Automation of Plastic Profile Extruder

Project Report

SUBMITTED BY

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UNDER THE GUIDANCE OF

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IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

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CERTIFICATE

This is to certify that the contents of the project report entitled

AUTOMATION OF PLASTIC PROFILE EXTRUDER

is the bonafide work carried out by

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Certified that the candidate has been examined by us in the project work viva - voce exam held on ..... and University Register No.....

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TO WHOMSOEVER IT MAY CONCERN

I hereby certify that Mr. M.V.SENTHIL KUMAR, A.SENTHIL KUMAR, K.MOHANASUNDARAM, P.THANGAVEL studying in final year B.E. Electrical and Electronics Engineering of KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE had done the project entitled "AUTOMATION OF PLASTIC PROFILE EXTRUDER" in Salzer Controls to the best of my satisfaction. During the course of their project their conduct was very good and I wish them best of luck for their bright future endeavours.

Place: Coimbatore
Date : 27.3.97

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SYNOPSIS

Since quite some time, users of Plastic processing equipments in India have been feeling the need for improvement on extrusion technology for plastics, for the Indian situation; The project is an outcome of the same.

The aim of this project is to design and develop an auto - punching tool for a special machine (Plastic Profile Extruder). To this end , different sub - systems are connected to the machine which forms the crux of the system. The different sub - system include Electrical, Electronic and Pneumatic systems. The project is intended to serve the needs of the persons working in extrusion technology by reducing the cost and time of manufacturing.

CONTENTS

CHAPTER .1

INTRODUCTION

The system of manufacturing cable channels with manual punch has several draw - backs which are overcome by auto- punching tool. The task of desiging auto - punching tool requires several modules and broadly classified into two parts, the electronics part and the mechanical part.

The electronic part is the heart of the system which includes sensors, timers, counters, solenoid coils, voltage regulators. The mechanical part includes pneumatic cyclinders, punching dies, Pneumatic valves, filter and regulator, cutting wheel etc, These modules are properly intergrated to give the desired output.

The general block diagram of the auto - punching tool for the process of manufacture of profile extruder is given in Fig 1.1

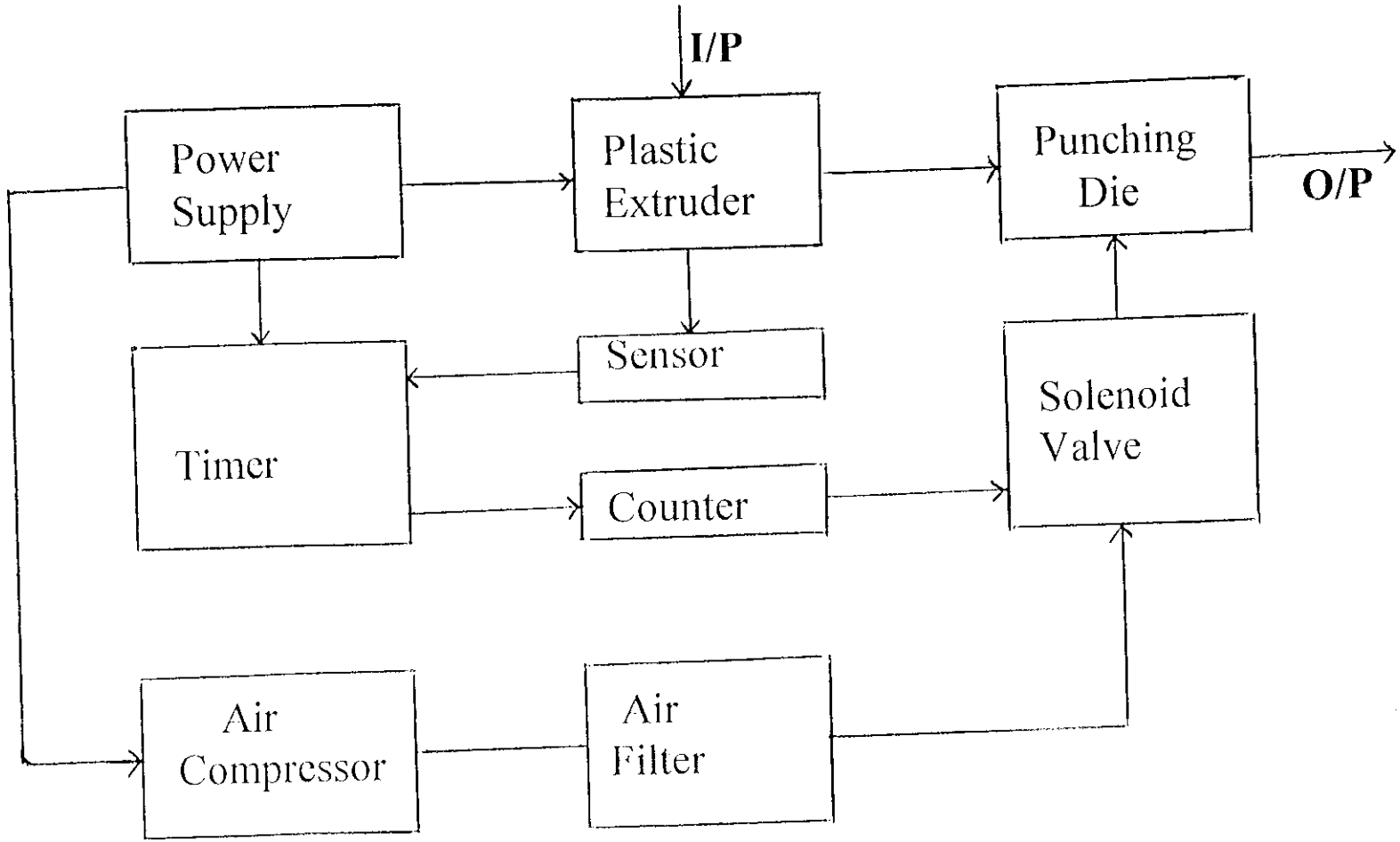


Fig. 1.1 *GENERAL BLOCK DIAGRAM*

CHAPTER .2

GENERAL DESCRIPTION

In order to get an better insight of the project a birds eye view of the process of manufacture of profile extrusion is seen. Extrusion of plastics is a process which is continous over long periods of time. The raw materials PVC together with plasticizers, stabilizers, fillers etc, are passed through screw pump. The pressure heat is applied invariably by electric heaters. The homogenised melt is pumped to die at costant rate and pressure. After exiting the die, the shape may be drawn into a water quench trough. It may be sized with intensely cooled vacuum sizing tools. The profile shape is usually drawn of with form of puller. Then the cutting and punching operations are done.

Now, the process of manufacture of cable channels using manual punch is seen, then it is compared with that of auto - punch.

2.1 SYSTEM USING MANUAL PUNCH:

The manufacturing of cable channels in valves several machines Viz,

* Plastic extruder Machine

* DC Traction

* Punching Machine

The block diagram is shown in figure 2.1

2.1.1 Plastic Extruder Machine :

The plastic extruder machine consist of

* Hopper

* Screw Pump

* Die

HOPPER:

Hopper is conical shaped and raw materials are fed through this to the machine. The raw materials include, PVC, HDPE, Plasticizers to improve flexibility, stabilizers to improve resistance to heat and light, pigments and lubricants to improve flow properties and to prevent the compound from sticking to Processing Machinery.

Screw Pump:

The screw pump provides the pressure required for extrusion. It has two counter rotating screw and speed lies between 4 to 40 rpm. The screw drive motor in 11.25 Kw.

DIE:

Die decides the shape of the product and depending on the type of product to be manufactured differnt dies are used.

The extuder machine also consist of cooling tanks where the product gets a rigid shape after passing through it from the die.

2.1.2 DC Traction :

The extrusion process needs some pulling force which is provided by the DC traction. This is a two belt unit which oppossed belts. The traction unit line is suitable for different ranges and the gap between the two belts is adjustable. The tracks are of polyvee belt with intergral; V pads on outside. The track length is 800 mm.

2.1.3 Cutting Unit :

The extrusion machine in provided with a cutting unit whose range varies from 20 mm to 160 mm. The cutting is done by circular saw blades. The product is usually cut for one metre length.

2.1.4 Power Press :

The power press is used for side and top punch. The capacity is about 15 tonne and a motor of 3 HP is used. It can be operated both pneumatically and mechanically. The power press is maually operated for punching. The profile is placed exactly where it should be punched and when the control at the bottom is pressed sligthtly by leg, the compressed air comes into action and punches the profile.

2.1.5 Draw Backs Of Manual Punching :

- Production rate is slow (550 mts / shift)

- Number of labours required is more i.e. four labours are used.

- Storage space is required for semi finished products.

- Accuracy of punching is only 90 %.

- Scrap is more.

- Power press is used as punching machine which consumes enormous amount of electric power.

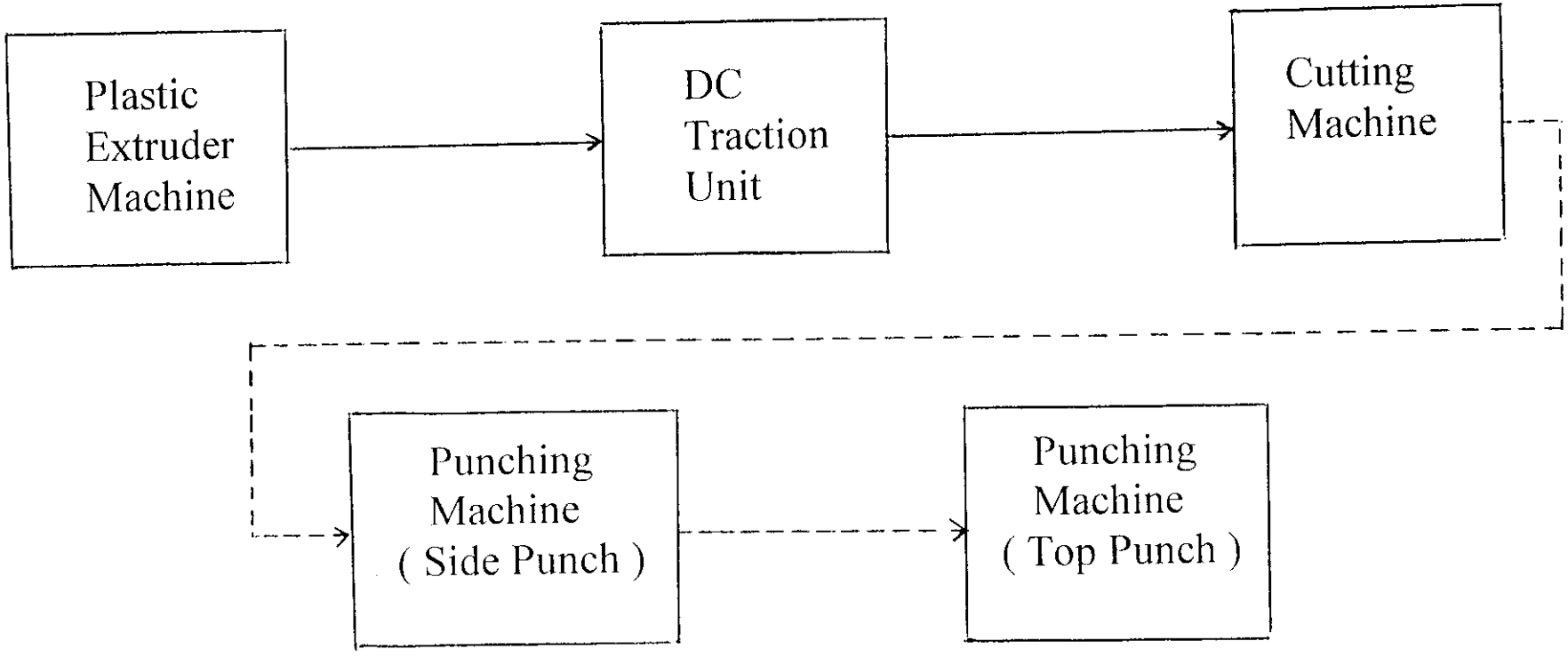
- The fatigue of workers will affect the production rate.

