臺灣二 OO 三年國際科學展覽會

科　　別：工程學科

作品名稱：節省能源之社區供水系統

學　　校：臺南市私立南英高級商工職業學校
　　臺南縣私立港明高級中學

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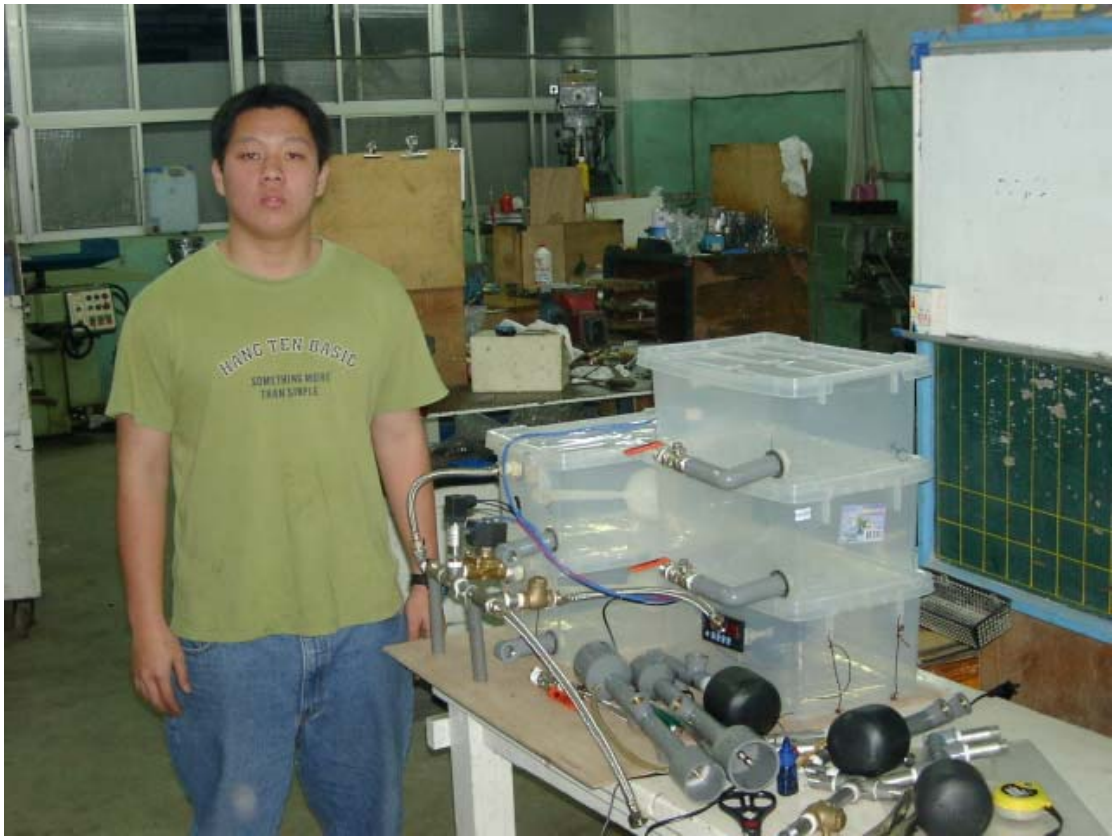


我的名字叫陳義成，家住台南縣，就讀台南市南英商工機械科三年級。剛進入這所學校時，上我們班實習課的老師是邱宏勇老師也是這一次科展的指導老師，在他上課的時候，他都會提到一些有關於科展的資訊。因此我每次在上實習課時都很用心地實地去做、去思考，老師他看我在實作這方面表現的不錯，便選我當學校機械科的代表選手。

我是邱懷德，民國 75 年出生，今年就讀台南縣港明高中一年級。假日時，偶爾會跟著父親修理家庭用具，對於一些機械構造與功用，都有一些初步的了解，有時父親更以一些簡單的機械解決復雜的問題，這也是我對父親敬佩不已的原因。在一次整理父親學生時代的報告時，發現了一些很好的構想，於是，一連串的研究設計就此展開。

研究報告

作品名稱:節約能源之社區供水系統

English Summary:

The system of community water-supporting to save more energy

The water-supporting system of community should use high efficiency pumps to support water and set up a unique water tower for each floor. Since there are high and low period of water-consuming and the variety of water pressure, we have to set up a unique water tower for higher floors firstly.
It help us through high peak period of water-consuming, or it turns on pressure-aid pumps to save energy.

