SUMMARY

[0023] Generally, t~~T~~he ~~invention~~disclosure is directed to a low cost high performance injection molded hard disk top cover that provides superior sealing properties at the seal locations preventing contamination of disk drive by moisture, gases as Oxygen or ambient dust particles. The plastic top cover does not resonate easily by spindle vibrations due to its low mass and low elastic modulus. The mass of the top cover is of importance since almost all the acoustic energy is airborne which means that the transmission loss of the acoustic energy through the top cover is very important and is mostly a function of mass. Damping does not do much for transmission loss. The disk drive with a plurality of disks has more airborne noise and the more important is the use of a high mass cover. Smaller dampers are also less functional since the noise simply goes around the sides of the small damper. The top cover of the present ~~invention~~disclosure has a low mass top cover with the insertion injection molded metallic strip at the flange. The flange thus becomes the large mass portion of the hard drive top cover and the vibrational energy transmitted to the flange is delivered to the damping elastpmeic gasket. The low elastic modulus in combination with viscoelastic flow properties of the polymer without insertion molded metallic portion generally results in relaxation of stresses applied to a seal ring and the seal quality could degrade as a function of time. The present ~~invention~~disclosure incorporates a insertion injection molded metallic strip in between screwed in locations of the top cover that assures adequate loading applied to the seals without viscoelastic creep relaxation of the polymeric top cover flange.

[0024] The present ~~invention~~disclosure provides a low cost highly reliable hard drive top cover that is a polymeric injection molded cover portion. The flange portion of the polymeric top cover has one or more metallic portion insertion injection molded providing stiffness to the flange especially between screwed in securing locations so that adequate contact pressure is applied to the seal element therein preventing any leakage or ingress of dirt into the critical components of the hard drive. The presence of metallic portions between the screwed in retaining locations assuring non relaxing nearly uniform contact pressure over the seal element during the lifetime of the assembled hard drive device. This contact pressure of seal element is typically accomplished by threaded screws inserted through several clearance holes in the hard drive top cover plate and the threads of the screws

engage with corresponding threaded apertures in the base plate at the bottom portion of the hard drive. Other fastening mechanisms may be used to apply required contact pressure on the seal elements such as clamps and the like.

[0025] In a preferred second embodiment, the insertion injection molded metallic portion that spans between the screwed in locations may be provided with a convex curvature so as to apply increased pressure at locations between the bolt securing locations. The clamping pressure generated in these locations between screwed in locations is comparable to that exerted directly at the screwed in securing locations. The injection molded polymer surrounding the curved metallic portion may also have a curved shape that mimics the shape of the curved metallic portion in the unstressed state, so that the application of the contact pressure by the screws result in straightening of both the metallic portion and the polymeric portion at the same time.

[0026] The injection molded top cover has a flange with metallic reinforcement portion and is subject to separation or delamination when the screws securing the top cover of the hard drive to the hard drive base portion is tightened. The third embodiment uses reinforcing metallic portion provided with a plurality of punched in apertures that provide pathways for the injection molded polymer. This attachment between the reinforcing metallic portion and the polymeric portion of the flange preventing the possibility of delamination of the metallic reinforcing portion even under extreme bending situations.

[0027] Preferably, the injection molded top cover of the hard drive is metalized by means including metal evaporation or electroless metal plating and grounded to the base member of the hard drive to guard the hard drive components against static electricity or electro magnetic interference. The screwed in attachment of the metalized top cover to the metallic base member of the hard drive grounds any electrical charge accumulated by the top plate.

[0027a] In a first aspect, there is provided a hard drive comprising:

an injection molded polymeric top cover;

a body portion and a flange portion;

said flange portion contacting an elastomeric seal squeezed against a base member of hard drive by a plurality of pressure application means;

said flange portion having a metallic reinforcement portion embedded within said injection molded polymer;

whereby the pressure on said elastomeric seal is maintained without viscoelastic relaxation of flange portion .

[0027b] In a second aspect, there is provided a method of producing an injection molded polymeric hard drive top cover comprising the steps of:

producing a metallic reinforcement strip of appropriate geometry for incorporation within a flange portion of said top cover during insertion injection molding;

inserting said metallic reinforcement strip into an injection molding machine at the flange location within a top cover mold;

injecting a polymer selected from Lexan EXL, VECTRA or other suitable injection molding polymers;

withdrawing the molded top cover from the mold and cooling it to room temperature.

[0028] Accordingly, the first embodiment of the present ~~invention~~disclosure is directed to a low cost injection molded top cover article for a hard drive, comprising:

- an injection molded top cover of the hard drive having a body that encases the hard drive mechanism and a flange portion that surrounds the body portion;

- said flange portion having plurality of apertures for receiving screws that attach said top cover to the base member of the hard drive;
- said flange portion being reinforced by one or more metallic portions embedded within the injection molded polymer and reinforces the flange span between said apertures;
- said reinforcement preventing contact pressure loss on seal element between screwed in securing locations.

[0029] Accordingly, the second embodiment of the present ~~invention~~disclosure is directed to a low cost injection molded top cover article for a hard drive, comprising:

- an injection molded top cover of the hard drive having a body that encases the hard drive mechanism and a flange portion that surrounds the body portion;
- said flange portion having plurality of apertures for receiving screws that attach said top cover to the base member of the hard drive;
- said flange portion being reinforced by one or more convex shaped metallic portions embedded within the injection molded polymer and reinforces the flange span between said apertures;
- said reinforcement preventing contact pressure loss on seal element between screwed in securing locations due to the curvature in mid span between screwed in locations applying increased contact pressure.

[0030] Accordingly, the third embodiment of the present ~~invention~~disclosure is directed to a low cost injection molded top cover article for a hard drive, comprising:

- an injection molded top cover of the hard drive having a body that encases the hard drive mechanism and a flange portion that surrounds the body portion;
- said flange portion having plurality of apertures for receiving screws that attach said top cover to the base member of the hard drive;
- said flange portion being reinforced by one or more metallic portions provided with plurality of apertures for passage and bond creation between injection molded polymer and said metallic portion;
- said reinforced flange span between said apertures preventing contact pressure loss on seal element between screwed in securing locations.