2.2 SYSTEM USING AUTO PUNCH

The manufacturing of cable channels using autopunching machine is chown in the block diagram given in fig 2.2.

The timer and control circuits together with punching machine consistute the autopunching machine. The auto punching machine is connected in-between DC traction and cutting machine whereas in manual punch they are two separate units. The punching machine used in auto punch is entirely different from manual punch (where power press is used).

The plastic extruder machine, DC traction, cutting unit are the same as in manual punch. The autopunching machine is described in detail in later chapters.



----------> Indicates External connection

_____ Indicates Internal connection

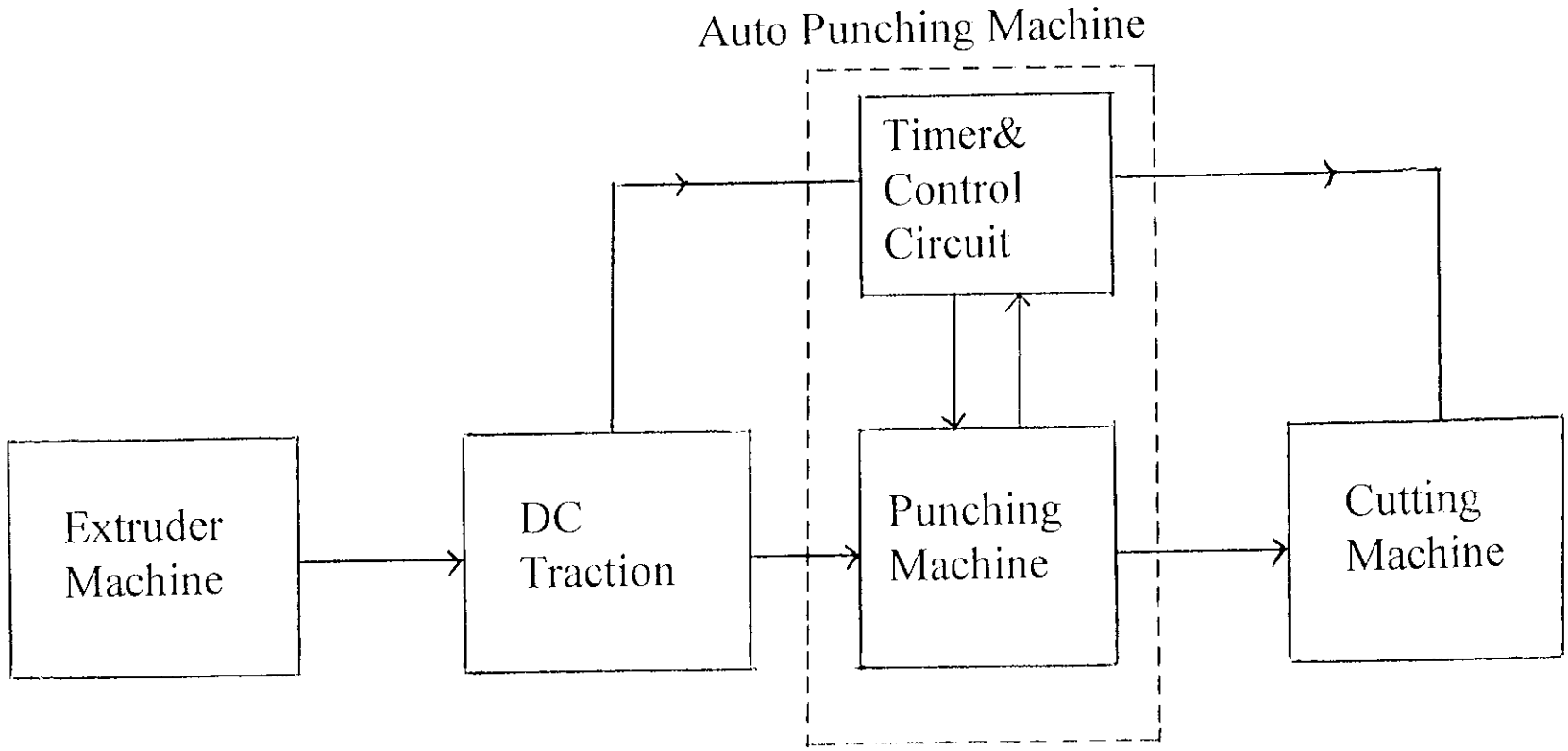


Fig. 2.2 *BLOCK DIAGRAM OF AUTO PUNCH.*

CHAPTER . 3

AUTO PUNCHING MACHINE

Auto punching machine consists of two parts

* Electronic part

* Mechanical part

ELECTRONIC PART:

The components that are used in electronic part are

* Sensors

* timer circuit

* solenoid coil

* counters

* voltage regulators

3.1 SENSOR :(Proximity)

Sensor is a device which causes switching action without physical contact. They respond to targets that come within the active range of their generated sensing field. They have no moving parts and are not susceptible to

contact contamination, contact erosion for material transfer as are mechanical switches. The block diagram of inductive proximity switch is given fig.3.1.

Inductive proximity switches depends on the output of an oscillator for their operation. The oscillator resonant circuit used an open core coil to produce a concentrated high frequency electromagnetic (rf) field, which emerges from the active surface surface of the sensor. If a metal target or (other electrical conductive material) enters this field, eddy current will be induced in it, causing the resonating oscillated to be damped. The associated electronic circuitry detects the damping of the oscillators, triggers the switching action and amplifies the output to drive various devices such as relays counters etc.,. When the target is removed from the sensing field, the reverse action takes place, undamping of the oscillator is detected and the switch is returned to its original state. The circuit shows oscillator, schemata trigger, voltage amplifier, polarity proof and voltage regulator.

3.1.1 Applications

* as motion detector and output indicators .

* in electronic counter and speed monitors.

* loging of the final position on conveyor belts.

* input to electronic equipment where low voltage and low current switching with bounds free operation is required.

* Machine tools, Textile Machinaries, Automation system etc.,

3.1.2 Advantages :

* they have no moving parts that can wear out.

* they are not susceptible to contact contamination and contact erosion.

* since sensing distance is very small, the probability of external disturbance is very small.

* the effect of histresin is very low.

* they does not respond to non metallic materials, that comes in their active range.

3.2 TIMER

Timer are used for providing accurate time delays. The timers get the input and their output are according to the circuit design. The 555 timer is used in autopunching and hence it is dealt here.

The timer 555 is a highly stable device for generating accurate time delay are oscillation. The 555 timer can be used with supply voltage in the range of +5 volts to +18 volts and can drive load up to 200 mA. Because of wide range of supply voltage the 555 timer is versatile and easy to use in various applications.

The timer circuit operates in two modes.

* monostable mode

* a stable mode

Monostable mode of operation is used in the electronic parts and the functional diagram of monostable operation is shown in fig.3.2.

In the standby state, FF holds transistor Q, on, thus clamping the external timing capacitor. C to ground. The output remains at ground potential, i.e., low. As the trigger in figure (a) passes through Vcc/3, The FF is set i.e.,Q=0. This makes the transistor Q of and the short circuit across the timing capacitor C is released. As Q is low, output goes high (Vcc). The timing cycle begins. Since C is unclamped, voltage across it rises exponentially through R toward Vcc with a time constant Rc as in figure (b). After a time period T the capacitor voltage is just greater than (2/3) Vcc and the upper comparator resets the FF i.e., R=1, S=0 (Assuming very small trigger pulse width). This makes

Q=1, Transistor Q_1 goes on (i.e. saturates), there by discharging the capacitor C rapidly to ground potentially. The o/p returns to the standby state are ground potential as in figure (c).

The timing interval is given by

$$T = 1.1\ R\ C$$

Once triggered the o/p remains the high, until time T elapses. However if a negative going reset pulses as in fig. (d) is applied to reset terminal during the timing cycle, transistor Q2 goes of, Q1 becomes on and the external circuit timing capacitor C is immediately discharge. The o/p will be now as shown fig(e).

The circuit for monostable mode of operation is shown in fig 3.3.

3.2.1 Applications :

555 trigger is used in

* oscillator
* pulse generator
* ramp and square wave generator
* monoshot multivibrator

* burglar alarm

* traffic light control

3.3 VOLTAGE REGULATOR.

Voltage regulator provides a stable dc voltage for powering electronic circuit they should be capable of providing substantial o/p current. They are of two types.

* series regulator

* switching regulator

Series regulator use a power transistor connected in series between the unregulated dc input and load. The output voltage is controlled by continuous voltage drop taking place across the series pass transistor. Series regulator are also called as linear regulators may have fixed are variable output voltage. Switching regulator are other hand operate the power transistor as a high frequency on-off switches. So that the power transistor does not conduct current continuously.

3.3.1 Series Voltage Regulator :

Series voltage regulator is a electronic circuit that provides a stable dc voltage independent of the load current, temperature and ac line voltage variation. The curcuit of series voltage regulator is shown in fig. 3.4. and it consist of following four parts.

* reference voltage circuit
* error amplifier
* series pass transistor
* feedback network.

The power transistor Q1 is in series with regulated dc voltage and regulated output voltage .So it must absorb the difference between the two voltage when ever any fluctuation in output voltage Vo accurs. With the advent of micro electronics it is possible to incorporate the complete circuit on a monolithic silicon chip.

