

OPTICS

Op Art Uses Psychology

See Front Cover

► THE PATTERNS you see when your eyes are closed just before sleep comes are known as phosphenes because these figures seem to glow in the dark. They can be produced by closing your eyes and then applying pressure with the fingers to the outer edges of both eyes.

Everyone obtains the same pattern, Dr. Gerald Oster of the Polytechnic Institute of Brooklyn said. At first, all that is "seen" is a general whitish glow. After about three seconds, a checkerboard design that flickers appears.

The picture on this week's front cover is an artistic rendition of one type of geometrical figure seen with the eyes closed, done by Dr. Oster and entitled Phosphene Burst.

The geometric patterns a person sees with closed eyes when relaxed are beautiful examples of op art, a new term for optical art designed to produce a "pronounced visual stimulation."

Op art goes beyond most of the abstract art of the past in that it uses simple forms deliberately to provoke visual images, Dr. Oster reported in *Applied Optics*, 4:1359, 1965.

Dr. Oster is both an optical scientist and an op artist and has thoroughly analyzed the elements of op art.

These elements include color, three-dimensional projections and the moire technique, which is the juggling of families of curves to produce new patterns. These elements are the basis of op art, individual works of which can stimulate anything from elation to nausea in a viewer.

Dr. Oster's analysis considers not only the physics of these effects but also the pertinent visual physiology and psychology. His report is also an extensive historical review of the scientific and artistic antecedents of op art.

In his report, Dr. Oster notes that an understanding of the real world is as important to the artist as it is to the scientist. Nowhere, he said, "do art and science seem to be on such common ground for discussion" as in optical art.

Dr. Oster states that phosphenes can also be produced by electrical means, and that these figures are easily remembered after several months if the person was under the influence of lysergic acid diethylamide, commonly called LSD, when they were "seen."

Concerning the prospect of digital computers being used to produce objects of art beyond the imagination of even the most imaginative human minds, Dr. Oster states that when "such a day is reached, it will require an artist" to tell the computer how to do so.

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INVENTION

Current U. S. Patents

► A LOW-TEMPERATURE system for carrying electricity, suitable for use with conventional equipment, was awarded a patent.

This method, although still far in the future, could not have prevented the power failure that blackened the Northeast and New York the evening of Nov. 9. However, engineers are working to perfect a system for transmitting electrical power at very low temperatures, somewhere in the neighborhood of 350 degrees below zero F.

The reason is that certain materials lose all observable resistance to carrying electricity when they are cooled to temperatures near absolute zero. At normal temperatures, metals resist the passage of electrical current, causing a power loss.

Alfred J. Cummings of Las Vegas, Nev., earned patent 3,216,208 for his method of maintaining long lengths of wire or films at cryogenic temperatures, as those close to absolute zero are called. He devised a system for keeping the wire or film at superconducting temperatures without immersing either the wire or film in the cooling fluid. This is accomplished by enclosing the wire or other electronic device in a small area within a shielded portion of a larger container holding the supercold liquid.

Mr. Cummings assigned patent rights to the Government through the Secretary of the Air Force.

Also assigned in this manner was patent 3,217,099, awarded to Radames K. H. Gebel of Dayton, Ohio, for his development of a system for amplifying very low light levels. It operates on principles similar to television and includes an extremely sensitive optical amplifier.

Use of the method, known as the "cat eye," is helping astronomers take previously impossible daylight photographs of planets and stars. When used with a 10-inch refracting telescope, the cat eye permits very short photographic exposures during daylight or darkness.

By electronically varying the contrasts between light and dark, the cat eye detects very small differences in light that are not apparent with conventional photographic equipment.

Fiber Optical Devices

An improved process for making the fiber optical tools that have proved valuable to doctors for medical examinations was granted patent 3,216,807. Richard F. Woodcock of South Woodstock, Conn., assigned rights to the American Optical Company, Southbridge, Mass.

Several million glass fibers, each no larger than a hair, are needed to make such optical devices. The problem has been to seal them together and still keep all of them in the correct position for transmitting light without distortion.

Mr. Woodcock's method for doing this also allows fabrication of much larger optical face plates, on which the information is seen, than was possible by previous methods.

Use of the glass fiber strands gives physicians instruments that eliminate blind spots caused by curves in body regions, such as the stomach. This is because the tiny glass fibers are flexible.

Other Interesting Patents

A radar system that is frequency modulated, which gives an improved way of telling how high an airplane is flying above the ground, was awarded patent 3,217,322. Louis J. Kabell of Albuquerque, N. Mex., and Conrad W. Roeschke of Palo Alto, Calif., assigned patent rights to the Government through the U.S. Atomic Energy Commission. Details of the system were not made public until 11 years after the patent application.

Another device held secret even longer, 13 years, earned patent 3,216,354 for Marshall P. Bearce, who was then in Falls Church, Va. Mr. Bearce assigned rights to his improved land mine to the Government as represented by the Secretary of the Army.

Also assigned to the Government, through the Secretary of the Navy, was patent 3,217,326, awarded to Maxime G. Kaufman of Camp Springs, Md., and Donald W. Lynch of Springfield, Va. The patent covers a method of determining the direction and occurrence of orbiting objects.

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TECHNOLOGY

Computer Foresees, Helps Eliminate Knock Knock

► THE KNOCK KNOCK of the "water hammer" pounding through pipes can be eliminated from rocket engines and nuclear submarines, as well as from massive hydroelectric or other plants.

The destructive pounding of a liquid moving through pipes can be stopped merely by anticipating with a computer where pressure waves will build up, and then setting in valves to relieve this pressure, said Dr. Victor L. Streeter, University of Michigan, Ann Arbor.

Water hammer, the same kind that makes household pipes pound, is caused by pressure waves surging through liquids in pipes, particularly after a valve has been suddenly shut off, Dr. Streeter said at an International Symposium on Water Hammer in Pump Storage Projects held in Ann Arbor.

By using a computer to analyze the flow of the liquid, engineers can set up valves in strategic locations in order to eliminate the knock.

This computer solution is still too complex and expensive for use in individual homes, however.

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