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DESIGNANDFABRICATIONOFPNEUMATICSHEETMETAL CUTTING MACHINE

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Abstract - Large numbers of industries, factories, and manufacturing companies use pneumatic systems. Simple, reliable, and easy to use pneumatic systems are widely regarded. They can also be used for rapid and powerful force application. A pneumatic sheet metal cutting and bending machine that can be readily operated and is strong is the goal of this project. Working at 8-10 bar is sufficient for this device. Pressurized air flows through the tubes and into the cylinder, driving the piston out, which in turn drives the punch. Die clearance allows the work item to be retrieved through the land clearance given by the die. In this method, the shape of the die is fixed so that the desired die can be utilized. So we may utilize a wide variety of punch dies to make a large variety of items. As a result, several punch types can be obtained according to need. The operating pressure can be adjusted according on the type of material being processed.

Key Words: Pneumatic System, Direction Control Valve, Compressor, Sheet Cutter, BendingPunch& Die.

I.INTRODUCTION

The first step in starting a business is to come up with a concept for it. The quantity and caliber of new ideas injected into an established company determines its long-term viability. With no new ideas, a firm cannot operate profitably or grow, and will eventually fade away into absolute obscurity. Humans are the originators of new business ventures, new products, ways to reduce manufacturing costs, and solutions to labor shortages in the industrial sector. In the vast majority of cases, people come up with their ideas subconsciously, and because of this, they are unable to re-create the mental processes that gave rise to the first "thought." Because of lylessexpensive than electric applications, most pneumatic devices are designed to use clean dry air as anenergy source. The actuator then converts that compressed air into mechanical motion. The type ofmotion produced depends on the design of the actuator. Pneumatics is employed in a variety ofsettings.

An electric drill with the same power rating can't match the speed, simplicity, and weight savings of a pneumatic drill in dentistry applications. This is because an electric drill requires a separate compressor to drive the motor, which can't pump air quickly enough to rotate the drill bit. Many businesses use pneumatic transfer devices to transport powders and pellets.

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Themanufacturingoperationisbeingatomiesfor thefollowingreasons.

- Toreducehuman efforts
- Toincreaseproductionrate
- Toincreaseefficiencyofindustry
- Toreducetheworkload
- Toreduceproductiontime

II. LITERATUREREVIEW

Vallance and Matlock Laboratory-scale friction analysis approaches involving sheet sliding over cylindrical dies were examined (1992). In their study of the literature on the springback of doubly curved developable sheet metal surfaces, Mai Huang and Garden (1994) compiled a bibliography on the topic. Researchers have been investigating springback for nearly six decades, according to a review of the literature. For a long time, the sheet metal forming industry has made numerous attempts to assess and/or reduce springback. For small and large curvatures, Perduijn and Hoogenboom (1995) derived a simple explicit bending-couple curvature relation and tested the model using experimental data. Sanchez (1999) focused on a systematic investigation of testing equipment as a measurement instrument for the frictional processes on sheet metal under plane strain. To maximize the efficiency of lubricants and sheet metal, this study gives experimental references. Samuel (2000) used a finite element program to examine the effects of tool geometry and blank holding force on the final shape following springback in axisymmetric U-bending procedures. Dual phase steel and conventional high strength steel were tested for springback in a hat channel section with varied cross sections by Aleksy et al (2001). They explained the experiment's technique and the findings of a springback experiment. High-strength steel springback was examined using both experimental and numerical methods by Carlos Gomes et al. (2005). TRIP steels were studied by DongyeFei and Peter Hodgson (2006) for their spring back behavior in the air v bending process. Se Young kim and other members of the group (2007)examined the effect of tool design and process parameters on the spring back of GLARE and theparametersstudiedincludepunchradius,punchspeed,formingload andformingtemperature.

III. SHEETMETAL:

Metal that has been thinned out and made flat is known as sheet metal. It is a basic metalworking form that may be cut and bent into a wide range of different shapes and configurations. The material is used in a wide range of daily goods. Foil and leaf thicknesses are exceedingly thin, while plates that are thicker than 6 mm (0.25 in) are referred to as plates. Flat sheets of sheet metal or coiled strips of sheet metal are also common options. To make the coils, a roll slitter is used to cut a continuous sheet of metal. The gauge refers to the sheet metal's thickness.Commonly used steel sheet metal ranges from Gauges range from thirty gauges down to roughly eight gauge. The thinner the metal is, the higher the gauge number gets. Nonferrous metals, such as aluminum and copper, are measured in a different way; for example, copper is measured in thickness by ounce, whereas gauge is used to describe ferrous (iron-based) metals. A wide variety of metals, such as aluminum, brass, and copper, can be formed into sheet metal. Other options include steel, tin, nickel, titanium, and more. Silver, gold, and platinum are among the most commonly used sheet metals for ornamental purposes (platinum sheet metal is also utilized as a catalyst.) Car hulls, airplane wings, medical tables and roofs for buildings (Architectural) are just a few examples of various uses for sheet metal. Laminated steel cores, or sheets of iron and other materials with a high magnetic permeability, are used in transformers and electric motors. Sheet metal