3.3.2 *Fixed Voltage Series Regulators :*

78XX series are three terminal positive fixed voltage regulators. In 78xx the last two numbers xx indicates the output voltage. IC 7805 is a fixed voltage series regulators with output 5 volts.

The representation of three terminal, positive monolithic regulator is shown in fig. 3.5

There are four characteristics of three terminal IC regulator which must be mentioned.

1. Vo : The regulated output voltage is fixed at a value as specified by the manufacturer. There are a number of models available for different output voltages, for example, 78xx series has output voltage at 5,6,8 etc.,

2. /Vin/>=/Vo/+2 volts : The unregulated input voltage must be atleast 2v more than the regulated output voltage. for example, if Vo = 5v, then Vin = 7v.

3. I(o) Max. : The load current may vary from 0 to rated maximum output current. The IC is usually provided with a heat sink, otherwise it may not provided the rated ,maximum output current.

4. Thermal shutdown : The IC has a temperature sensor (built in) which turns off the IC when it becomes too hot (usually 125^0 to 15^0 c) The output current will drop and remain there until the IC has cooled significantly.

3.3.3 Electrical Characteristics : (IC 7805)

Input Voltage	-10v
Out current	- 500 mA
Cin	- 0.33 Mf
Cout	- 0.1 Mf
Output Voltage	- 5 v
Short circuit current	- 750 mA
Peak output current	- 2.2 Amp.

3.4 SOLENOIDS :

When the coil of wire is wound on a non-magnetic substance such as plastic tube, it is called solenoid. If a soft iron core is inserted into the coil, it

is electromagnet. A solenoid in which the length is greater than the diameter is one of the most common types of coil construction used in electronics. The field intensity is highest at the centre and at the ends the fields intensity falls to a lower value . The field intensity at the ends is approximately one - half of that at the center.

The solenoids can be used to provide mechanical motion or to generator a voltage that is result of some mechanical movement . A small piece of magnetic material such as iron, if placed inside a solenoids, will try to move with force towards the center of the solenoid which has max. magnetic intensity as soon as the electric current is applied to the coil.

The term solenoid therefore has commonly come to mean a coil of wire with a moving iron core that can center itself length wise within the coil when current is applied to the coil. The circuit of the solenoid electronomaganet is shown is fig. 3.6.

If a ferromagatic core is properly suspended and under suitable tension it can be moved in and out of a solenoid coil from the application of coil current. As shown in the fig 3.6 the soft iron core is pulled inside the solenoid when current switched on and the spring pulls the core out of the solenoid when current is switched off.

3.4.1 Advantages :

The advantage of solenoid electromagnet are

* Substantial pulling output power can be developed with a small coil current.

*The contacts can be made large and can handle, and switch high values of electrical current.

* Small amount of control power thus can be used to switch much higher voltages and current in a safer manner.

3.4.2 Applications :

The large travel of the amateur or plunger itself is used to operate mechanical devices such as reversing mechanism of a cassette recorder or closing of a fluid valve.

3.5. COUNTER :

ICM 7217 A (Common cathode)

The ICM 7217 is a 4 digit , presentable up/down counter, with an on board presentable register continuously compared to the counter. These version are intended for use in hard wire applications were thumb wheel switches are used for loading datas and simply SPDT switches are used for chip control. These counters provide a max. count of a 9999 this circuit shown in fig 3.7.

These circuit provide three main outputs, a carry/borrow output which allows for direct cascading of counters, a ZERO output, which indicate when the counter is ZERO, and a EQUAL output, which indicates when the count is equal to the value contained in the register. Data is multiplexed to and from the device by means of 3-state BCD input port. The CARRY/BORROW, EQUAL, ZERO outputs, and the BCD port will each drive and standard TTL load.

To permit operation in noisy environments and to prevent multiple triggering with slowly changing inputs, the count input is provided with schmatt tirgger.

Input frequency is guaranteed to 2 Mhz, although the device will typically run with fin as high as 5 Mhz counting and comparing (EQUAL OUTPUT)will typically turn 750 kHz max.

DETAILED DESCRIPTION :

CARRY / BORROW :

This output is a positive going pulse occurring typically 500 ns after the positive going edge of the count INPUT. It occurs when the counter is clocked from 9999 to 0000 when counting up and from 0000 to 9999 when counting down.

This output allows direct cascading of counters.

EQUAL :

This output assumes a negative level when the contents of the counter and register are equal.

ZERO :

This output assumes a negative level when the contents of the counter is 0000. The digit and segment drivers provide a decoded 7 segment

display segment system capable to directly driving common cathode LED displays at a peak current of 12.5 mA corresponding average segment currents of 3.1 mA.

COUNTING CONTROLL :

The counter is incremented by the raising edge of the COUNT INPUT signal when UP/DOWN is high it is decemental when UP/DOWN is low. A schmitt trigger on the COUNT INPUT provides hysterosis to prevent double triggering on slow rising edges and permit operation in noisy enviroments. The store pin controls the internal latches, and consequently the signal appearing at the 7 segment and BCD Outputs.

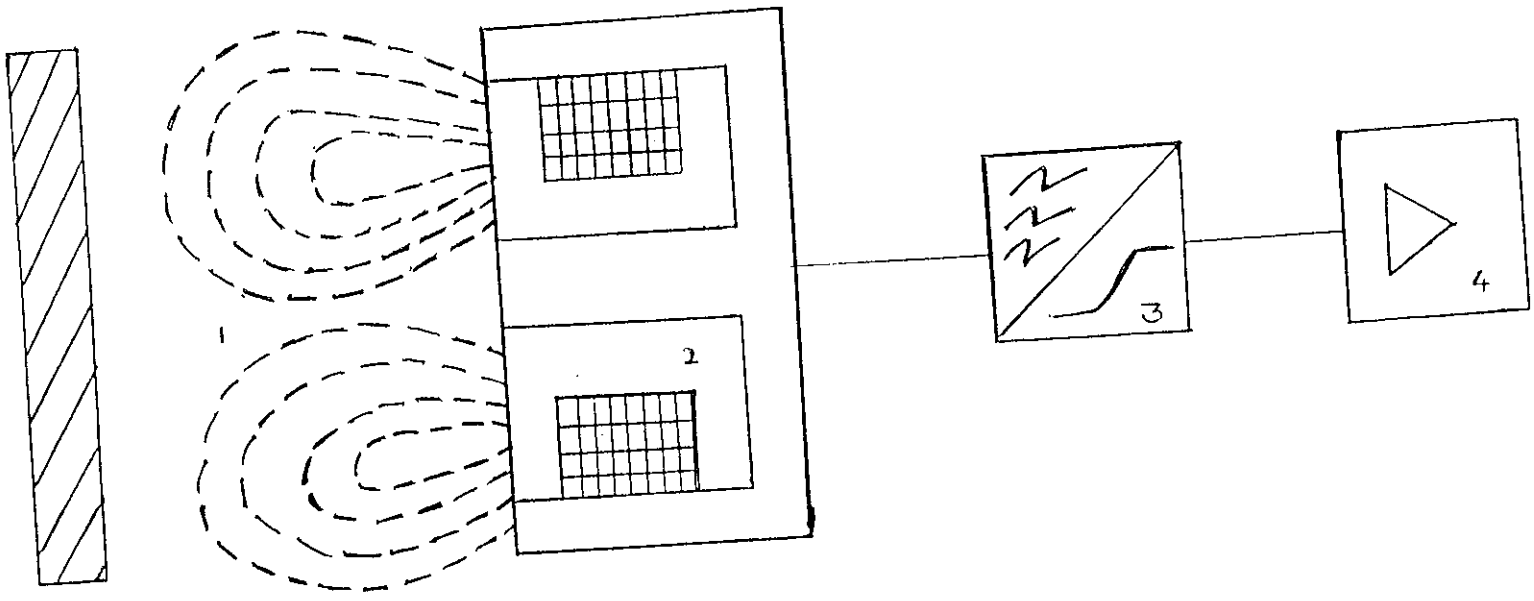
Bring store pin low transfers the contents of the counter into the latches. The counter asynchronously reset to 0000 by bring the reset pin low. The display pin controls the display output using 3 level logic. When this pin is connected to Vdd (+ Vcc), the segments are inhibited, and when connected to Vss, the leading Zero blanking features is inhibited

FEATURES :

Four decade, presentable Up/Down counter with parallel zero detect. Stable register with contents continuously compared to counter.

* Directly dirves multiplexed 7 segment common anode or common cathode LED displays.
* On-board multiplex sean oscillator.
* Schmitt trigger on count output.

TTL compatible BCD I/O port, carry/borrow equal and zero outputs. Display blank control for lower power operations. Quiescent power dissipation < 5 mw. All terminals fully protected against static discharge. Single 5v supply operation, the pin diagram of IC 7217 counter is shown in fig shown fig. 3.8 the timing diagram is shown in fig. 3.9.



1. FLUX LINES

2. ELECTROMAGNET

3. OSCILLATOR

4. AMPLIFIER

3.1 BLOCK DIAGRAM OF PROXIMITY SENSOR

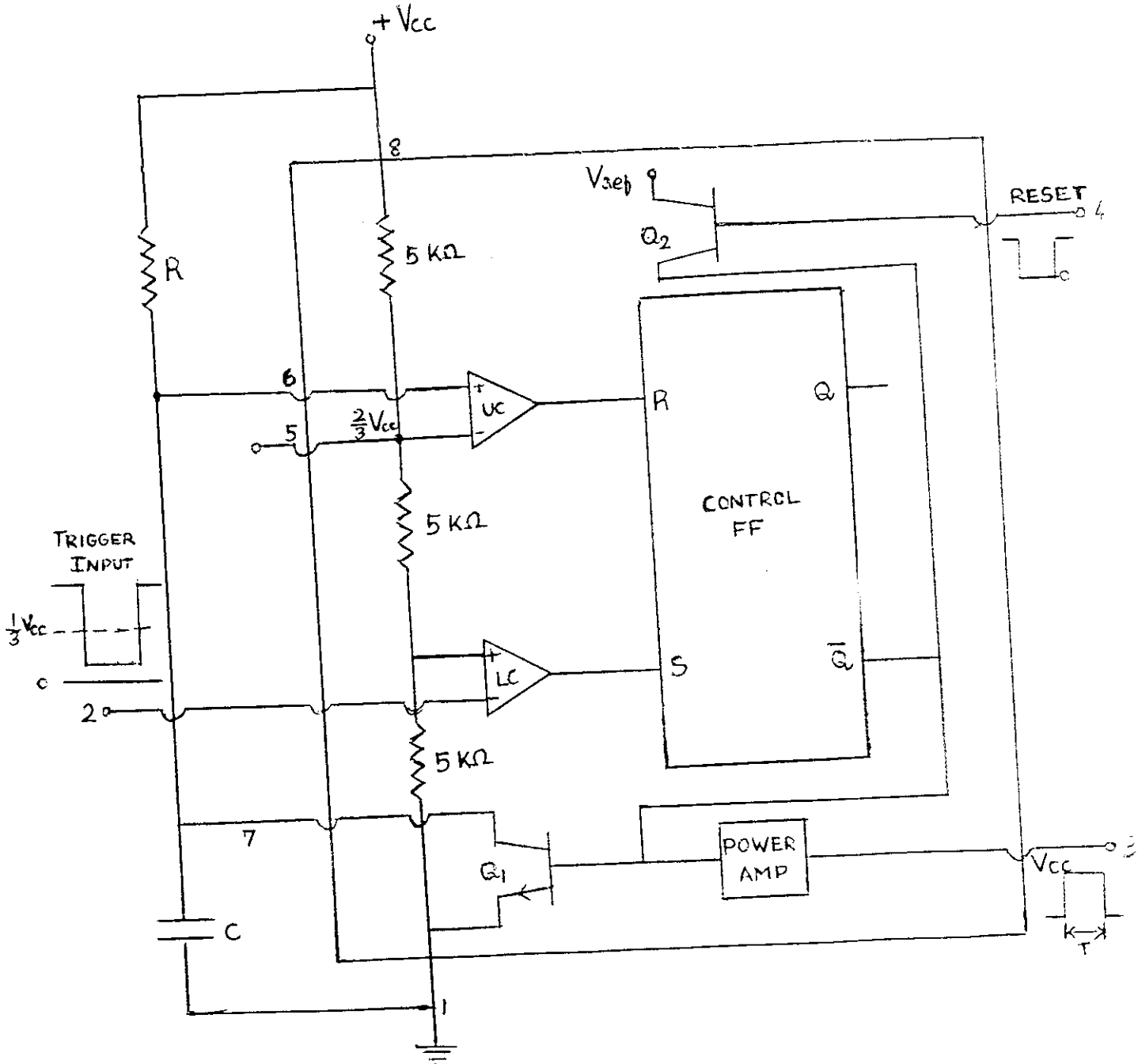


Fig. 3.2 *FUNCTIONAL DIAGRAM OF MONOSTABLE OPERATION*

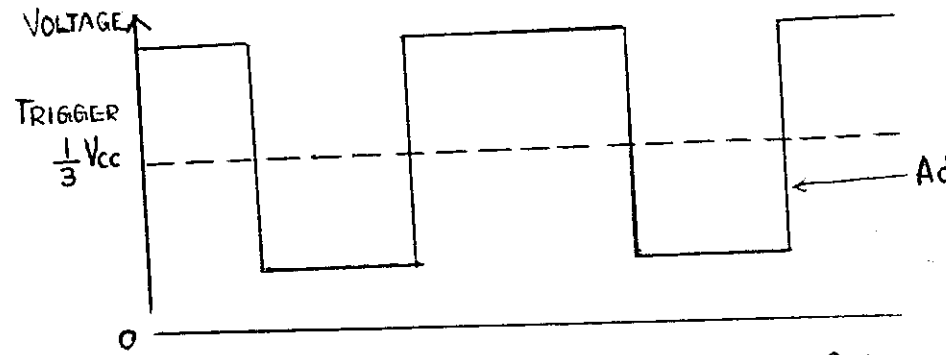


Fig.A

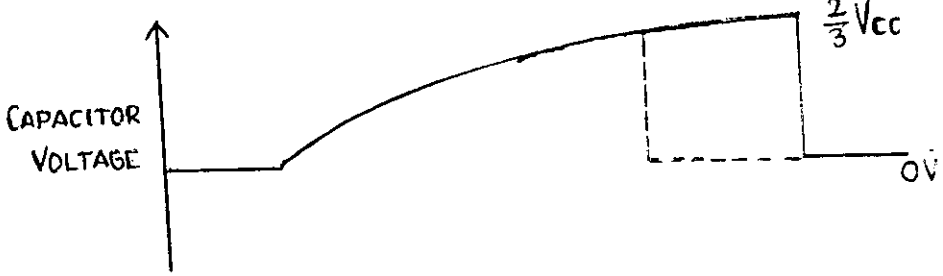


Fig.B

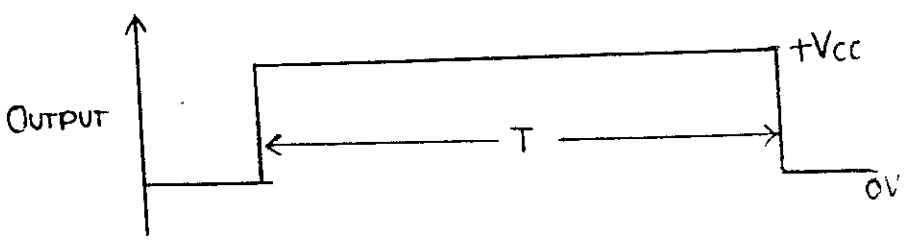


Fig. C

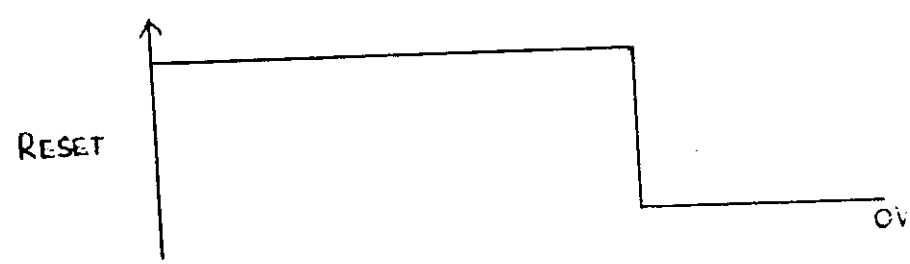
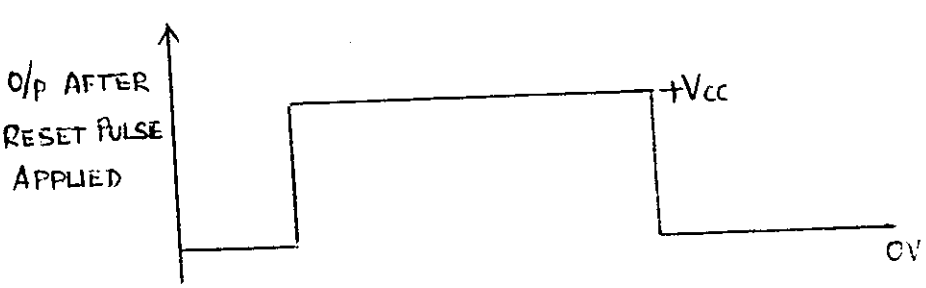