中文摘要:

節約能源之社區供水系統

社區供水系統應採高效率之幫浦高壓供水,分樓層設置專用水塔,在用水有高峰及離峰時段,水壓有高低變化,優先順序供水給較高樓層的專用水塔,樓層專用水塔容量必須足以渡過用水高峰時段之容量,否則就啓動輔助加壓幫浦,達到節約能源之目的o

節省能源之社區供水系統

壹. 研究動機及目的:

看了父親所寫節省能源之都市供水系統之報告,了解目前傳統式供水方式,均忽略供水的位能,將水儲存於蓄水槽內再使用低效率之幫浦加壓至頂樓水塔,若能採高效率之幫浦高壓供水可節省能源,引發若分樓層設置專用水塔,且採用優先順序供水,更能節省能源 o

貳.研究方法及過程:

一.原採用機械式控制,尚有些缺點未能克服,故採用電子電機式控制 o

如圖一所示:

二.因製作參加複審之模型時使用止回閥,突然想出解決機械式控制之缺點的方法,使用三個閥門含壓力閥門.浮筒閥門.低壓釋放閥門組合而成機械控制系統如圖二所示.圖三:

參.研究結果及討論:

一.在用水有高峰及離峰時段,水壓有高低變化,若優先順序供水有如圖四之效果 o

二.樓層專用水塔容量必須足以渡過用水高峰時段之容量,否則就啓動輔助加壓幫浦 o 如圖五所示:

三.樓層專用水塔設置於比用水樓層高兩個樓層高處,水壓約達 0.7kg/cm2(每平方公分 0.7 公斤之壓力)就足以提供用水所需 o

四.樓層專用水塔可利用防震隔板設計減低地震時之震動 o

五.樓層專用水塔可分置於大樓不同平面處做爲平衡大樓結構 o

肆.結論與應用:

在新社區開發時,若能採高壓供水及分樓層設置專用水塔採用優先順序供水給較高樓層專用水塔,必能節省可觀之能源 o

伍.參考文獻:

節省能源之都市供水系統,摘要及教授評語,如附文 o

The system of community water-supporting to save more energy

Key words : High-pressure . Water-supporting . Orderly . Save energy

1.Motivation and purpose:

After reading the report of city water -supporting system written by Father, I understand the traditional ways of water-supporting.They all neglect the position power of water can be saved in tanks, and then inefficiently pumped up to water tower on top floors. If we use high efficiency pumps to support water, we can save energy. Especially, we can save more energy when we install unique water tower and support water orderly.

2.Methods and procedure:

(1)Instead of using mechanical-control type, we use electronic-control type to improve the system as shown in Fig.1.

(2)When I made the model, I suddenly think of the way to solve the problem of mechanical control in check valve. I combined three valves, include pressure valve, float needle valve and relief valve . The mechanical control system is shown in fig. 2.

3. Result and discussion:

(1)During the high-peak period the water pressure show high and low. Supporting water orderly, and it appears the efforts as Fig.2.

(2)The unique water tower must have enough contents to pass the high-peak water-consuming Period. Otherwise we have to use pressure-aiding pumps. Fig.3

explain the situation.

(3)The unique water tower must be two-floor higher than the water-supporting floor. If the water pressure can reach 0.7 kg/cm2, it will be enough for water-supporting.

(4)The unique tower can be designed in earthquake-proof panel to reduce the vibration while in earthquake.

(5)The unique tower in can be arranged at different position of each floor to balance the building structure.

4.Conclusion and application:

While developing a new community, we surely save a lot of water energy if we set up a high-pressure water-supporting system and each floor has a unique water tower for water-supporting orderly.

5.Reference:

節省能源之都供水系統,摘要及教授評語,如附文.

