DESIGN AND FABRICATION OF MULTI PURPOSE CUTTING MACHINE WITH DUST COLLECTOR

First Author
DR. V. B. VAIDYA
(Mechanical Department, K.D.K. College Of Engineering, Nagpur-09
Email:)
Second Author
Nilesh Rathod, Amarpreet Singh Bhatia, Piyush Bhoyar, Ashwadeep Jambhulkar, Devendra Shebe
(Mechanical Department, K.D.K. College Of Engineering, Nagpur-09
Email: nileshrathod16796@gmail.com)

Abstract:

This paper presents a simple way of designing and implementing multi purpose cutting machine. A concrete saw (also known as a consaw, road saw, cut-off saw or quick cut) is a power tool used for cutting tile, concrete, masonry, brick, asphalt, and other solid materials. It can be a small hand-held cut-off saw, a big walk-behind saw or other styles, and it may be powered by gasoline, hydraulic or pneumatic pressure, or electric motors. The saw blades used on concrete saws are often diamond saw blades to cut concrete, asphalt, stone, etc. Abrasive cut-off wheels can also be used on cut-off saws to cut stone and steel. The significant friction generated in cutting hard substances like concrete usually requires the blades to be cooled to prolong their life and reduce dust. This machine creates substantial amounts of dust during operation. