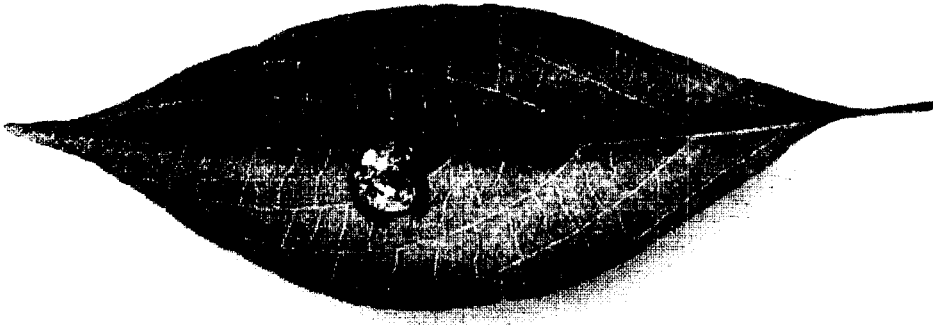


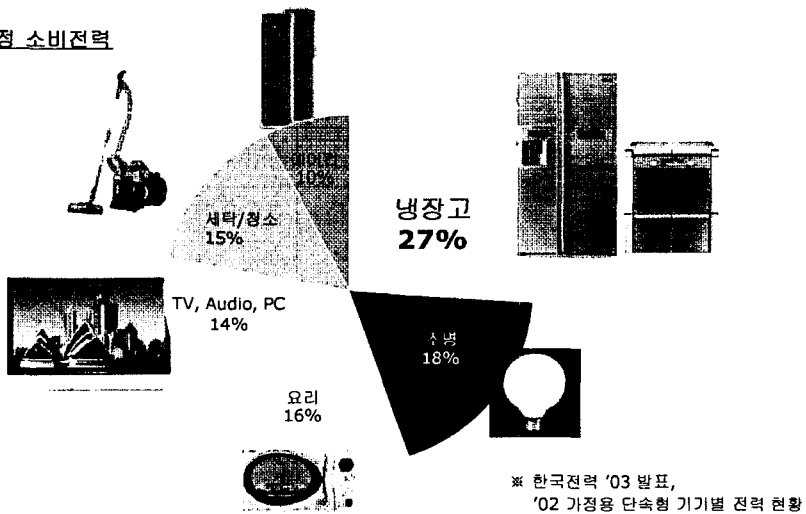
# Linear Compressor 개발

이 형 국  
(LG전자 DA연구소)



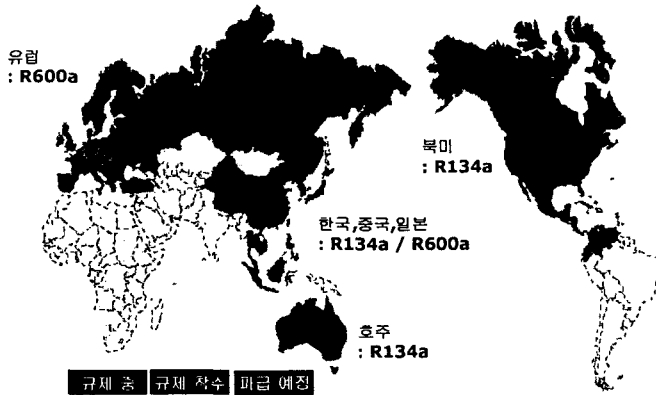
## 개발 배경

### 가정 소비전력



## 개발 배경

### 소비전력 규제 동향

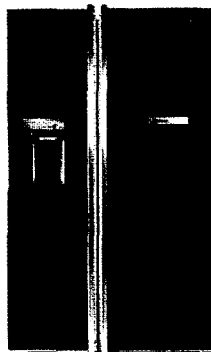


### 주요 국가별 규제 내용

- 일본 : '04.1 省 Energy 법 시행  
'04.1 R141b 발포제 전폐
- 미국 : '04.1 Energy Star 5%강화  
'03.1 R141b 발포제 전폐
- 유럽 : '04.3 최저 에너지 표준 40% 강화  
'03.1 R141b 발포제 전폐  
천연냉매 사용 법규화 추진 中
- 한국 : '04.1 최저 소비 효율제 실시