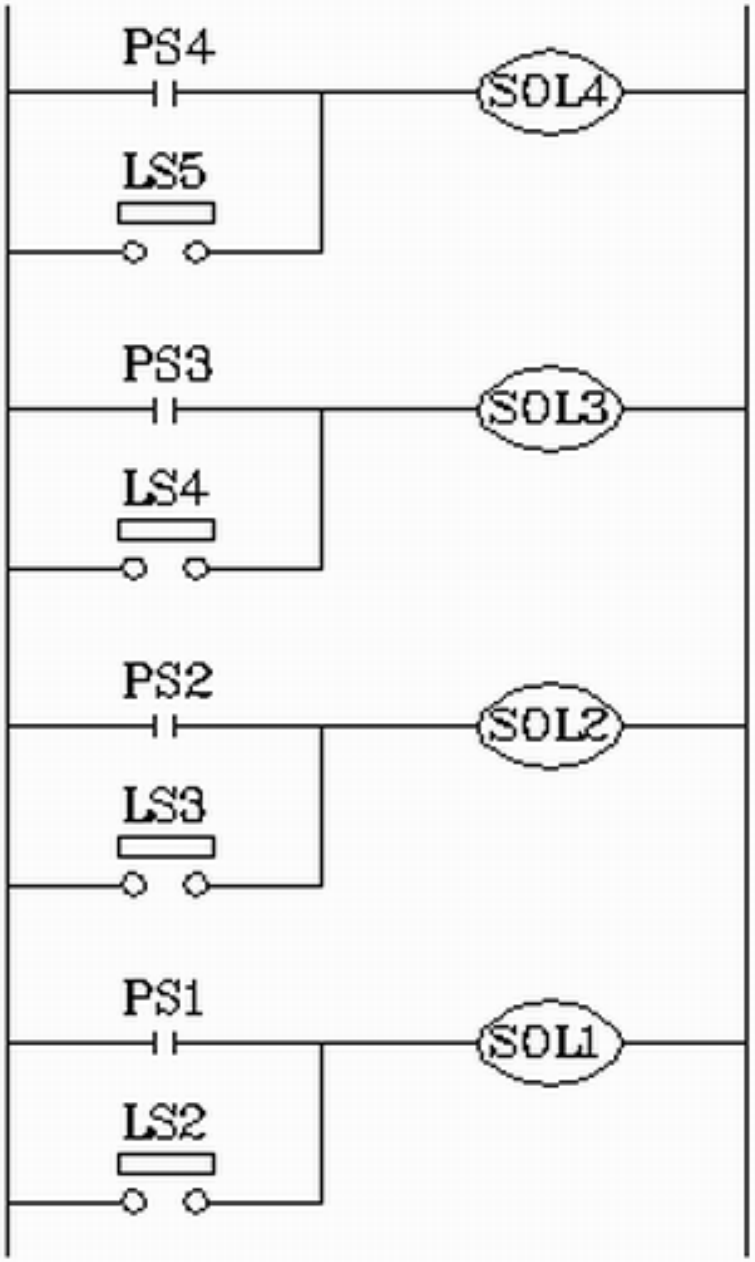
附文：

節省能源之都市供水系統

摘要:

都市供水應採高效率約 85%之幫浦加壓供給用戶,不必讓用戶蓄水後再使用低效率約 30%~40%之加壓至頂樓水塔,扣除管路損失尙能節省很多能源 o

教授評語:高雄市苓雅區之大水塔係由西德工程師根據以上理論設計建造的,但因高雄市當時之供水管路承受不起高壓而廢棄不用,能發現此一理論而非抄襲而來可謂觀察力佳值得鼓勵 o



1

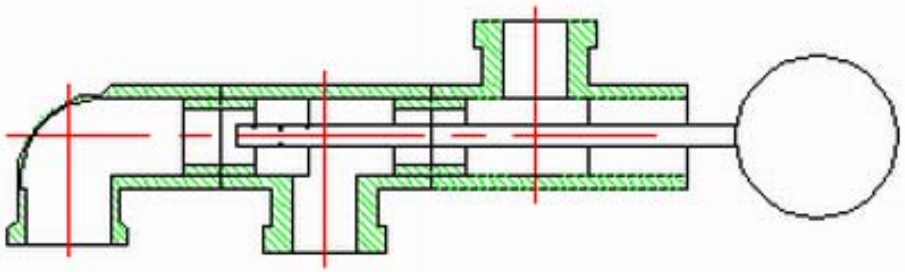
PS1=1.03kg/cm²
PS2=0.68kg/cm²
PS3=0.33kg/cm²
PS3 ON
PS2 OFF
PS1 OFF
PS4 ON

