

Patent Applications: A Clue to Technology Trends

By Tadashi Ishii

Recent vigorous technological development and the rapid emergence of new technologies, especially in electronics, have been reflected in a huge increase in the number of patent and utility model applications. The increase has been most conspicuous in electronics, office automation and factory automation. What kind of technological trends emerge when we examine the statistical record on Japanese patent and utility model applications?

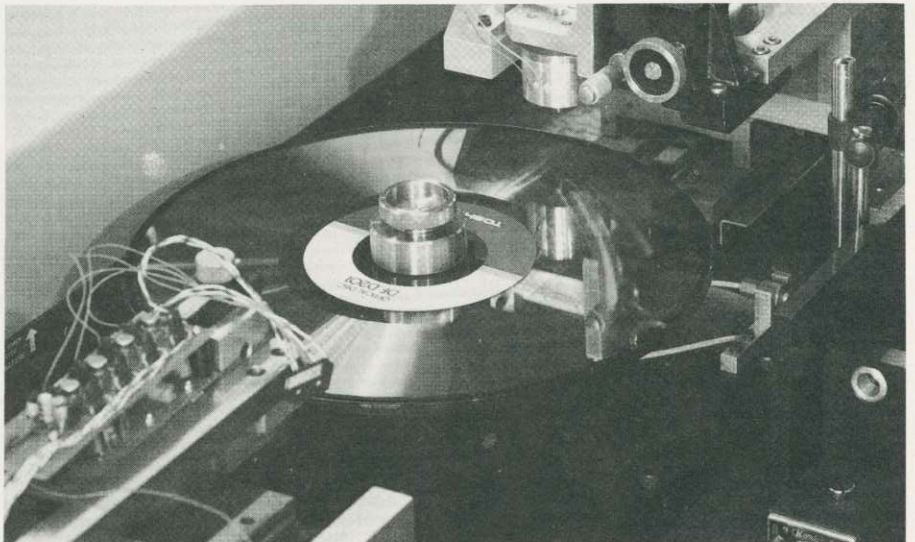
Patent application trends

There were 238,000 patent applications and 203,000 utility model applications in Japan in 1982, up 64% and 37% respectively over 1973. In 1982, applications filed in Japan accounted for 44% of all patent and utility model applications filed anywhere in the world. This exceptionally large number reveals the vigor of technology development in Japan, the intensity of market competition, the depth of the stratum of inventors, and the dedication of workers and engineers alike to invention and innovation.

Of all patent applications in 1981, 21.9% concerned electricity, 23.2% physics, 15.7% chemistry, and the rest mechanics and living necessities. Compared with 1976, the share of applications in electricity and physics increased, while those in chemistry, mechanics and living necessities decreased.

Of all the utility model applications in 1981, 49.6% concerned mechanics, 18.6% electricity and 14.7% physics. Compared with 1976, the proportion of applications in mechanics and physics increased, and those in living necessities decreased.

These shifts reflect the nature of technological development in recent years. The rapid progress in electronics and



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office automation has led to more applications in electricity and physics, while the increased proportion of utility model applications in mechanics shows of the development of microcomputer products and automated machinery such as robots.

Technology in growth areas

Overall, patent applications increased 35% between 1976 and 1981, but the rate of increase was clearly higher in some fields than in others. Fig. 3 shows the rate of increase in the number of applications between 1976 and 1981 in five representative growth areas.

With respect to electronics, a category which covers information storage, controls, communication, electric elements and computing, the increase in the number of applications in the sub-categories ranged from 73% to 100%.

This attests to the vigorous progress in computer, semiconductor and communication technologies.

The advances in office automation technology have also been mirrored in a rapid rise in the number of applications. Technology related to display screens, photography and optics is indispensable to office automation as it is embodied in photocopiers, facsimiles and word processors. Applications involving display technology increased by 160% from 1976 to 1981, while applications involving photographic technology increased by 95%.

With respect to factory automation, applications related to the manipulator technology used in industrial robots increased by 85% over the same period.

Other high growth areas included laminating technology for composite materials, up 126%, and medical technology, up 73%. The latter in particular reflects recent spectacular progress in medical electronics.

Let us look more closely at four of the technologies in which applications increased most sharply—optical fibers, facsimiles, industrial robots, and computer tomography.

Optical fibers

Since low-loss optical fibers were first developed in the United States in 1970, considerable work has gone into develop-

ing communications applications, some of which are already in practical use. These efforts have been paralleled in Japan, as shown by a sharp increase in patent applications in this field since 1973. In 1973, only 170 patent applications were made public; by 1982 the number had risen to 1,360.

The substance of the applications received over these years reveals a clear shift from basic to applied research and development. Up until 1975, many applications dealt with the material and structure of

optical fibers and with production methods. In recent years, more and more inventions concern connectors for the fibers.

Facsimiles

Facsimiles, which are central to office automation in Japan, are making rapid progress. Between 1977 and 1982, the number of patent applications dealing with facsimile technology made public increased by 138%, from 776 to 1,844.

Fig. 1 Total Patent and Utility Model Applications

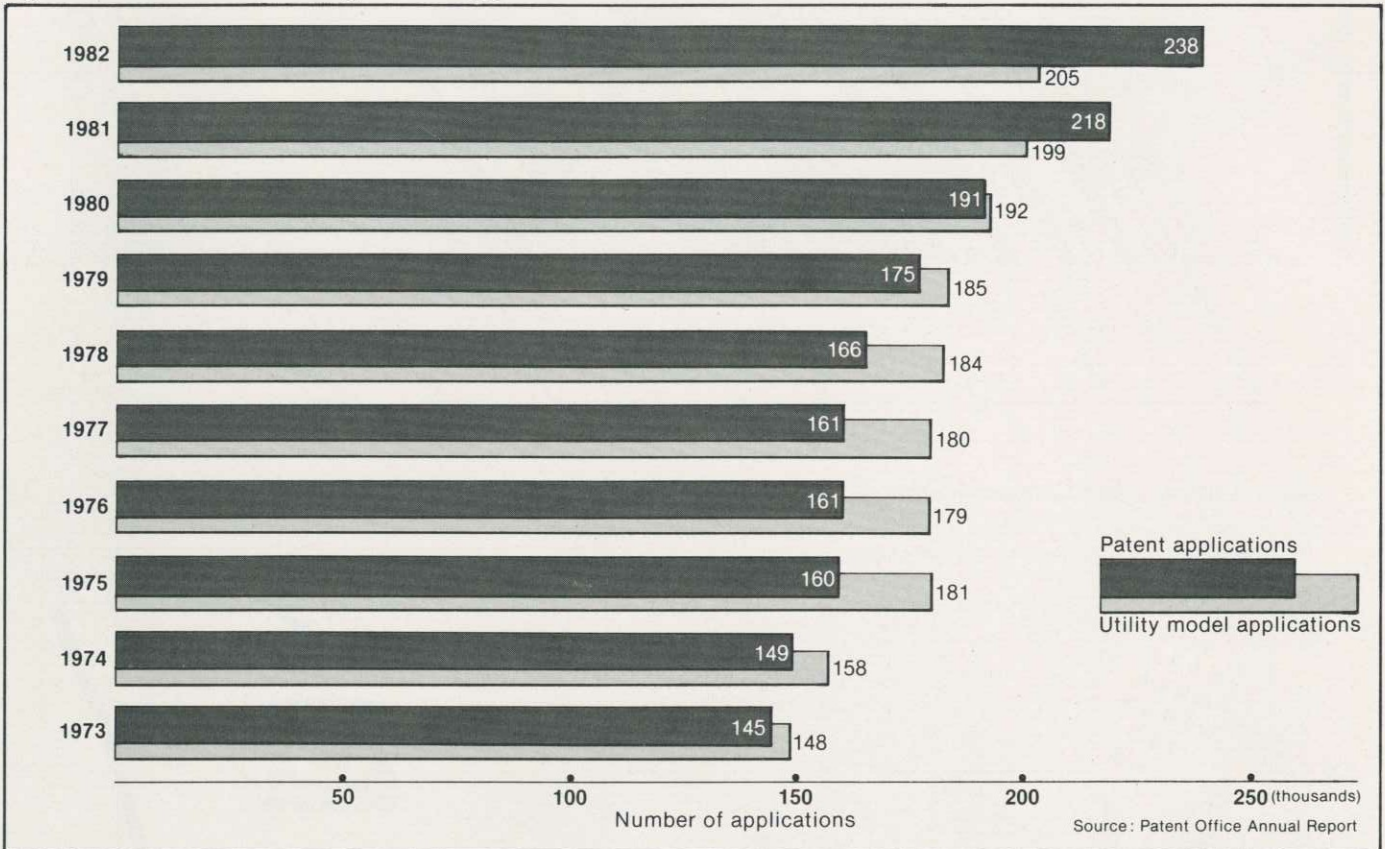


Fig. 2 Technical Classification of Applications (%)

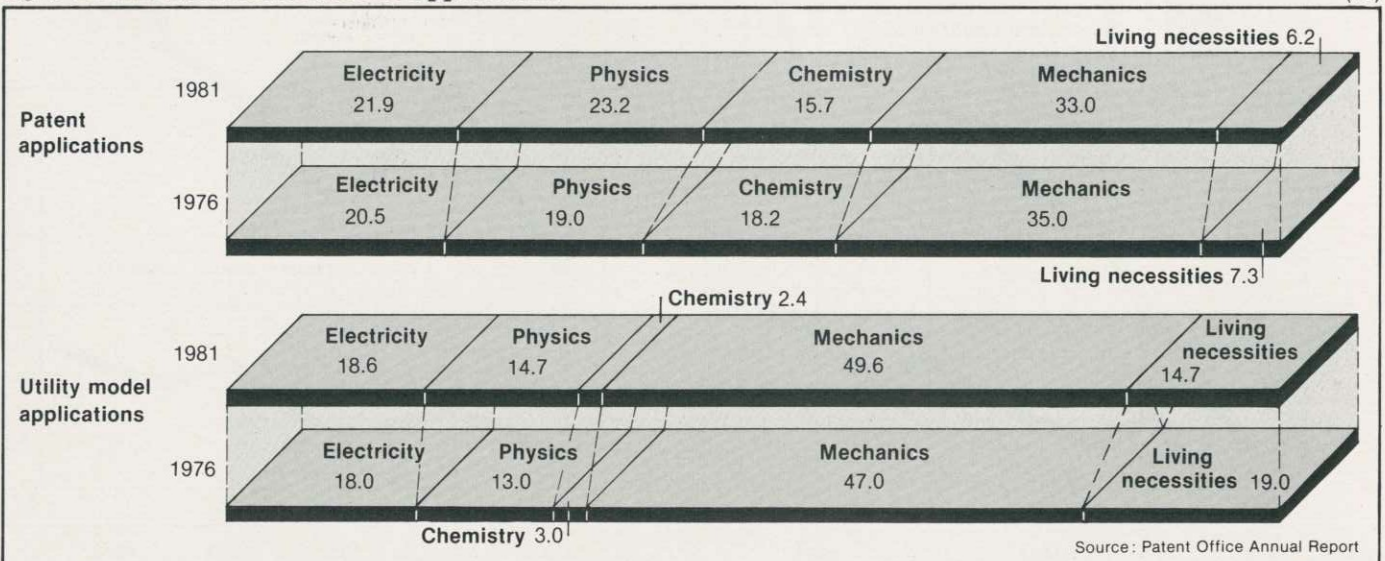


Fig. 3 Rate of Increase in Patent Applications

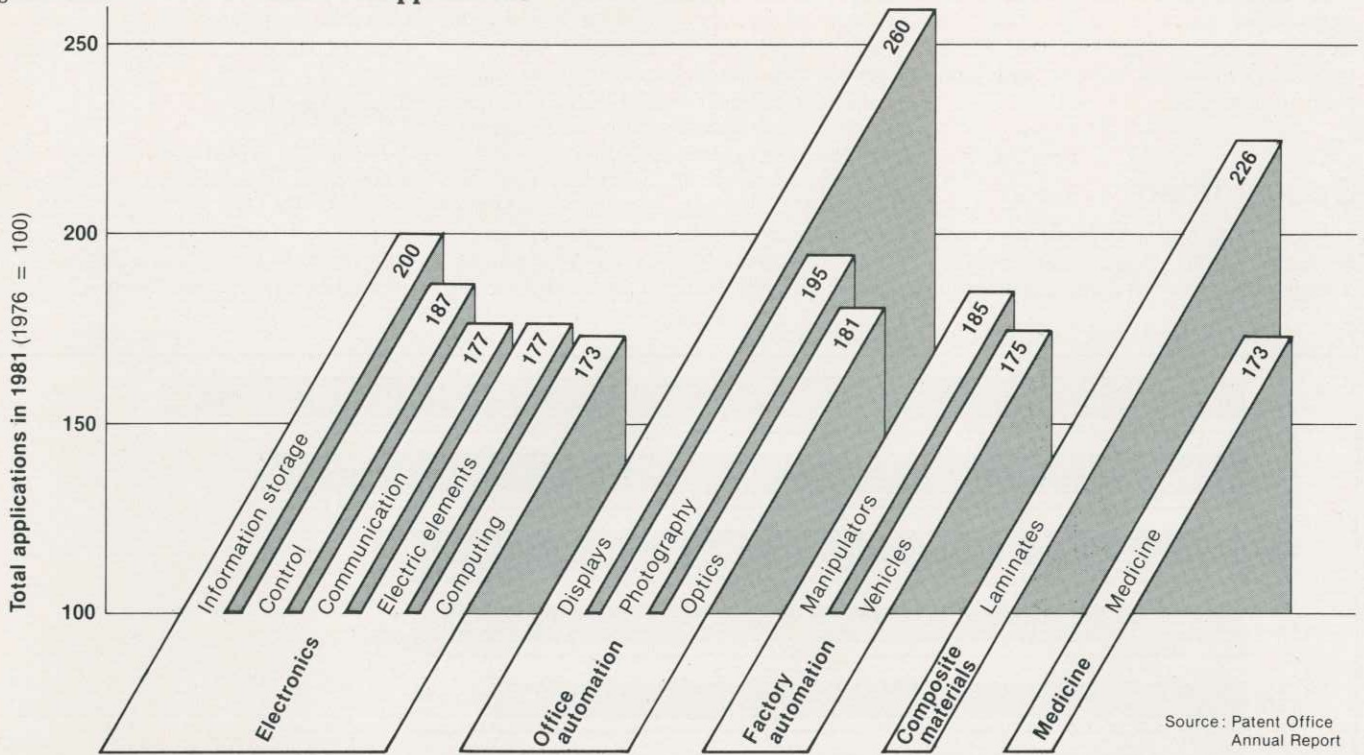


Fig. 4 Optical Fiber Communication Applications

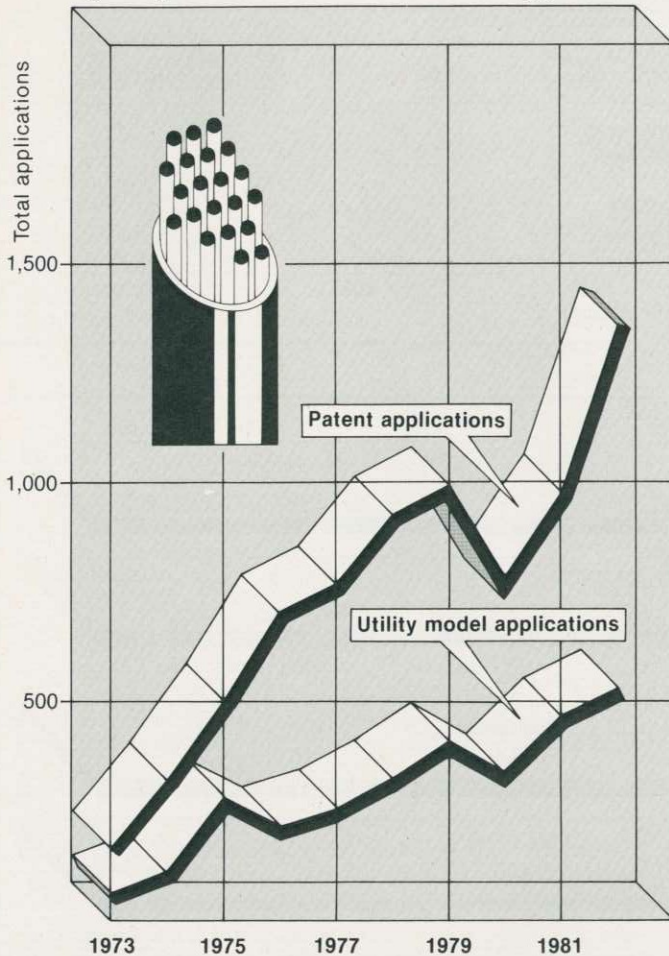


Fig. 5 Facsimile Technology Applications

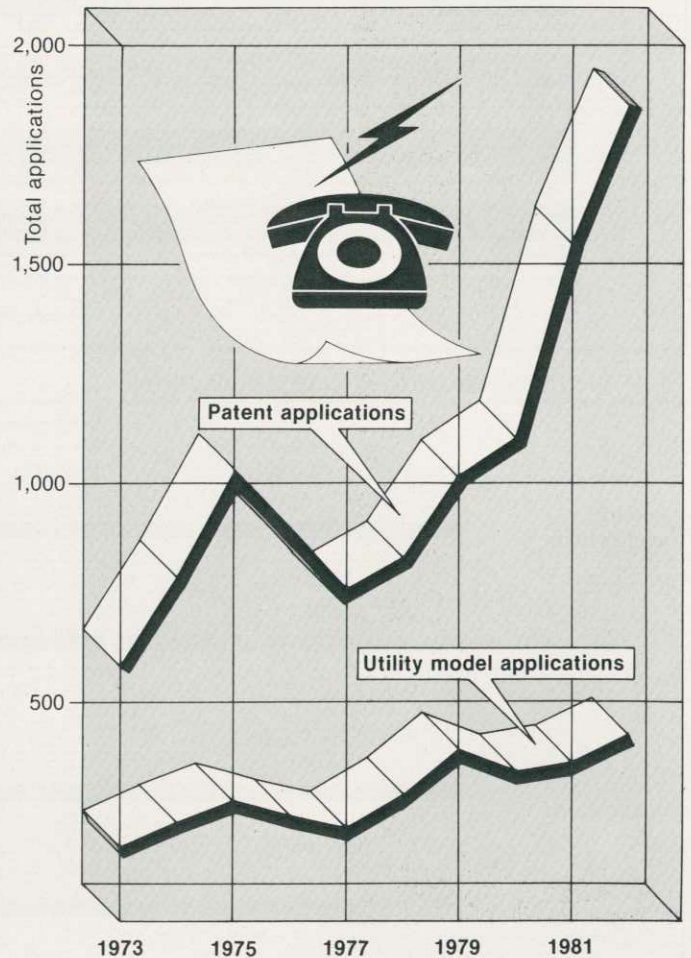


Fig. 6 Industrial Robot Applications

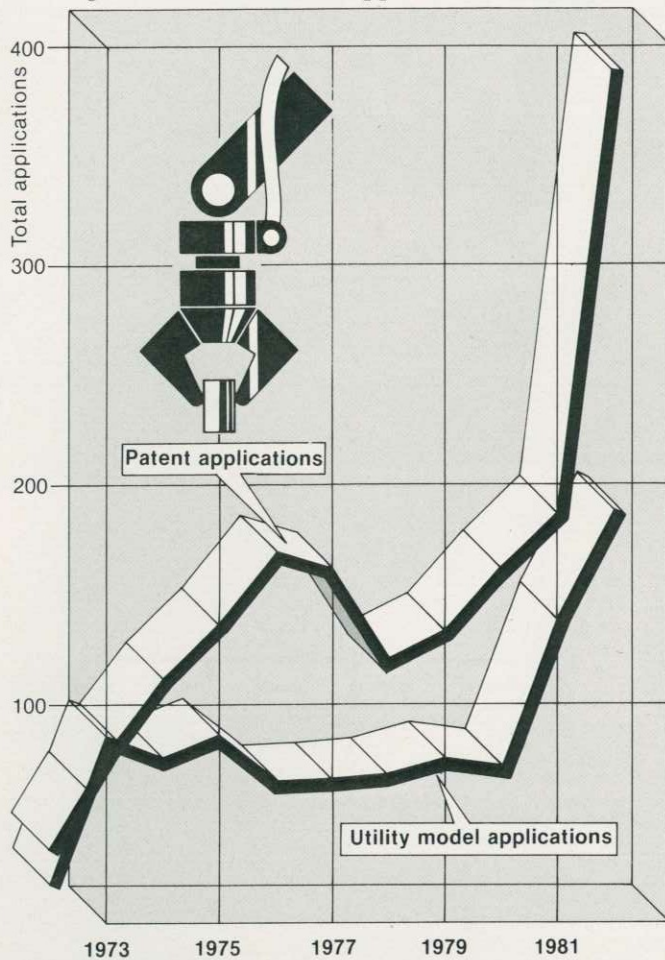
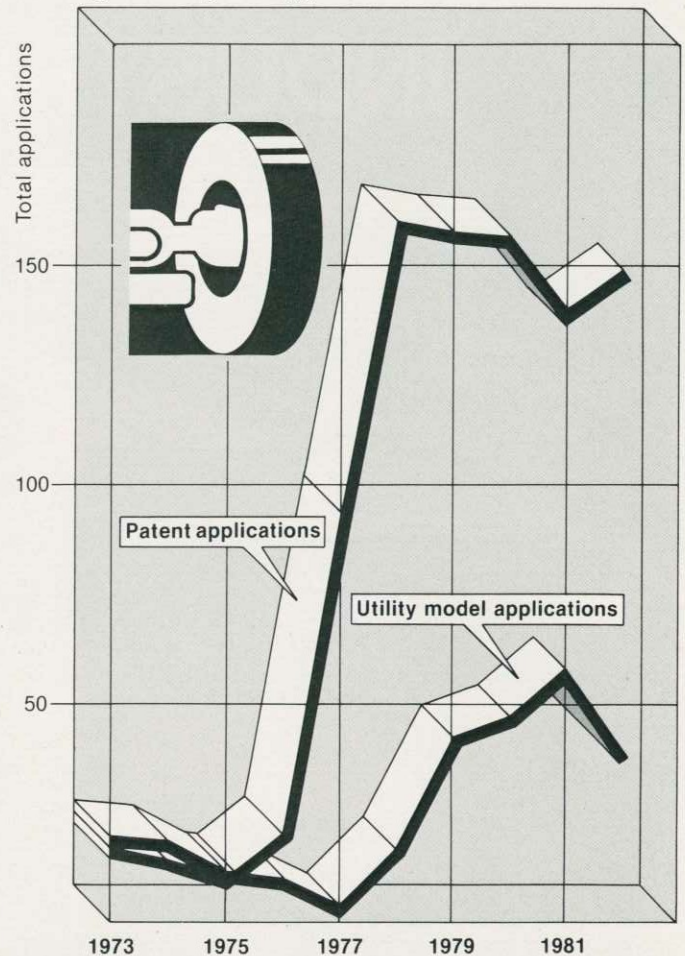


