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Energy-saving Elevator Based on Water Circulation

節能淼電梯

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作品摘要 Abstract

一般市面上的曳引電梯均是以電梯車箱外側懸掛平衡的配重塊，如圖一所示。配重塊重量取決於車箱重量並加上一半滿載人數重量為固定的配重，此設計問題在於當進入電梯人數重量不等於配重塊重量時，使電梯馬達必須消耗多餘的能量抵抗阻力，進而增加電梯馬達本身耗電量和輪軸的耗損。

本作品為具備自動調節配重之節能電梯，如圖二所示。經實測驗證，其功率消耗與一般傳統電梯相比，最多可減少50%的功率消耗。當空載時，電梯廂本身重量等於可調節配重水箱重量，在靜止狀態時，能使馬達達到最小功率消耗；當電梯廂重量改變時，系統會依據可調節配重水箱所在樓層，決定由上、中、下水箱中的一個，作為配重水之充填來源或排放容器，並將配重水送至可調節配重水箱中，或將多餘配重水自可調節配重箱中排出，以調整配重箱重量，達到電梯廂與可調節配重箱的平衡，如此即可達到電梯運行功率消耗最小化之節能目的。

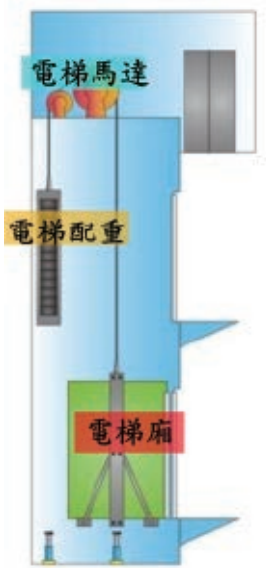

圖1 > 傳統電梯

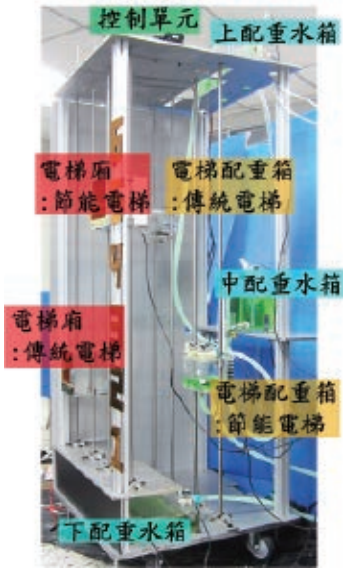

圖2 > 節能電梯機構圖

資料來源：電梯資料網首頁http://www.hkelev.com/elev_str.htm，2012年11月15號

The elevator car is generally equipped with a parallel counterweight, as shown in Fig. 1. The common weight of the counterweight is determined by the weight of the elevator car and a half weight of the load. The main problem is that when the load is not equal to the weight of the counterweight, the elevator motors are required to consume more energy to increase the power consumption and the depletion of axles.

This product named "energy-saving elevator" has the ability of adjusting the weight of the counterweight automatically, as shown in Fig. 2. Proven by the experimental results, the power consumption is able to be reduced by up to 50% more than those of traditional elevators'. When the load is zero, the weight of the elevator car equals to an adjustable counterweight tank's. In the steady state, the motors can achieve the minimum power consumption. If the weight of the elevator car is changed, the system can automatically decide to use the upper, middle, or lower tank as the water resource or the water emission container according to position of the adjustable counterweight tank. Moreover, in order to adjust the weight of the tank, the system can either deliver the water into the counterweight tank or carry the surplus water out of the counterweight tank for the balance between the elevator car and the tank. Therefore, the proposed study can successfully achieve the purpose of minimum power consumption.