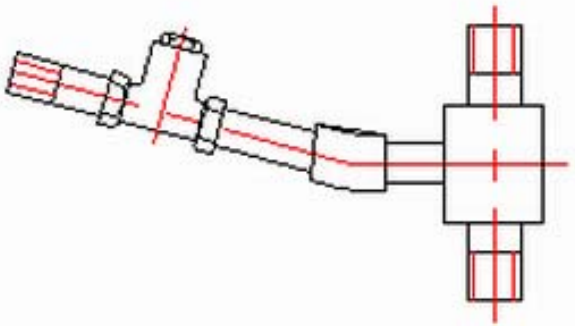
2

PS4=0.36kg/cm²
PS3=0.71kg/cm²
PS2=1.06kg/cm²
PS1=1.41kg/cm²
PS1.PS2.PS3
PS4.均OFF

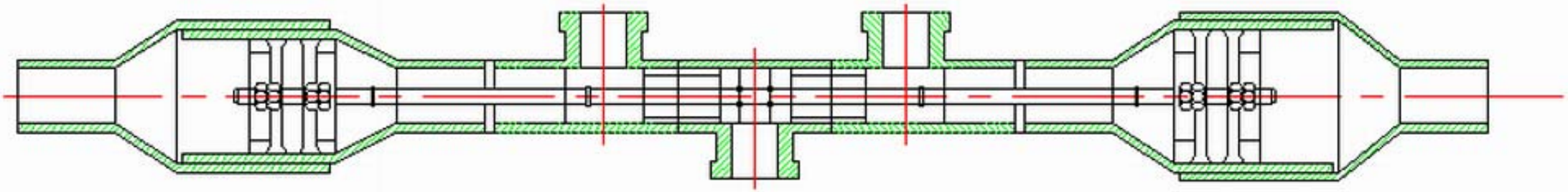
ΔP=0.35kg/cm²