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has long been used to make plate Armor for cavalry, and it is still used for ornamental purposes in horse equipment. In the roofing industry, hammering panel seams together while installing a tin roof has earned sheet metal workers the nickname "Tin Bashers" (or "Tin Knockers" in British English). Layout consists of three main steps.

1. Parallel
2. Radial
3. Triangulation

SheetMetalCutting

When a large enough force is applied to a piece of sheet metal to cause it to fail, cutting procedures are being used. Shearing procedures, which use a shear force to cut material, are the most frequent cutting methods. A large enough shearing force will cause the material to be stressed beyond its ultimate shear strength, causing it to fail and separate at the cut site. One tool above and one below the sheet apply this shearing force. With a punch and die or upper and lower blades, the tool on top quickly slams down on the sheet of metal on the bottom tool. Having a tiny amount of space between the upper and bottom tool edges helps to break the material. For normal shearing processes, material thickness, and sheet thickness all affect the clearance size, which ranges from 2 to 10 percent of the total sheet thickness. Theeffects of shearing on the material change as the cut progresses and are visible on the edge of thesheared material. When the punch or blade impacts the sheet, the clearance between the tools allowsthe sheet to plastically deform and “rollover” the edge. As the tool penetrates the sheet further, theshearing results in a vertical burnished zone of material, finally, the shear stress is too great and thematerial fractures at an angle with a small burr formed at the edge. The height of these portions of thecut depends on several factors, including the sharpness of the tools and the clearance between thetools.

IV. CONSTRUCTION

A pneumatic double-acting cylinder powers the sheet metal cutting and bending equipment. The cutting tool is linked to the piston by a hose. The little sheet metal can be cut and shaped with this tool. The machine's compact size makes it easy to move about. This process uses compressed air from the compressor as a force medium. Dual-acting pneumatics are available cylinders solenoid valves, It is necessary to make use of the flow control valve and the timing device. The solenoid valve receives the regulated air from the flow control valve. All of the air's solenoid valves are working at the same same time. The solenoid valve is a 5/2. The cutting stroke is obtained by pushing the piston with air that enters the cylinder in one position. This position sees air enter the cylinder from the opposite side, causing the piston to return to its starting position. The timer control unit circuit adjusts the cutting and releasing stroke's pace. This process uses compressed air from the compressor as a force medium. Flow control valves and timer units are among the pneumatic components that are employed. It is through this flow control valve that the compressor's arm enters. Solenoids are used to open and close the flow control valve. It is the solenoid valve's job to supply the correct amount of air at the right time. The solenoid valve is a 5/2 kind. The cutting stroke is achieved by allowing air to enter the cylinder and pushing the piston. This position sees air enter the cylinder from the opposite side, causing the piston to return to its starting position. The timer control unit circuit adjusts the cutting and releasing stroke's pace.

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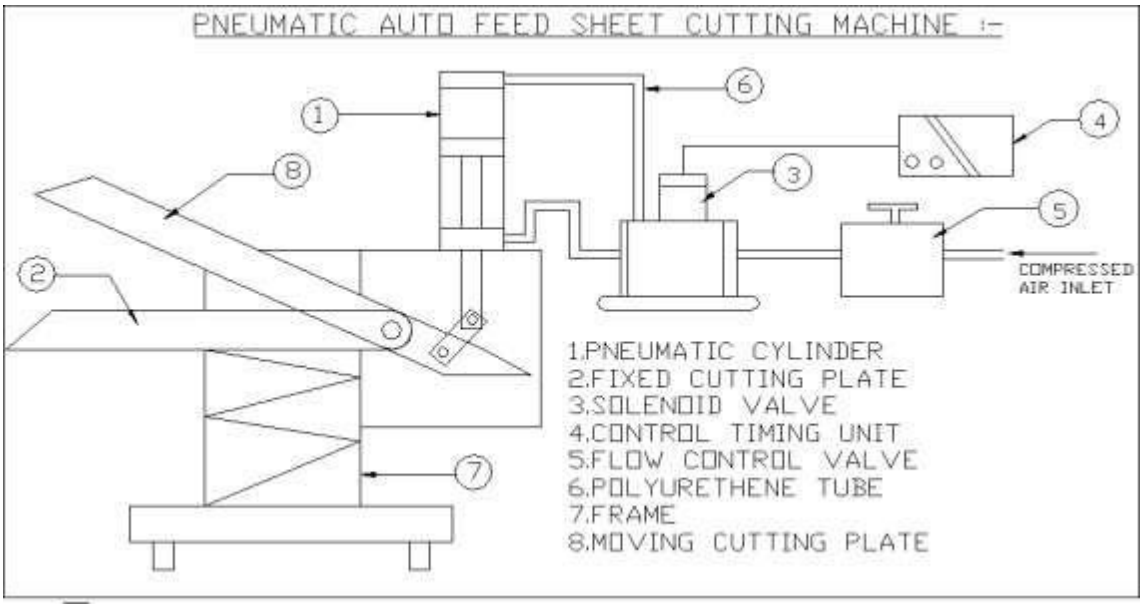