Fig. 7 X-Ray CT Applications



About 70% of these applications were related to apparatus for improving the quality of picture information pick-up, circuits for processing picture signals, and code translation circuits for reducing transmission time. The remainder concerned synchronizing and recording gear and other functions.

Industrial robots

The industrial robot was invented in the United States in 1954 with actual production beginning in Japan in 1968. The

recent progress in computer technology and factory rationalization has resulted in a rapid rise in output. The number of related patent applications has also increased, from about 30 in 1972 to 170 in 1976 and 390 in 1982.

The technical aspects most commonly covered by these applications are for the control system, the physical structure of the robot, and the gripper, in that order. The most common control techniques are programs concerning the storage and reproduction of teaching data. One new development enables an "intelligent robot" to use tactile sensors or information from a TV camera to recognize signals and make a judgment based on the data. However, there have yet to be any patents filed for a sophisticated intelligent robot equipped with recognition and thinking functions.

CT technology

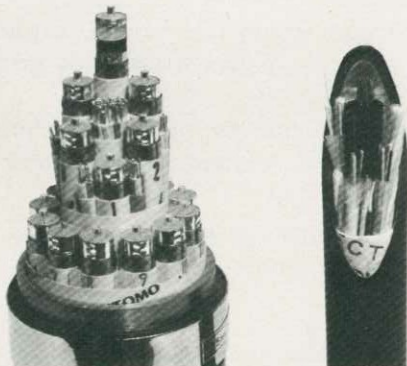
CT, which stands for computerized tomography, is a technique for generating sectional views of body parts with X-ray or ultrasonic waves. It was developed by Godfrey Newbold Hounsfield of Britain in 1968, and production of X-ray CT

equipment got underway in 1973. After its introduction into Japan in 1975, X-ray CT equipment was further improved and production boosted. In 1981, there were about 1,800 units used for medical purposes in Japan.

The number of patent applications dealing with X-ray CT increased phenomenally from 1977 onward. Now, about 200 applications—150 patent applications and 50 utility model applications—are filed in Japan each year. CT patents cover data-recovery, operation and display techniques. About 80% fall under the category of data-recovery. ●

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Now 40, he joined MITI in 1968 after graduating from Chuo University, and did a year's postgraduate work in nuclear engineering at Purdue University in the United States from 1976-77. Ishii's books include "Patent Management" and "Patent Business."



Conventional coaxial cable (left) and optical fiber (right)