Fig.D



Fig

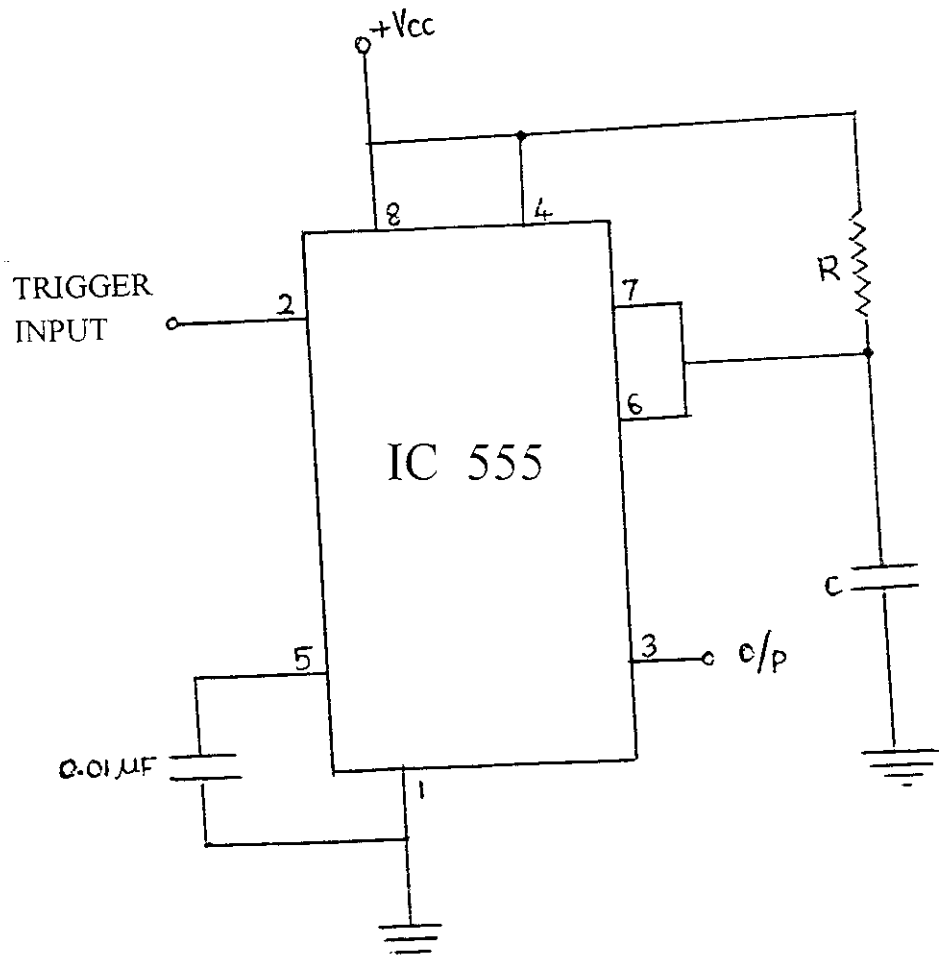


Fig. 3.3 *CIRCUIT OF MONOSTABLE MODE OF OPERATIO*

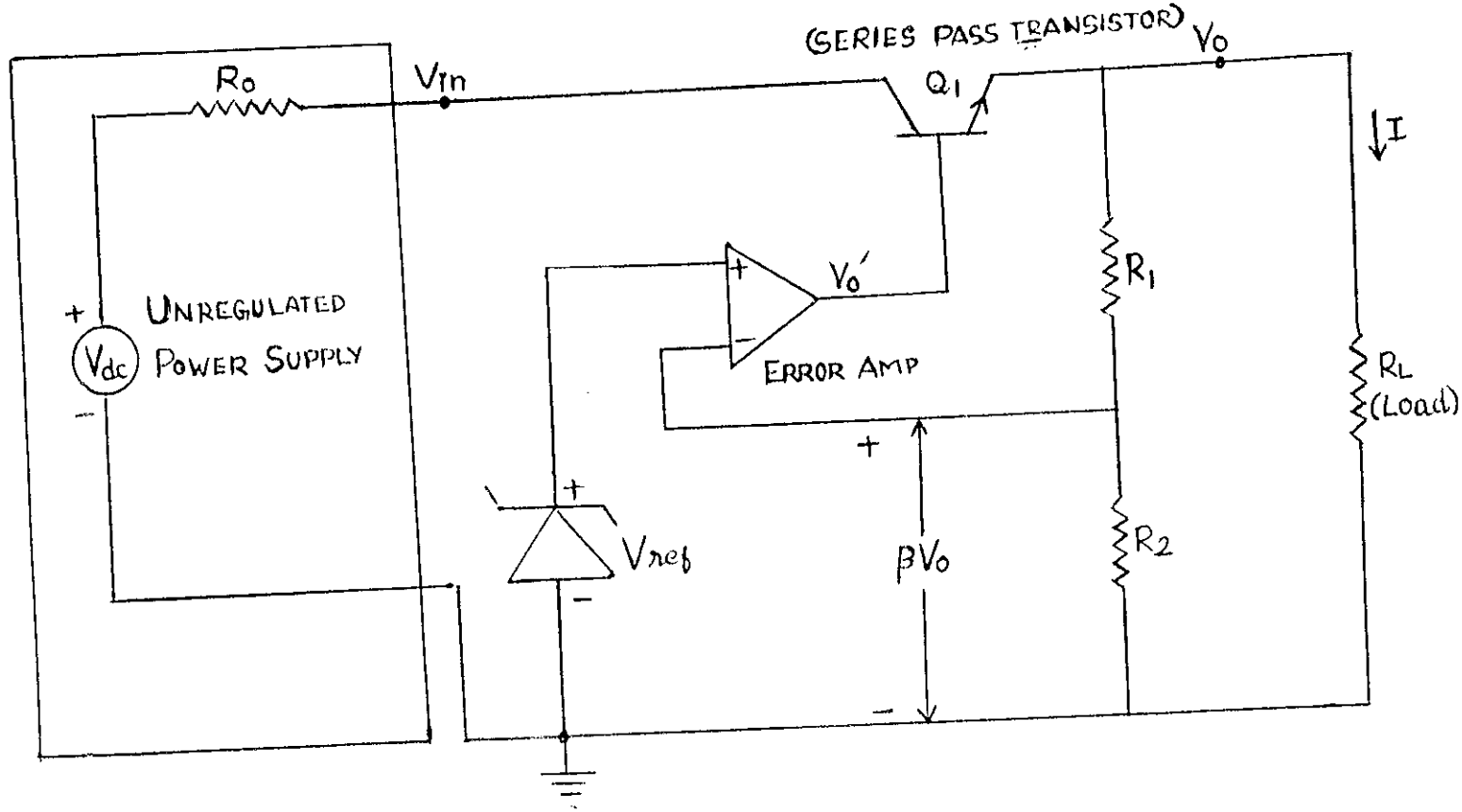


Fig. 3.4 *CIRCUIT OF SERIES VOLTAGE REGULATOR*

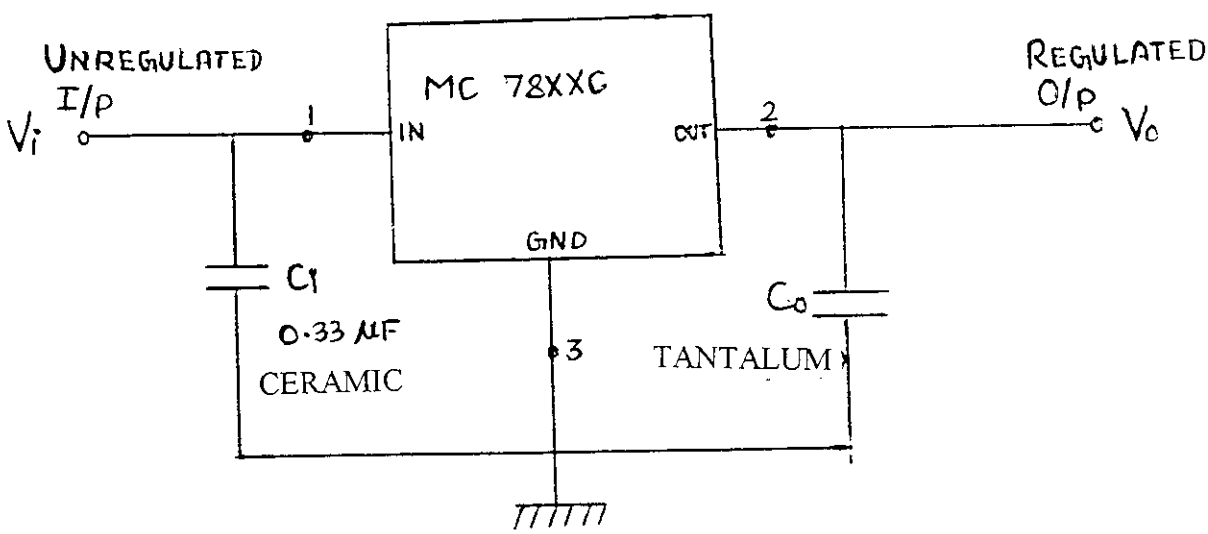
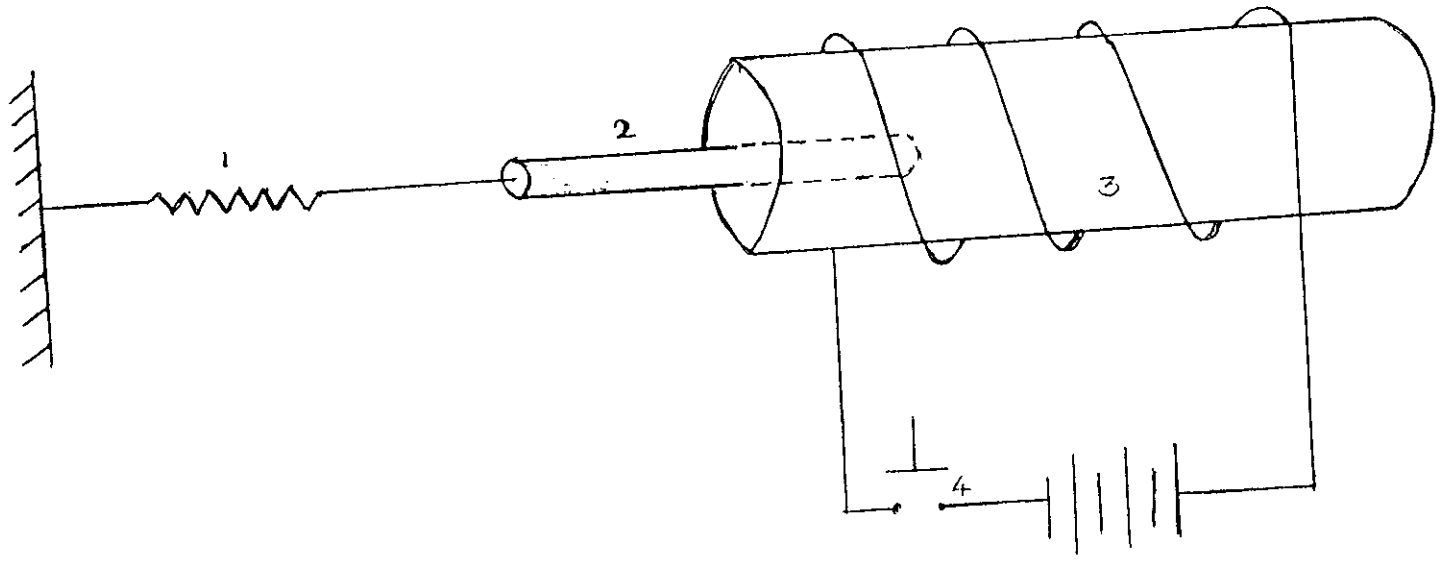


