

for a 25% to 50% hike, and a "micro-miniature" model can sell for as much as 100% more than the original.

Much of the production machinery must be especially designed, at least at the outset. Some firms have to build their own. Whole new plants may be required to eliminate dust, vibration and temperature variation.

Raw material costs are high for top-quality, long-life metals. The vacuum-melt steel used in miniature ball bearings, for instance, sells for \$5.67 a pound, compared to 24¢ a pound for ordinary cold-rolled steel.

Since miniaturization is a relatively new endeavor, companies often have to train their own experts. Production workers, too, need careful training.

Final assembly of very high precision parts may have to be done in sealed areas with air filtered to remove minute particles of dust. A complete absence of sunlight keeps heat from expanding the parts. Components must be handled with rubber gloves or tweezers to keep perspiration from corroding them.

Inspection and quality control expenditures run from 20% to 30% of manufacturing costs. The rigid requirements for much of the equipment necessitate costly testing

and a high percentage of waste.

Big profits are possible, however, and the opportunities are many and varied. The future is particularly bright for the manufacturer who can find new, economical ways of shrinking some part of a partially miniaturized product that still remains "unshrunk."

Man himself is the greatest known example of miniaturized efficiency, notes Horace D. Gilbert, president of Miniature Precision Bearings, Inc., Keene, N. H. A computer expert has described the human body as a ten-cycle computer in a one-tenth of a ton chassis with a one-tenth of one horsepower motor.

The number of elements inside the skull's bone box are infinitely greater than the number in the most advanced computers. Their microscopic size enables them to function so efficiently within such a small space.

"Is it not conceivable that someday man might create a computer as complex and as complete and as small as the human brain?" Mr. Gilbert asks. "Perhaps not, but the goal to aim at is there for us, and we now are on the trail in pursuit of it."

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motor, powered by batteries, has been invented by Lee Devol, Dayton, Ohio. Movement between coils and a circle of permanent magnets ceases immediately if the motor stalls, permitting use of the motor for the winding of watches or clocks without danger to the mainsprings. The motor also is adaptable to miniaturization, Mr. Devol said. Rights to patent No. 2,993,159 were assigned to Hamilton Watch Company, Lancaster, Pa.

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AERONAUTICS

Jet Pilots Told How to Reduce Take-off Noise

► TO CUT THE NOISE from jet aircraft operating near residential areas, pilots have been advised to get the plane up as high as possible on take-off, then to reduce engine power as much as possible while flying over homes.

The counsel came from the International Air Transport Association, Montreal, Canada. Their technical committee approved recommendations offered by a study group of noise abatement experts.

The take-off climb should reach at least 1,500 feet, and normal climb power should not be resumed below 2,000 feet or until the plane is past inhabited areas, the Association said. Above 3,000 feet, however, the pilot should forget about noise abatement and concentrate on adhering to the flight path.

On the ground, civil authorities should see to it that potentially noisy areas near airports are not zoned for home building.

Airport administrations were urged to help by establishing ground and navigation facilities to assure use of minimum-noise flight paths.

The Association said that compulsory restrictions on sound levels at given points and aircraft take-off weights, or changes in jet operational schedules, are not necessary. They believe such regulations would interfere with efficient airline operations and passenger services.

The recommendations were called "a practical guide to making airports good neighbors as well as community assets" by Sir William P. Hildred, the Association's director general.

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INVENTION

Patents of the Week

Improved method makes diamonds from piles of discs under high pressures and temperatures. A device for locating crashed aircraft invented in Spain.

► AN IMPROVED METHOD for controlled "growing" of diamonds has been patented by Harold P. Bovenkerk, Saratoga, N. Y., who assigned rights to patent No. 2,992,900 to General Electric Company.

The Bovenkerk system is said to produce "superior individual diamond crystals." Discs of non-diamond carbon material, such as graphite, and discs of various metal alloys, serving as catalysts, are stacked alternately in a new type of reaction chamber. When high pressures and high temperatures are applied, the carbon changes to diamond form.

Mr. Bovenkerk indicated that the best results were achieved when the alloy was made from an elemental catalyst metal combined with one of the strong carbide-forming elements, such as titanium, zirconium, boron, silicon, iron, manganese and tungsten. The melting point of the alloys is lowered, and the diamond-producing catalytic reaction increases. Why this happens "is not understood at the present time," he said.

He said "true diamonds" that passed standard tests for quality and density were obtained. The method reportedly improves on previous techniques of "growing" diamonds in cluster formation, which may inhibit growth of individual diamonds and cause surface irregularities.

A device to enable rescue parties to detect

and locate crashed aircraft has been invented by Karl Edmund Devantier, Madrid, Spain, for which he was awarded patent No. 2,992,793. Planes would be equipped with battery-operated radio equipment in a small projectile, which would be catapulted automatically from the rudder tail unit at the moment of impact. The radio, protected by shock absorbers, would start emitting signals immediately, and would be parachuted to the ground or water near the crash scene.

Another invention was an improved method of converting salt water into fresh water. Norman D. Greene and Heinz F. Poppendiek, La Jolla, Calif., assigned rights to patent No. 2,992,977 to General Dynamics Corporation, San Diego, Calif.

The method used is thermal distillation, with the saline water first heated to vaporization temperature and the vapor then boiled off and condensed to pure water. Instead of the standard duct flow for the saline water, however, a whirling vortex flow is employed, producing much higher heat transfer and evaporation rates.

This, the inventors point out, makes their method more economical by heating the saline water faster, lessening the area of heat transfer surfaces, and greatly reducing the accumulation of salty crusts inside the boilers.

A simple, low-cost magnetic impulse

Questions

ANTHROPOLOGY—How long ago may man's earliest ancestor have lived on earth? p. 83.

ASTRONOMY—What earth satellites have been photographed for the first time? p. 82.

Photographs: Cover, Bell Telephone Laboratories; p. 83, National Geographic Society; p. 85, National Aeronautics and Space Administration; p. 87, Andrews Air Force Base; p. 90, Radio Corporation of America; p. 95, NASA; p. 96, Eastern Safety Equipment, Co., Inc.