PS1,PS2
SP3,PS4
均為

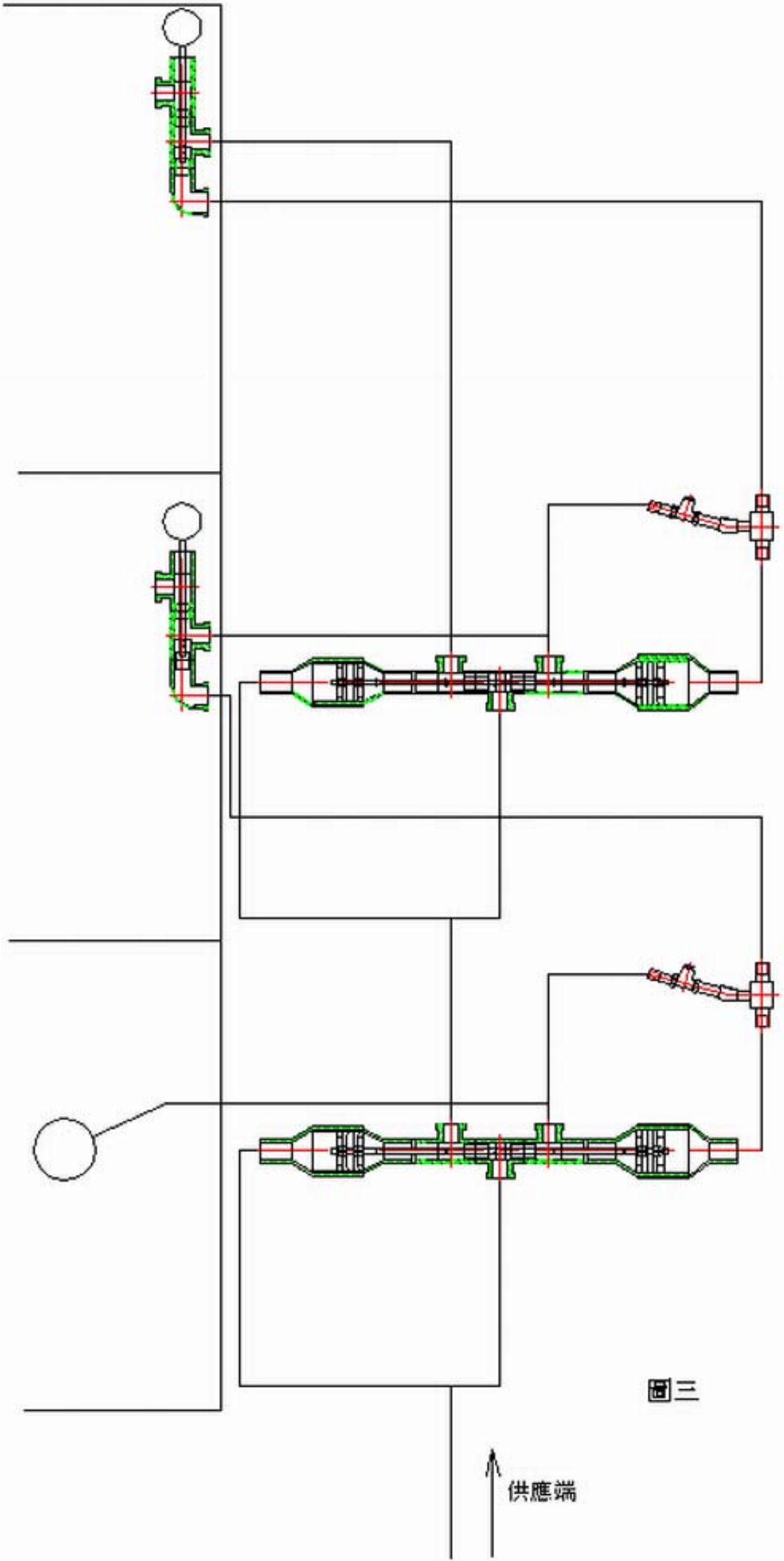
圖一



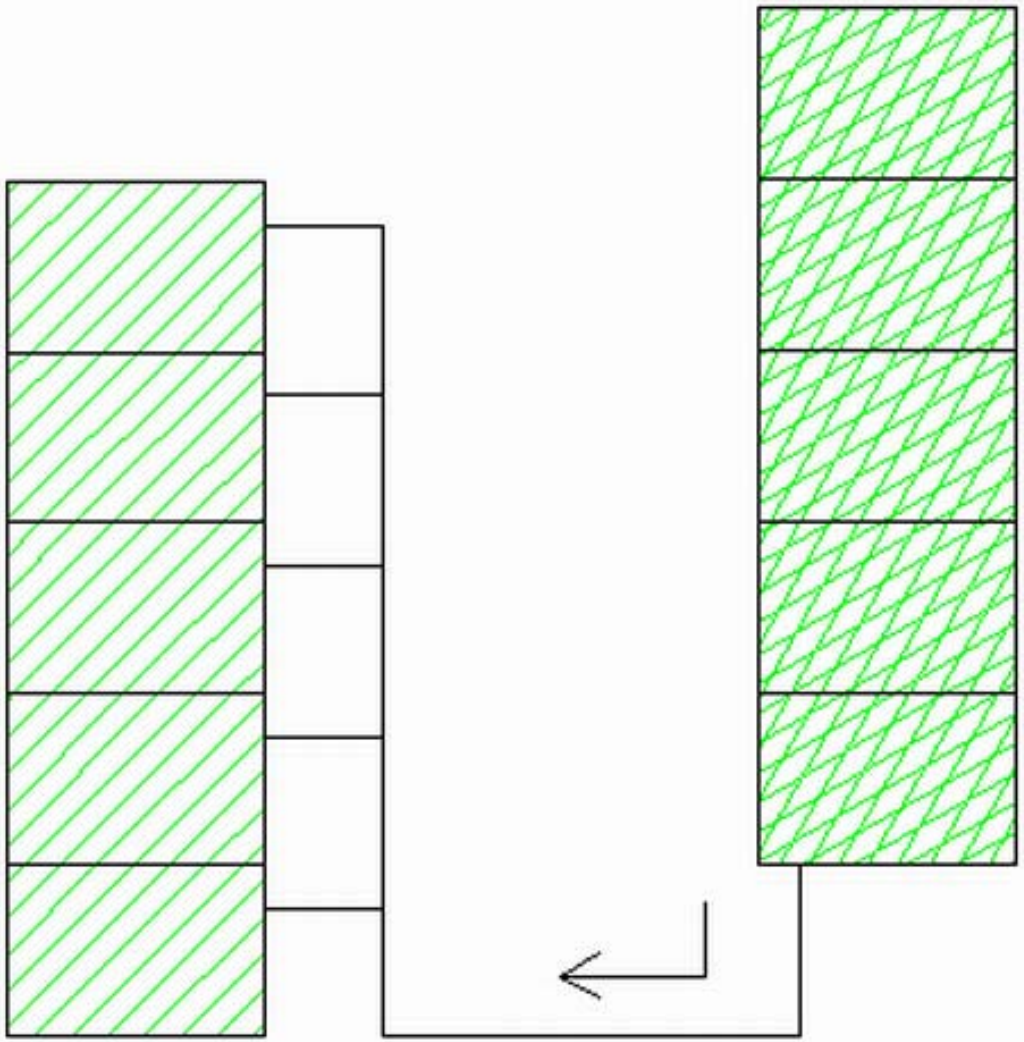


圖二

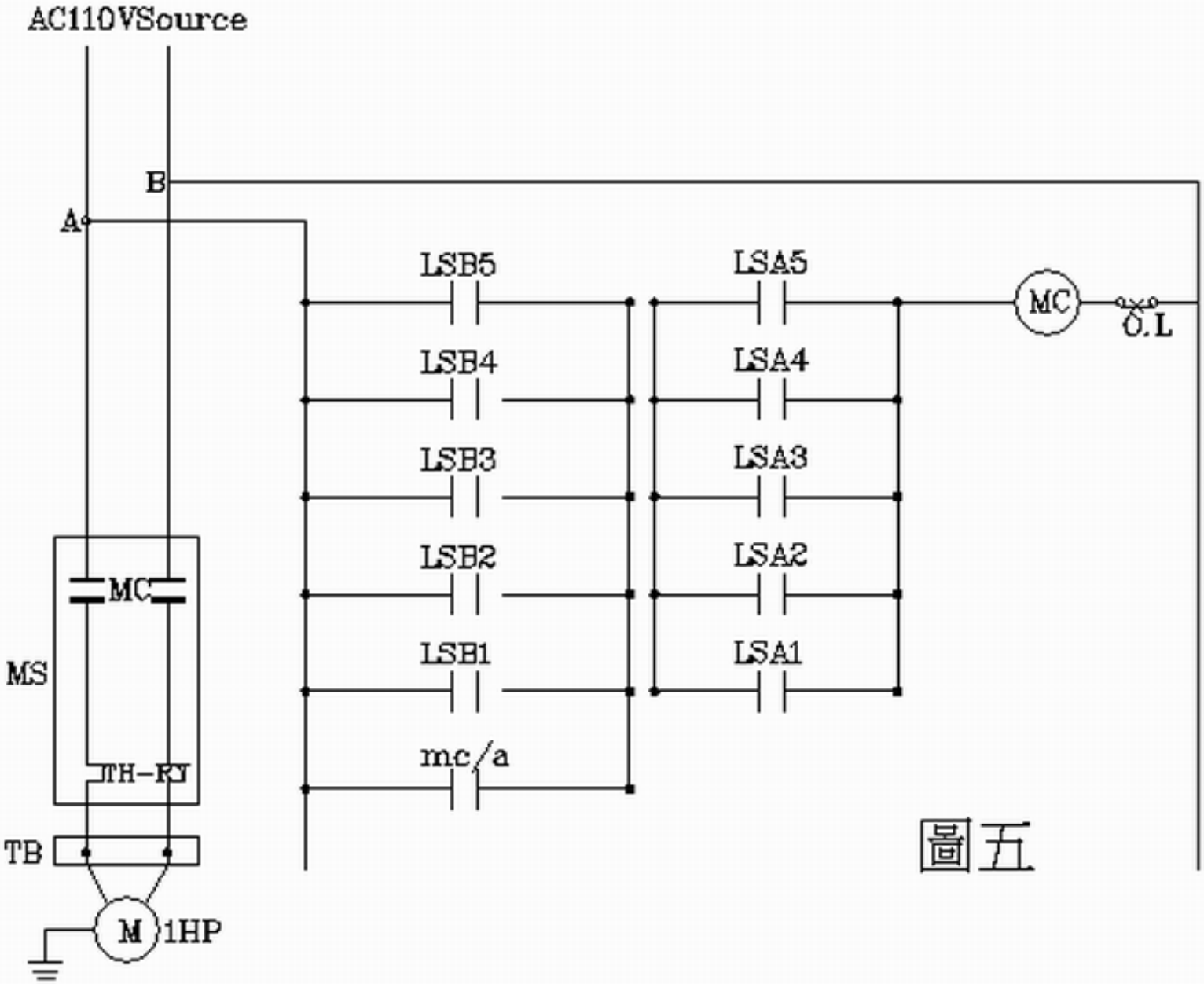




圖三



圖四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B
A
LSB5
LSB4
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mc/a
LSA5
LSA4
LSA3
LSA2
LSA1
MC
O.L
MC
MS
TH-RY
TB
M
1HP

圖五