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## 개발 배경



### Compressor

81%



### Fan

7%

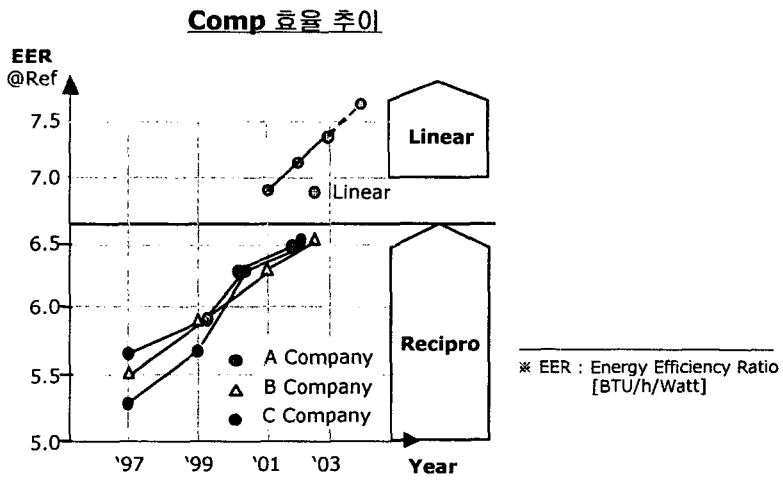


### Electronics

5%

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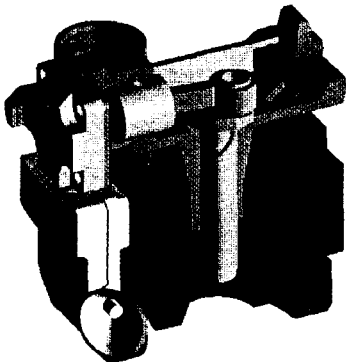
## 개발 배경



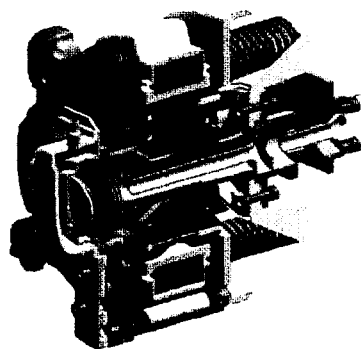
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## 개발 배경

**Recipro Comp**



**Linear Comp**

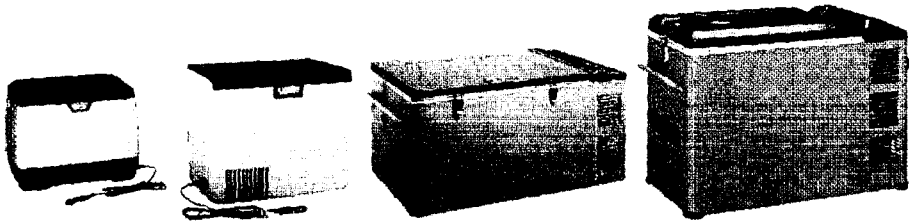
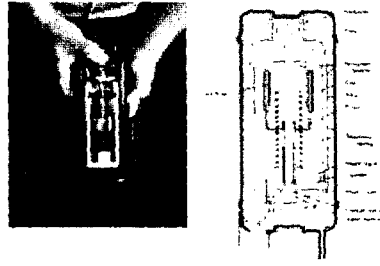