RequirementofComponent-

- PneumaticCylinder
- FixedCuttingPlatt
- SolenoidValve&ControlTimingUnit
- Polyurethanetube
- Frame
- MovingCuttingPlate

ConstructionandMeasurement ofAirEngineCylinder-

- TotalLengthof Cylinder=150mm
- BoreofCylinder =30mm
- StrokeLength=125mm
- Piston Rod Diameter=10mmConstructionalandMeasurement ofMovingCutter-
- Length ofMovingCutter=380mm
- WidthofMovingCutter=25mm
- ThicknessofMovingCutter = 3mm
- MaterialUsed = Cast IronConstructional measurementofFixedCutter-
- Length =300mm
- Width =25mm
- Material Used= Cast IronConstructionalMeasurement ofAircompressor-
- Voltage = 12vi/p
- Maximumpressure=7kg/cm2
- Displacement =35L/min
- SttrokeLength =80mm
- Boreofcompressor(D)=60mm
- Sweptvolume =Π/4 D2 LBattery used for I/P to The Compressor = 12volts & 2.5HzConstructionalMeasurementofBaselFrame-
- Length=550mm
- Width =350mm
- Height = 160mmConstructionalMeasurement ofPolyurethane-
- Diameter ofTube=10 mm
- Thickness=1mm

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- Quantity = 3

V. COSTANALYSIS

- PneumaticCylinder = 1350Rs
- Fixed &MovingCutter =20Rs
- PneumaticPolyurethaneTube=40Rs
- AirCompressor =3000Rs
- Battery(a) 12 volt =1300Rs
- 9volt =25Rs
- SolenoidValve =1400Rs
- Frame = 63Rs

Total Cost =5798Rs

VI. APPLICATION

- Thismachineisveryusefulforsmall scaleindustries
- Thismachineisusedtocutthesheetmetal
- ForPapercutting

VII. ADVANTAGE

- Thepneumaticismoreefficientinthetechnicalfield
- Quickresponseisachieved
- Simpleinconstruction
- Easytomaintain andrepair
- Cost oftheunitislesswhencomparedtoothermachine

Nofire hazardproblemduetooverloading

- Comparativelytheoperationcost isless
- Theoperationof cuttingisfasterbecausethemediumusedto operateis air
- Continuousoperationispossiblewithoutstopping

VIII. DISADVANTAGE

- While working, the compressed air produces noise therefore a silencer may beused.
- Hightorque cannotbeobtained
- Loadcarryingcapacityof thisunitisnot veryhigh.(<50N)

IX. FUTURESCOPE

1.Man has a lifelong desire to amass ever greater material wealth as he ages. Man is continuously looking for new and improved ways to increase both the aesthetic appeal and the economic value of his creations. As a result, there is always room for improvement. Diploma Engineers, on the other hand, are well-versed in strategic thinking and planning. Nevertheless, due to time restraints and a lack of funding, we have only considered and included the following prospective modifications in the report:

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2.The gear oil pump can be used in place of the air compressor and pneumatic cylinder setup to make it hydraulically powered.
3.The rack and pinion mechanism can be substituted for the pneumatic circuit by a square threaded screw and nut setup, or it can be spring and lever actuated.
4.The electric motor-operated compressor is replaced by an I.C. Engine-installed compressor in areas where electricity is scarce. Consequently, in the future, we will have a wide range of options for adapting to the ever-growing global competition..

X.CONCLUSION

When cutting die blades for punching dies in a manufacturing cell, we use a "Pneumatic cutting machine" that uses branch and bound optimization techniques along with fast, effective bounds. Control architecture design was critical to the research since it necessitated close coordination among numerous components. Some limitations prevent us from using our "Pneumatic cutting machine" on the production floor. We are aware of this. However, we will fix the system's flaws and it will be employed in industry. Our project has met our expectations, and we are happy with the results.

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