



PATENT NUMBER 3,931,459: VIDEO DISC

Inventor: Adrianus Korpel

Assignee: Zenith Radio Corporation

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Summary of the Invention [Excerpt]: "Optical image reproducing systems have been proposed as adjuncts to home color television receivers to increase their use by arranging for the play back of recorded program material through such receivers. As heretofore proposed, the program material is stored in a carrier, such as a disc quite similar to well known audio discs, to be read by a beam of energy, usually a laser beam, to develop an electrical signal representation of the stored information..."

Y B Blu?

by Derek Barnes

... In other words, stick the round, flat shiny thing into the right kind of player, and you can watch "Xanadu" whenever you like. Not that discs mattered much since, in the early days of home video, most people wanted their movies on VHS videotape. At least they did until the DVD — with it's commentary tracks, extra scenes and additional cinematic goodies — became the format of choice for most of the late 1990s... which brings us to the Blu-ray format. You have to wonder: How many media players and versions of "Blade Runner" are we supposed to buy? And what's the difference between a DVD and a Blu-ray disc anyway?

Just as poly/cotton blends have replaced bison pelts in our wardrobes, embracing the new video technology is about more than just fashion or money: It's about good science and genuine progress. Progress that helps you experience, with hitherto unimagined clarity and nuance, the campfire fart scene from "Blazing Saddles."

Video discs, CDs, DVDs and Blu-ray discs are all forms of optical storage media. There are three things needed for optical data retrieval to work: a disc, a disc reader and a little light.

Understanding the nature of light means understanding the nature of waves. Light has many wave-like characteristics including a set of characteristic wavelengths. Wavelengths of light are usually measured



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in nanometers, one nanometer (abbreviated "nm") being equal to 0.0000003937 inches. A typical sheet of typing paper is around 0.004 inches thick or roughly 101,600 nm. The visible portion of the electromagnetic spectrum, the light we can see, has wavelengths between 400 and 700 nm, give or take.

Digital data is burned onto a disc in a path that spirals outward from the center. If the spiral path of a Blu-ray disc were stretched into a straight line, it would be over 37 miles long.

Different wavelengths of visible light correspond to the different colors of the rainbow. Lasers are made to emit light of some particular wavelength which is why the light from a laser has a specific color. Focused laser light is an essential element when it comes to reading the data stored on a disc.

Optical storage media, like Blu-ray discs, are made out of several layers — but only one or two of those layers keep them from being nothing more than undersized Frisbees. Sandwiched between clear protective outer layers is a shiny, reflective layer containing microscopic indentations of various lengths called pits. The pits follow a path, only a few hundred nanometers wide, that spirals outward from the center of the disc. The arrangement of the pits alternating with non-indented areas called lands — kind of looks like a long Morse code message when the pitted layer is seen through a powerful microscope.

The smallest pits on a CD can be no smaller than 600 nanometers because the laser reading them has a wavelength of about 780 nanometers. But on a Blue-ray disc, the pits can be as tiny as 150 nm because the laser reading them only has a wavelength of roughly 405 nm, a wavelength of light that corresponds to the blue region of the visible spectrum. Using a laser light with a smaller wavelength allows the player to read smaller pits. Smaller pits means more pits fit on a disc. Fitting more pits on a disc means fitting more data on a disc... meaning two different commentary tracks, two Spanish language versions and a "Finding Your Inner Stripper" featurette will all fit quite easily on your Blu-ray disc of "Showgirls." ▶

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Smallest Pit: 600 nm wide



Stores 4.7 GB of data Smallest Pit: 400 nm wide



Blu-ray Stores 25 GB of data Smallest Pit: 150 nm wide

It's the Pits

Data burned onto an optical disc exists as microscopic indentations (called pits) of various lengths. The indentations on a Blu-ray disc are smaller than the pits on a CD or a DVD. This allows a Blu-ray disc to hold about five times more data than a DVD and over 35 times more than a CD. Having more pits closer together allows much higher storage densities.

Source: Blu-ray Disc Association, http://www.blu-raydisc.com.

The science behind Blu-ray is, y'know, there... but really it's all about your favorite movies and TV shows being available for you to watch in the privacy and comfort of your own home. It's about letting your friends think you only watch moody art house films while copies of "Porky's" and "Eyeborgs" are secretly stashed away in your condo. But be warned: When "Eyeborgs II" comes out, you might not be watching it on a Blu-ray. New players and new formats are in the pipeline at this very moment. When fully developed, these new technologies will have the potential to store four to five times more data than a Blu-ray disc. Imagine the whole Harry Potter series or an entire season of "Seinfeld" on one disc. Imagine having to shell out even more money for another CENSORED player!

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