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## Previous Works

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Sawafuji, Japan



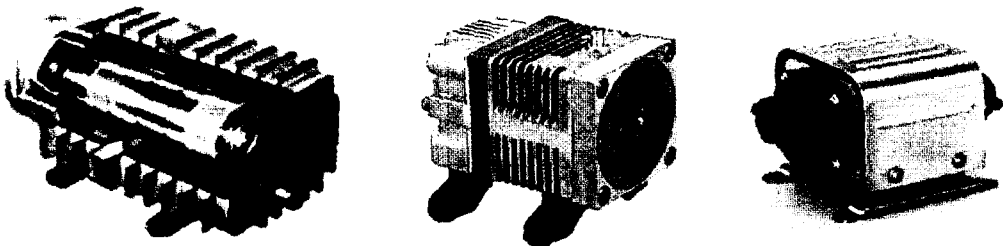
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## Previous Works

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Nitto Kohki, Japan



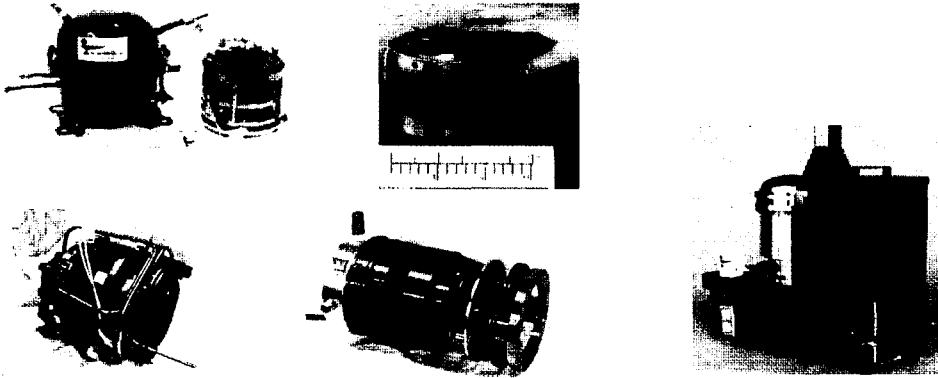
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## Previous Works

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### Sunpower, USA



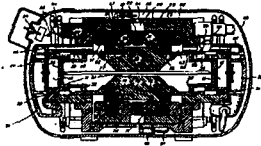
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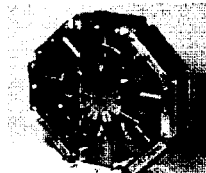
## Previous Works