Fig. 3.5 *DIAGRAM OF MONOLITH IC REGULATOR*



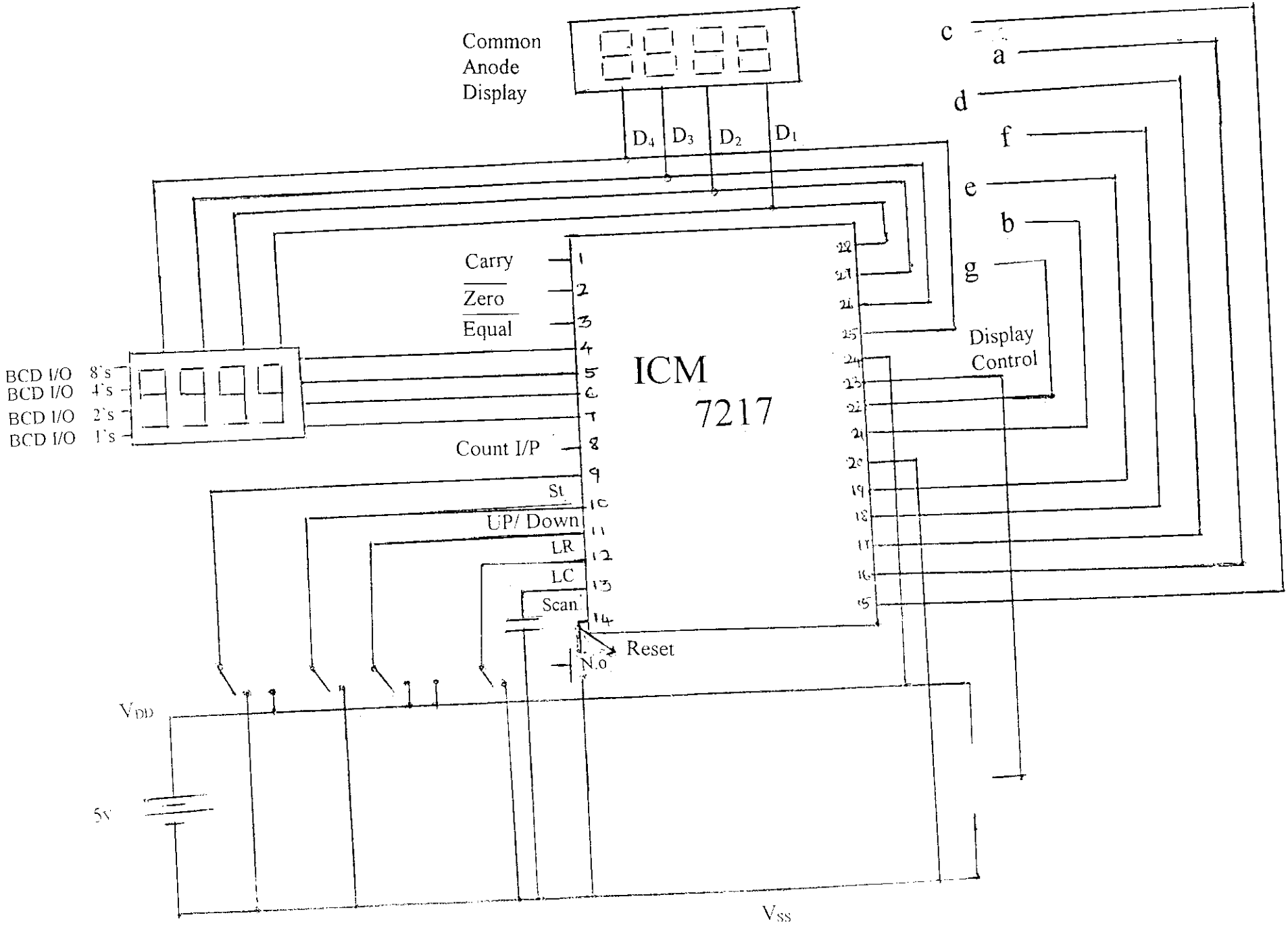
1. SPRING

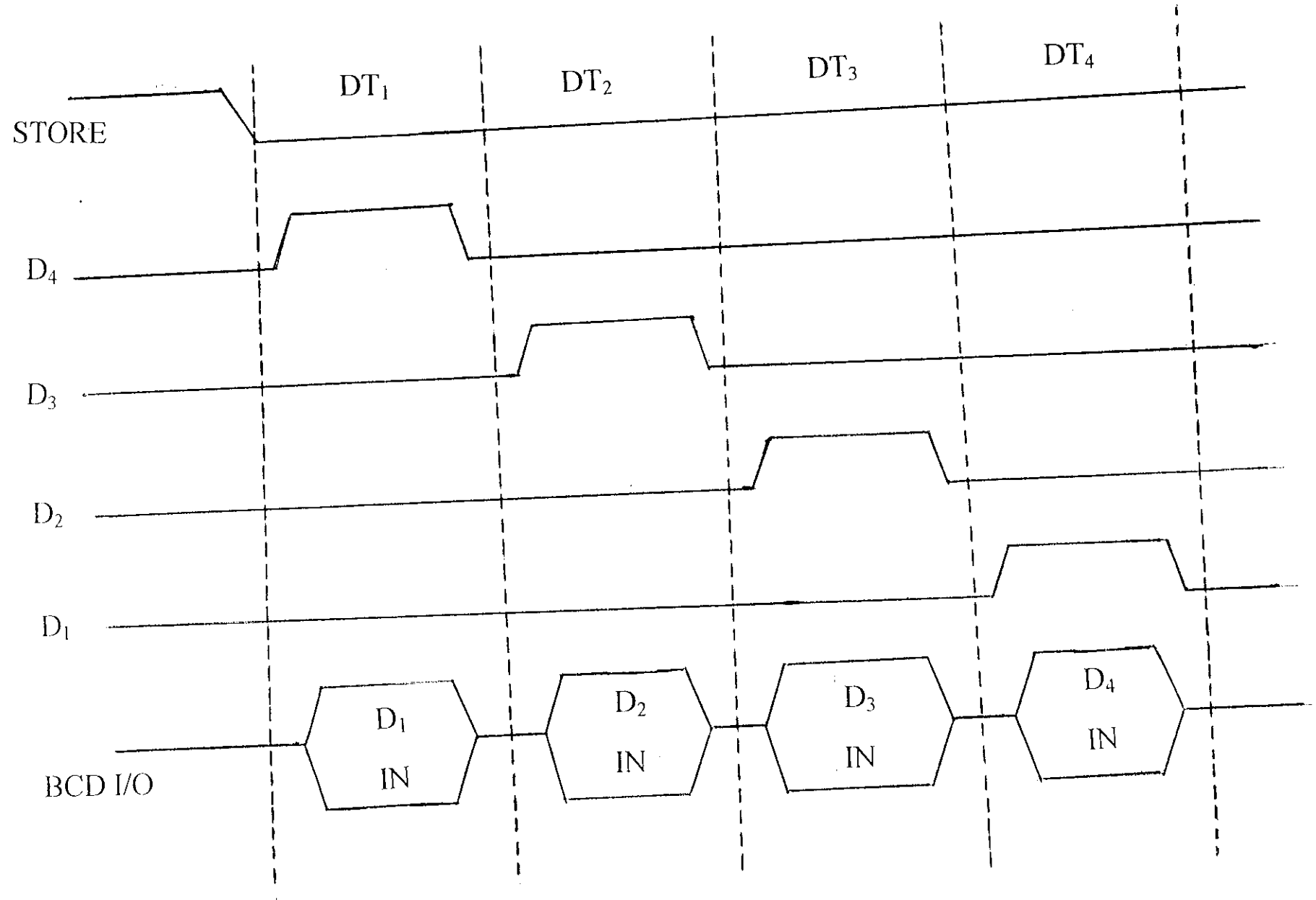
2. PLUNGER

3. SOLENOID

4. SWITCH

3.6 CIRCUIT DIAGRAM OF SOLENOID COIL


Common
Anode
Display
D4
D3
D2
D1
c
a
d
f
e
b
g
Display
Control
ICM
7217
Carry
Zero
Equal
Count I/P
St
UP/ Down
LR
LC
Scan
N.O
Reset
BCD I/O 8's
BCD I/O 4's
BCD I/O 2's
BCD I/O 1's
VDD
5V
VSS


DT1
DT2
DT3
DT4
STORE
D4
D3
D2
D1
BCD I/O
D1 IN
D2 IN
D3 IN
D4 IN

CHAPTER . 4

CALCULATION OF GEAR WHEEL RATIO

This specification ratio is absolutely necessary for the determination of the speed of the movement of the profile. Hence, to preset the counter the gear wheel ration calculation is done as shown below using the traction specifications.

Specification of DC Traction :

Speed in RPM : 72 1440

Distance moved : 0.5m 10m

From the above specification, speed for 1 cm movement of profile :

72/0.5 x 0.01 = 1.44 RPM

i.e., for 1 cm movement of profile, 1.44 revolutions is required.

Total punching length/stroke required = 10 cm

Therefore the motor should rotate 14.4 Rev (1.44 x 10) for one punching stroke.

No of teeth in gear wheel = 100

Since the sensor senses each teeth and sends and output pulse, the total no of pluses that will be produced for one punching stroke = 1440.

Hence, the counter preset value is programmed to be 1440 and at the end of this count, and output is sent to timer.

CHAPTER . 5

MECHANICAL PART

The Mechanical part consist of :

* Compressor
* Air Receiver
* Air Filter
* Regulator
* Lubrication
* Double acting cylinder
* Two way directional value
* Punching die

The block diagram of the mechanical parts and their relationship shown in fig. 5.1

5.1 COMPRESSOR :

Compressor takes the air from the atmosphere and sent it under great pressure. The compressed air is about 8 bar and it is used to operate the pneumatic system.

5.2 AIR RECEIVER :

The pressure vessel is installed directly downstream from the compressor and in intended to even out the pressure surges coming from the compressor. In addition it is the reservoir for the entire network and also helps to cool the compressed air in order to separate any condense forming here. Large compressor system have an after cooler with water separation between the compressor and receiver. This after cooler then separates most of the condense. Compressed air reservoirs are used to even out pressure fluctuations within the system to ensure the highest common pressure for all consumer units

5.3 AIR FILTER :

Impurities in the compressed air such as scale, rust and dust as well as the liquid constituents in the air which deposit as condense can cause a greater deal of damage in pneumatics systems. These contaminants accelerate wear on sliding surface and sealing elements, adversely affecting the functioning and service life of pneumatics components.

Compressed air filters remove solid particles and moisture droplets form the supply air. Particles which are larger than 40μn are retained by a sentered filter. Liquids are separate into the filter bowl by means of a special device. The condense collecting in the filters bowl is drained from time to time as other wise it would be entrained by the air.

Various branches of industry often require very finely filtered air : Chemicals, Pharmaceuticals, process engineering, food processing, etc., here microfilters are used.

Microfilters remove from the control air even the smallest water and oil droplets as well as dirt particles still contained in the compressed air. In this way, the compressed air is filtered to 99.999% (bared on 0.01 micron).

5.4 REGULATOR :

The regulator keeps the working pressure (Secondary side) largely contact, irrespectively of pressure fluctionation in the supply system (primary side) and the air consumption. The inlet pressure must always be higher than the working pressure.

5.5 LUBRICATOR :

The task of lubrication is to supply pneumatic pressure with an adequate amount of lubricant. Using the venturi principle oil is drawn out of the reservoir and is automized by coming into contact with the flowing air. The lubricator will not start to operate until a sufficiently high flow rate is present.

When using low pressure component or sensors, a pre filter followed by a microfilter should be used. Lubrication pressure components should be avoided because they could cause malfunctions.

5.6 TWO WAY DIRECTIONAL VALVE :

The two way directional valves are well proven general purpose range if value for most applications. All are of the popped principle which offers extremely low wear and low "Stiction", providing long life and reliability. There valves can be operated at range of coil voltages. The operation of this is non-lubricated operation.

The two way directional value consist of a central rod which is a dynamic one. The central rod consist of three Norly valves. These Noryl valves can withstand high pressure and tension hence, they are used. The two way directional value consists of single input and two outputs.

The regulated air from the regulator enters the valve through the input port. The output port are connected to the double acting cylinder.

The air from the regulator is sent to the cylinder through the 2 way directional valve. The two way directional valve is shown in fig 5.2. When the

solenoid is actuated, the air enters to the cylinder form one output part. When solenoid comes to its original position the air from the cylinder is sent to the atmosphere through other port.

5.7 DOUBLING ACTING CYLINDER :

Double acting cylinder has a piston which moves in both direction. The air to the cylinder is from the two way directional valve. The working of the cylinder can be understand from the diagram 5.3.

The air enters through the port A and piston moves to the profile where the cutting dies are connected to its end. It punches the profile and when the air in the directional value changes the air enters through port B and the piston moves backward..

The punching stroke is about 1 sec. The cylinder diameter use d is 18 cm.

5.8 PUNCHING DIE :

Die is made of cast iron which is connected to the piston rod of the double acting cylinder. Die is used for punching the channel. In the Die there are five punches. These five are not arranged in a line, instead they are given some slanting angle, such that each rod can get same force from the cylinder (ie) only one rod will punch the channel, then followed by remaining punches one by one, such that the hole are perfect. Further the dies are not arranged in straight line . They are placed one behind the other and they differ by a length of two mm . Since, there are five punches, the first and the last punch differ by 1 cm.

