III. Intellectual Property and R&D in Main Target Businesses

1. A-train Aluminum Cars for the 21st Century

With technological innovation advancing at an amazing speed, railway car structure and manufacturing methods must keep up with the pace of change and the demands of each new generation. In recent years, aluminum has begun to be used in the body of bullet trains, express trains, and even commuter trains. Hitachi has developed a double-skin body structure using frameless, aluminum hollow extrusion material. The manufacturing method involves a switch from welding a frame to a single-skin body to an innovative, new, automatic method based on friction-stir welding[1] of aluminum hollow extrusion material. The new welding process marks a major change in manufacturing method from reliance on manual labor to automated equipment. The new process enables a much higher degree of precision in the body structure. Only a few hundred modular parts are now required compared to tens of thousands previously. Safety, freedom of design, and passenger comfort are all enhanced; and maintainability is greatly improved. As the first company to use friction-stir welding in train-car assembly, Hitachi has become a leading innovator in train-car structure and manufacturing. The new manufacturing method that meets the needs of the 21st century is called “A-train.”

Figure 3.1 British CTRL-DS Railcar

The road to make A-train into a product began in 1997 in Japan with customers such as Japan Railways, private railway companies, and Tokyo Metro Company, delivering 815 cars to date. A-train is also in use overseas. Hitachi has received an order from the British Strategic Railway Authority and HSBC Rail UK Ltd. (who lease) to supply and maintain 168 cars in 28 trains for the Channel Tunnel Rail Link Domestic Services (CTRL-DS) line. Capturing this order is a reflection of excellent performance through the years and the high reputation that Hitachi’s manufacturing technology receives. Hitachi is now trying to make its brand name pervasive in the railway sector, not only in the British market but in markets throughout the entire European community.

Intellectual property activity in this area in 2004 resulted in 280 patent applications in Japan and 80 in Europe. The “picket-fence” patent applications around friction-stir welding, which Hitachi considers a differentiated technology, will help Hitachi create a global patent portfolio, and, through the exploitation of IP rights, will help Hitachi get new orders and expand global business.

2. Finger Vein Authentication Device for Financial System Security

Illigal withdrawals using fake or stolen cash cards have become a problem in society. There is a strong need among financial institutions for appropriate security measures to safeguard users from “sophisticated crime technology”. On February 22, 2005, the Financial Service Agency of Japan requested financial institutions to prepare measures to combat fake cash cards.

[1] Friction-stir welding was invented by The Welding Institute in England. Hitachi is the first company to successfully apply the technique to train cars.

Hitachi Central Research Laboratory has been developing a personal authentication system that uses finger vein patterns since 1997. Since finger vein authentication uses internal information of the human body that cannot be seen, it is difficult to steal or to damage the information used for authentication. Hitachi-Omron Terminal Solutions Corp. is marketing a product that combines a finger vein authentication device with its own ATM to provide a high-security cash machine system. In order to avoid illegal use of biometric information, the finger vein authentication device does not keep the finger vein information in its internal storage after completing the authentication process. Additionally the biometric and authentication information is encrypted when it is transmitted to other external devices. Hitachi-Omron has developed a new open-type finger vein authentication device in which a person only needs to put one finger on the device. This simple and natural human interface allows anyone to use this authentication device, which is small enough to easily fit on an ATM. The design enables a customer in a wheelchair or a customer with visual disability to operate the device easily. High-speed image processing ensures that a customer does not need to wait for a long time to be authenticated.

Figure 3.2
High-security ATM

Major financial institutions are beginning to deploy ATMs with finger vein authentication functionality throughout Japan. The device features high-reliability, ease of use, and versatility. It is expected to be used in ATMs and bank-counters where high-security is essential, at companies and apartment buildings to manage entering and exiting, and with personal computers. Hitachi is currently developing a plan to shift this technology from a Japanese standard to a global standard.

Since the beginning of the R&D activity for finger vein authentication, the goal of the intellectual property activity related to this technology has been to build the world's strongest patent portfolio by applying for patents in Japan and overseas. So far, 100 patent applications, mostly on basic inventions, have been filed and six of them have already been patented. Currently, the main focus is on further increasing the number of patents. Finger vein authentication is an original technology of Hitachi Group. The ATMs with finger vein authentication functionality are supplied to customers with is technology hidden in a black box for keeping high-security. Hitachi Group is making every effort to promote its widespread use.

Figure 3.3
Finger Vein Authentication Device