---

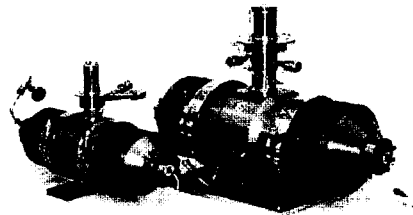
### MTI, USA



### CFIC, USA



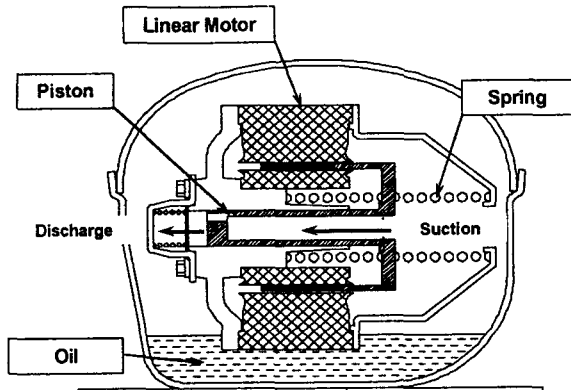
### STC, USA



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## Linear Compressor의 특징



$$M\ddot{x} + C\dot{x} + kx = \alpha I + F(x)$$

$$V(t) = \alpha \dot{x} + LI + RI$$

$\alpha$  : Motor Constant  
 $F(x)$  : Pressure Force, Nonlinear

### 특징

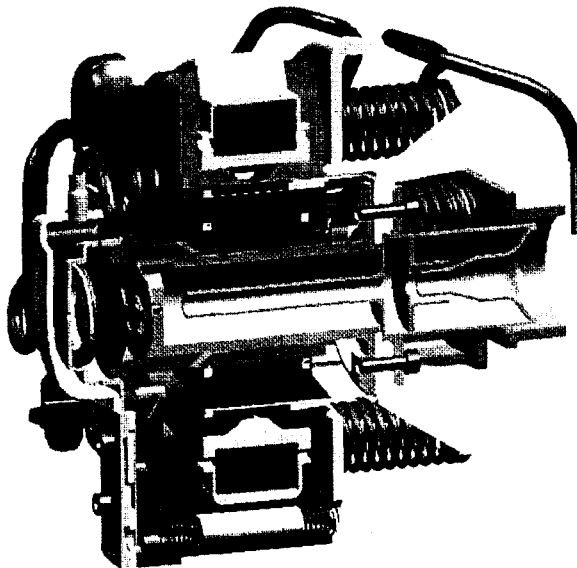
- 구조 간단
- 고효율
- 친환경 대체냉매 적용 용이

### 개발 과제

- Free Piston Mechanism
- Linear Motor
- Controller

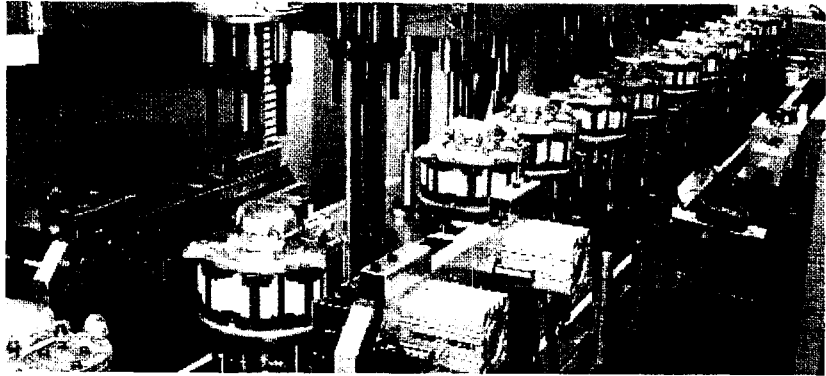
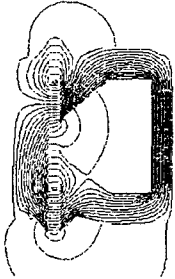
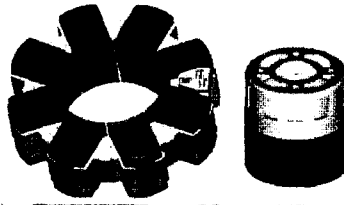
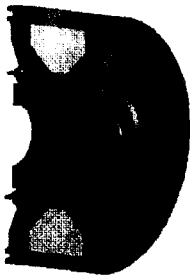
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## LG Linear Compressor



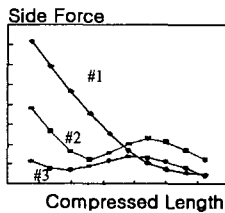
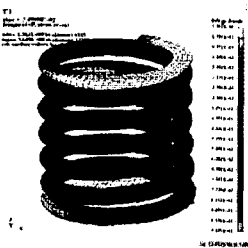
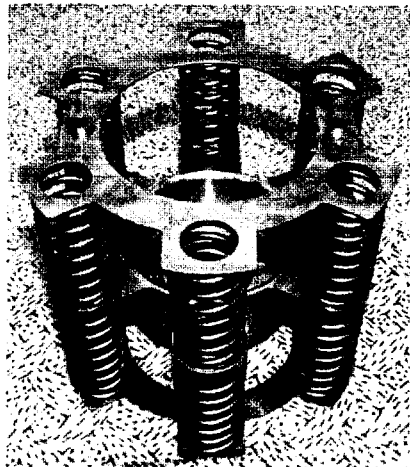
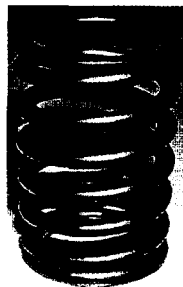
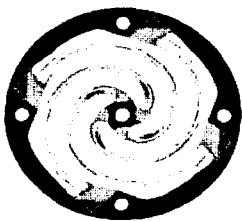
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# Linear Motor