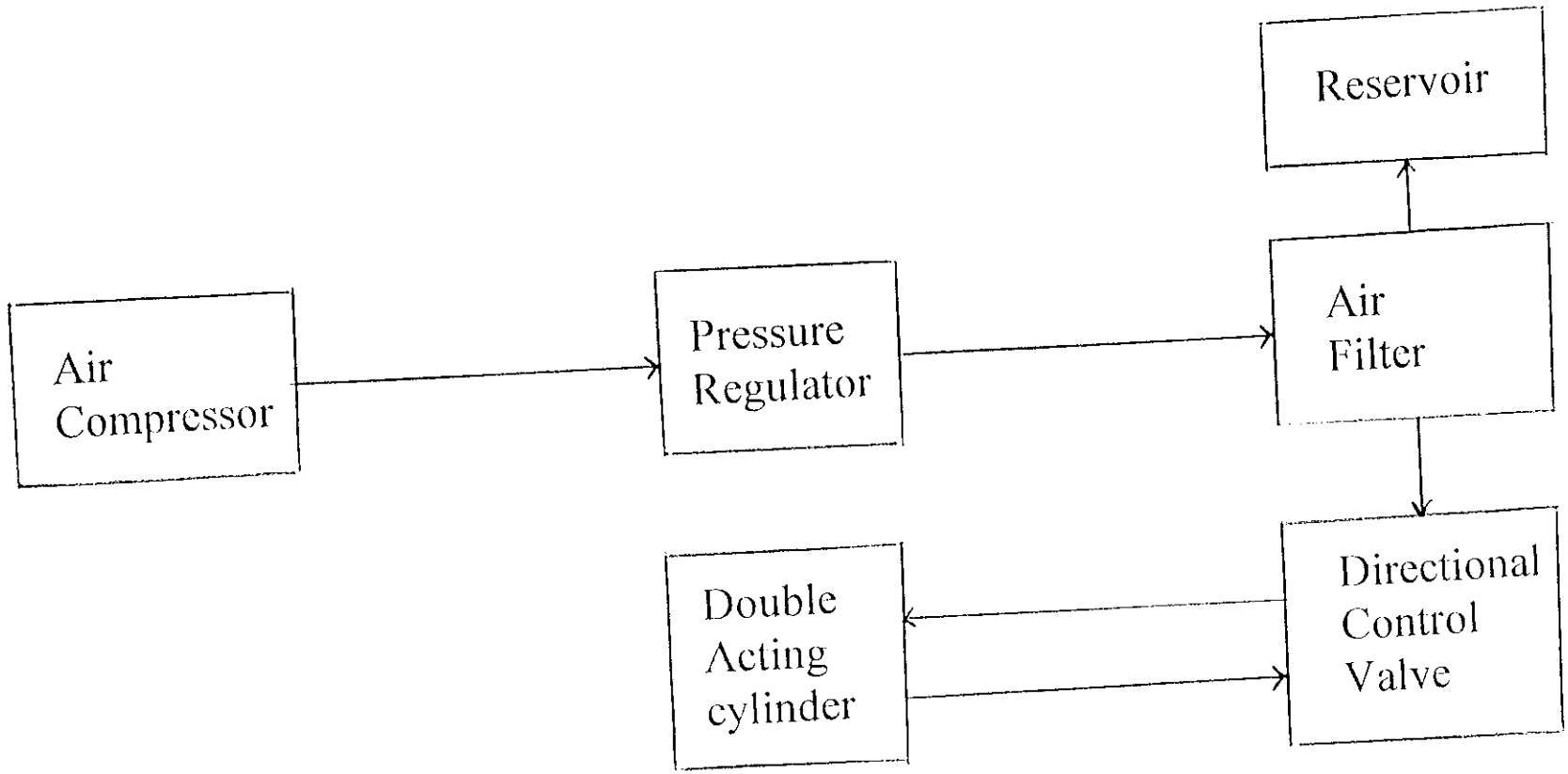
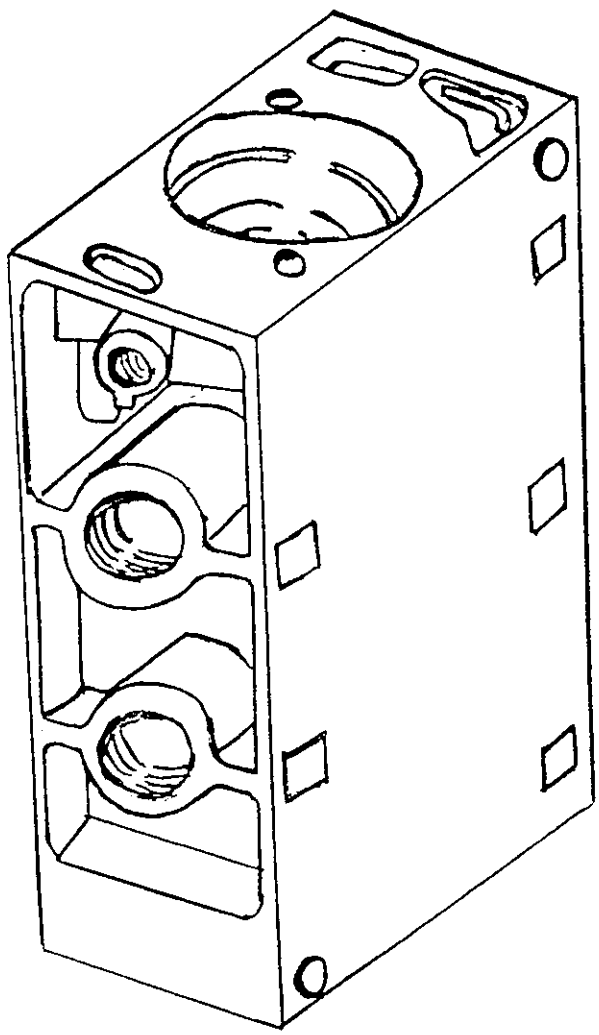


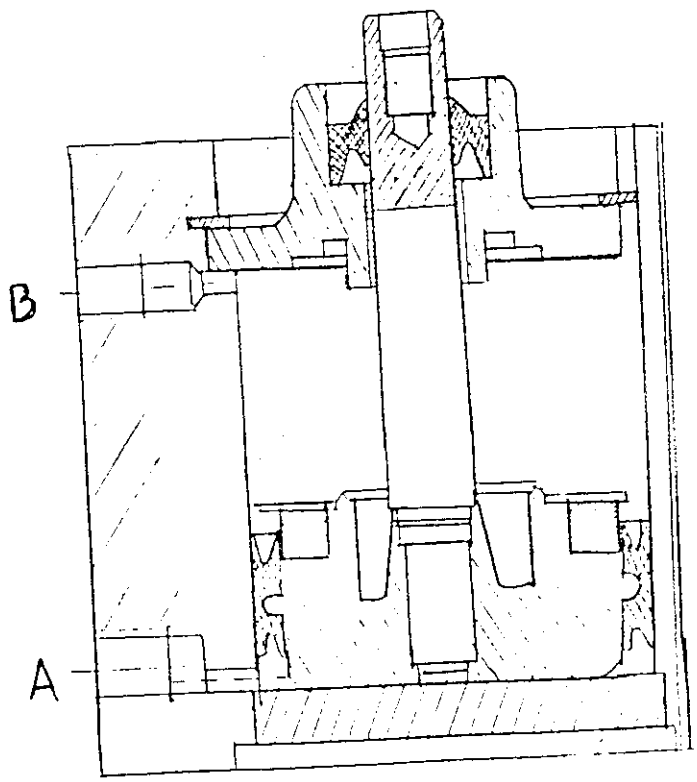
Fig. 5.1 *BLOCK DIAGRAM OF MECHANICAL PART*



5.2 THREE DIMENSIONAL

VIEW OF

TWO WAY DIRECTIONAL VALV



A. INPUT PORT

B. OUTPUT PORT

5.3 CROSS - SECTIONAL VIEW OF DOUBLE ACTING CYLINDER

CHAPTER . 6

DESIGN OF CYLINDER DIAMETER

The tensile force required for the punching operation is given by

$$F = 2TL \text{ (kg m / Sec}^2\text{)}$$

where,T is the tensile strength (Kg /sec^2)

L is the surface length (m)

Total surface length = 175 mm

Tensile strength = 4 Kg /sec^2

$$\text{Therefore Compressive force} = 2 \frac{175 \times 4 \times 2}{10} \times 5 \times 1.1$$

(10% allowance)

$$= 1540 \text{ kg cm /Sec}^2$$

This force should be equal to the product of the area of the cylinder and pressure.

$$\text{Force} = \text{Area} \times \text{Pressure}$$

$$F = \frac{\pi \times D^2}{4} \times P$$

$$P = 6 \text{ kg/cm2}$$

$$\therefore D = \frac{\sqrt{F} \times 4}{\pi \times P}$$

$$\therefore D = \frac{\sqrt{1540} \times 4}{\sqrt{\pi} \times 6}$$

$$D = 18.08 \text{ cm}$$

Hence, the diameter of the double acting cylinder should be 18.08 cm to withstand the pressure and force for the punching operations.

CHAPTER . 7

WORKING CONCEPT :

The complete block diagram of the auto - punching tool is shown in the fig. 7.1 . The working concept is explained with the help of the block diagram. The sensor 1 placed near the gear wheel of DC traction motor senses each tooth of the gear and sense the pulses to the counter. The counter is preset for a particular value and when it is reached it gives an output pulse to activate the solenoid coil. The activated solenoid coil, makes the valve open; the double acting cylinder is acted upon and the side punch is performed. The solenoid valve gets the pressurized air from the compressor. The sensor 2 is place near the side punching die and whenever the side punch is done the sensor 2 sense and gives a pulse to timer and the top - punch is performed in the similar manner. The sensor 3 is place near the top - punching Die. The output of the sensor 3 is given to another counter which is preset for a value which determines the length of the profile. The counter output is given to the timer. The timer out put is given to the solenoid coil which when activated switches on the motor of the cutting wheel and the profile is obtained as a finish product.

