it in place or rotate it without the aid of the spindle motor.

Also shown in this figure are mounting screws 20. These mounting screws screw into corresponding holes 16 in disc drive spindle 134 (Fig. 3). The screws' flange sections are circular in shape. However the disc clamp screw holes are oval in shape, substantially symmetrical about a radius drawn through the center of a hole, with the wider portion of the oval radially outermost.

The screw size and spindle screw hole location are selected such that the outermost edge of the screw flange does not interfere with the disc clamp, but rather lies within the edge of the oval screw hole.

The effect of this arrangement is best illustrated by comparing Figures 2 and 3. In Fig. 2, screw 20 is fully seated. The screw contacts the disc clamp at its radially innermost edge. Further, the spring section of the clamp is allowed to flex above the level of the screw flange.

Compare this to Fig. 3, which shows an older arrangement. Here the disc clamp screws are shown spaced slightly above the clamp. The clamp itself is shown

ORIGINAL

in its fully unflexed condition such that the lowermost lip of the clamp at 22 lies below the level of the top of the topmost disc 8b. In an actual drive, the clamp would ride on the top of the disc and be pressed up against the bottom of the screw flange. Further, due to the bending of the clamp, the disc clamp will contact the screw flange at its radially (from the point of view of the disc clamp) outermost edge.

The effect of this new structure is to permit both the lowering of the overall stack height of the disc clamp structure, which includes the disc clamp mounting screws, and to move the point of contact radially inward. Moving the point of contact of the screw to the disc clamp radially inward evens the spring rate at the edge of the spring and thereby lessens the disc "waffling" problem.

The use of oval screw holes also permits the use of larger screws in a smaller drive. Larger screws permit less screw stress and/or increased screw torque which is essential in increasing shock resistance.

The aforegoing embodiment has been given by way of example only and it will be appreciated by a person skilled in the art that modifications may be made without departing from the scope of the present invention.

This Sheet Has Been Replaced

ORIGINAL

CLAIMS

* C L M S *

1. A circular disc clamp for use in a disc drive, characterised by a plurality of oval-shaped screw apertures (16), said apertures disposed substantially symmetrical about respective disc clamp radii, the larger section of the oval lying radially outermost.

2. A disc drive having a circular disc clamp as claimed in claim 1.

This Sheet Has Been Replaced