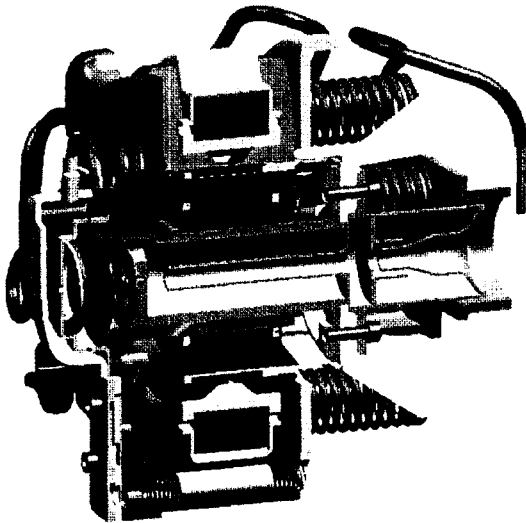
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# Spring



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## Valve / Muffler



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## Controller

### Sensor

#### Sensor

- Inductive
- Eddy Current
- LVDT
- Hall Effect

#### Sensorless

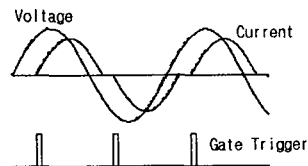
$$V(t) = \alpha \dot{x} + L \dot{I} + RI$$

$$\rightarrow \dot{x}(t) = (V - L \dot{I} - RI) / \alpha$$

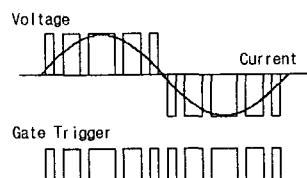
- Analog Computation
- Digital Computation

### Drive

#### Voltage Control



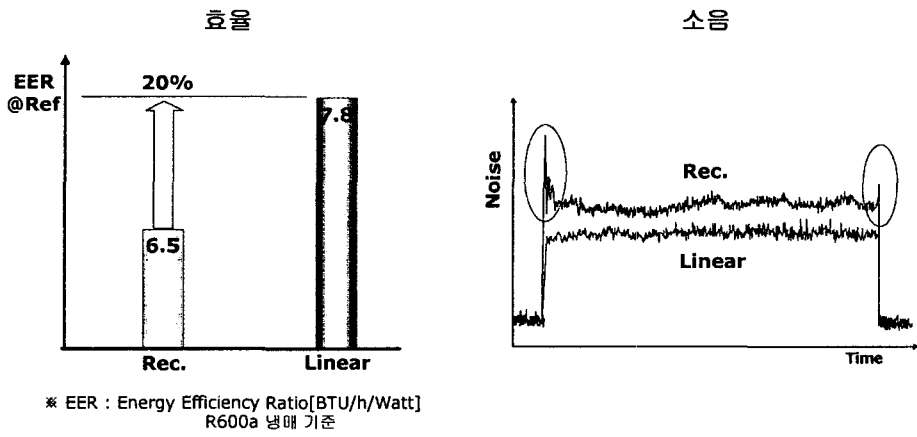
#### Inverter (VVVF)



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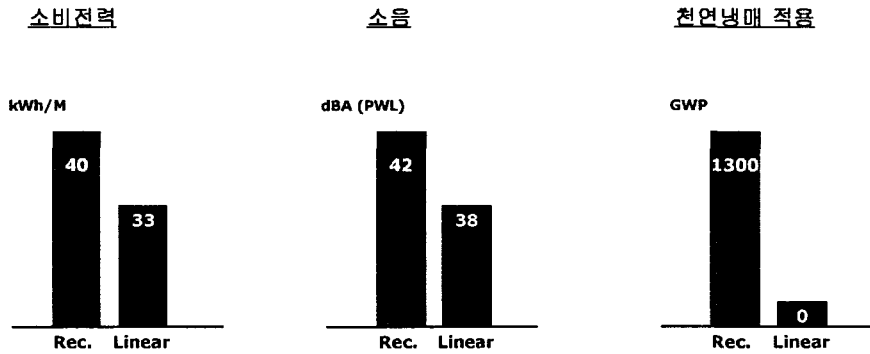