The block diagram of the Electronics part for the auto - punching tool is given in the fig. 7.2 . The 230v AC power supply is reduced to 5 V DC power supply using a full wave rectifier and IC 7805 regulator . The timer output current is just 3 to 5 mA. The transistors BC 547 are used in parallel to increase the current to 350 mA which is the rating of the solenoid coil. Similarly the counter output current is also amplified using transistors. The solenoid coil activates when the output from the timer is obtained. The magnetization of the coil is persistent as long as the timer output. When the timer output is zerto, then the coil demagnetizes. Thus the operation of circuit take place

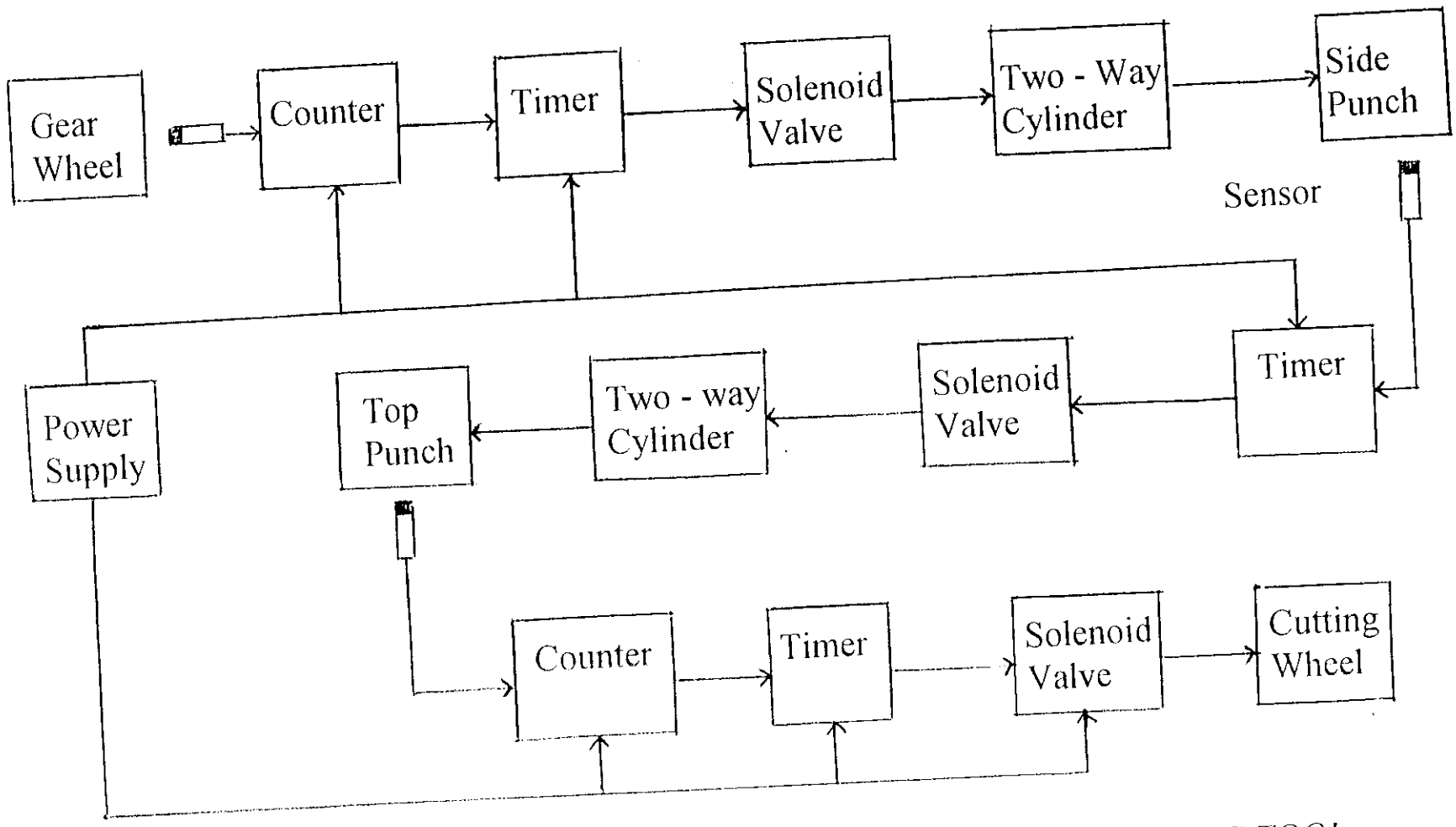
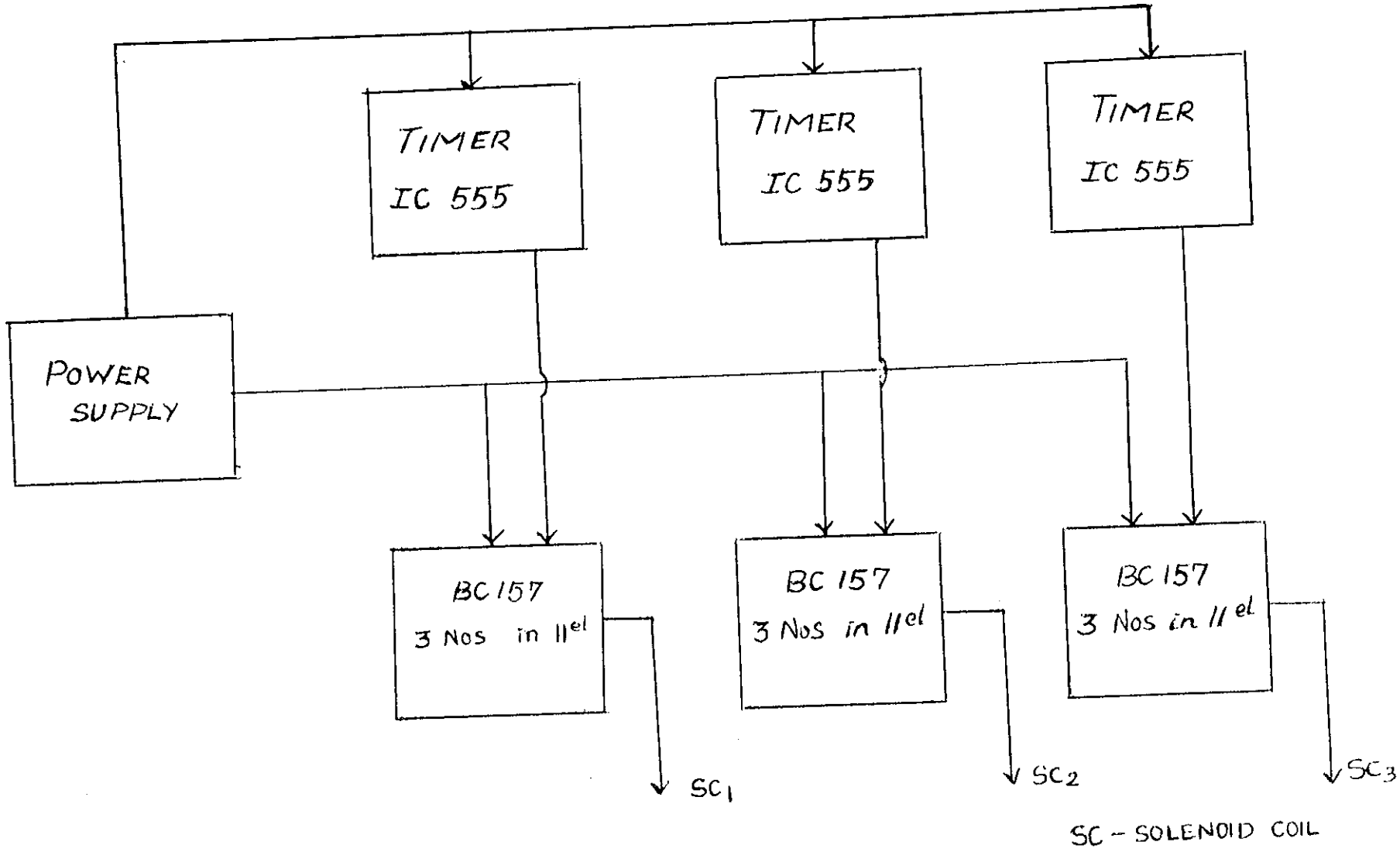


Fig. 7.1 *COMPLETE BLOCK DIAGRAM OF AUTO - PUNCHING TOOL*



7.2 BLOCK DIAGRAM OF ELECTRONIC PART

CHAPTER . 8

COMPONENTS LIST AND COST OF PROJECT

8.1 Components List :

1. Proximity Sensors (M12 - PNP NO)	3 Nos.
2. Solenoid Coil (12 V/350 mA)	3 Nos.
3.Timer (IC 555)	3.Nos.
4. Counter (IC 7217)	2.Nos.
5. Regulator (IC 7805)	2.Nos.
6. Transistors (BC 587)	6.Nos.
7. Transformers (230v/12v)	2 Nos.
8. Resistors, Capacitors	
9. Directional control valve	3 Nos.
10. Double acting cylinders	3 Nos.
11. Filter / Regulator	
12. Terminal Connectors.	

8.2 COST OF THE PROJECT :

Electronic components	-	10,000
Solenoid valves	-	18,000
Double acting cylinders	-	6,000
Filter / Regulators	-	5,000
Punching dies	-	30,000
Trolley arrangement	-	10,000
Stand & Reservous	-	20,000
Miscelaneous	-	11,000
		1,10,000

8.3 ADVANTAGES OF THE PROJECT

1. COST:

a) Initial Cost :

The cost of power press for the punching operations = 1,50,000 x 2

= Rs. 3 Lakhs.

The cost of auto punching tool = Rs. 1,00,000 /-

The initial cost hence is reduced to 33%.

b) Running Cost :

The cost of running the auto-punching tool is very less compared to that of power press.

c). Maintenance Cost :

As the wear and tear is almost nil in the case of auto punching tool, the maintenance cost is less.

2. PRODUCTION :

Continuous production as there is no fatique of works.

Production rate is increased from 550m/shift to 816m/shift. i.e., Increase in the production rate by 33%.

3. LABOUR :

The number of labours used in auto punching is one where as for manual punching system, four workers are needed. Lone at extruder, two for power press and one for transport of the product from cutting m/c to punching m/c.

4. POWER CONSUMPTION :

Power press is used in manual punch which uses a 3.H.P. motor consuming a large power where as in auto punching the electronic circuits consumes only very less power.

5. STORAGE SPACE :

The products from the auto punching can be directly sent for package where as in manual punch the products are to be punched at power press. Hence they require space for semi finished goods.

6.SCRAP :

The scrap in manual punch is around 80 m/shift, where as in auto punch it is only 12 to 14 m/shift. Hence it is reduced to approx 20%.

7.PROFIT :

Taking all the above into account the nett profit is increased by 60 %.

CHAPTER . 9

CONCLUSION

An Auto punching tool for special machine (plastic profile truder) has been designed and fabricated. Punching of profile using the machine is tested and the efficiency of production is increased by 35% per shift. The number of labours is reduced by 75% as that for a manual punch. The wastage is nil, expect for 10 to 15 metres during initial adjustments of the profile when compared with 60-80 mts/shift for manual punch. The production cost is reduced by 60% and hence the net profit is increased. The raw materials are fed and the finished product is obtained as output. Hence the storage space for semi-finished goods is not required as in manual punch. The production is continous and the maintenance cost is less.

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