# Compressor 성능



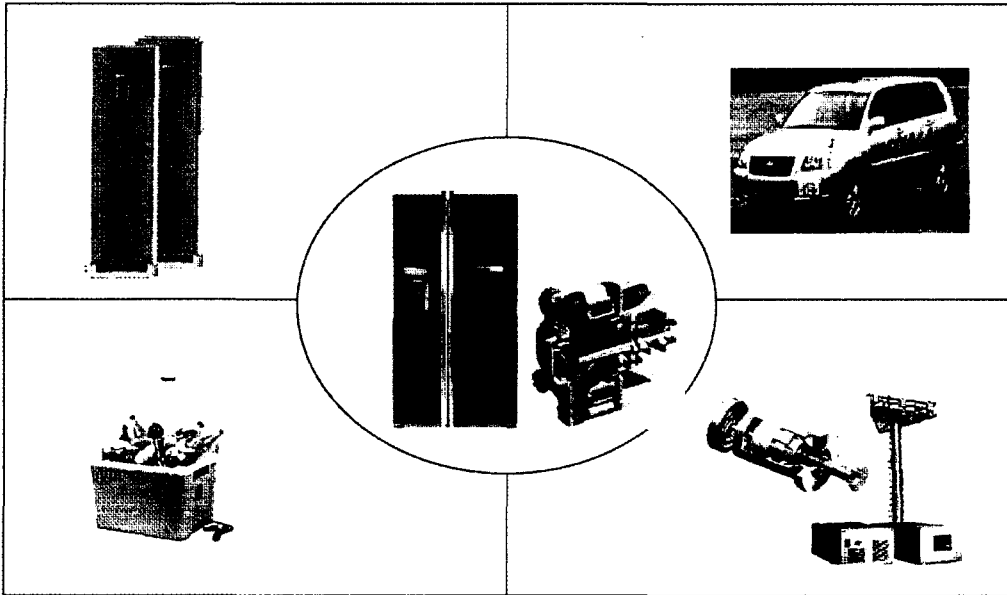
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# 냉장고 성능



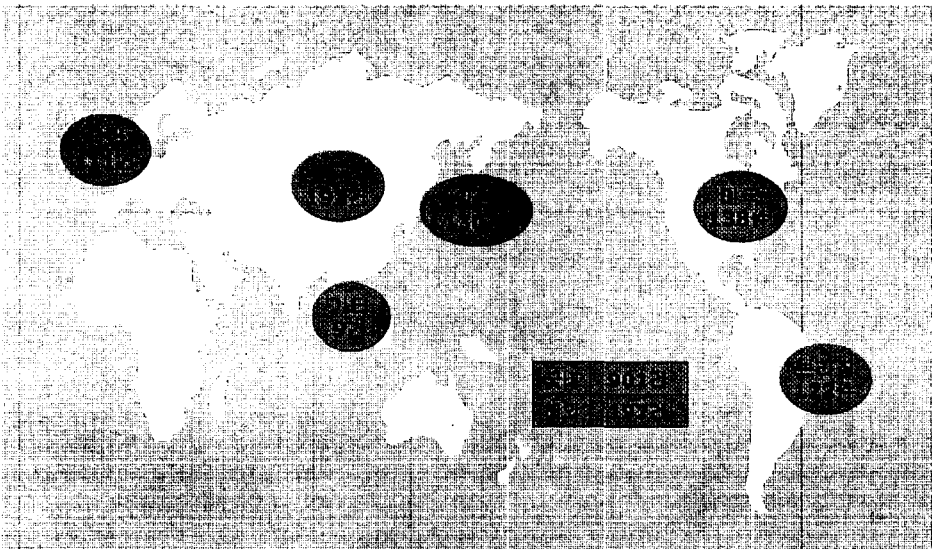
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기술 파급



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특허



※ 2003.11 기준

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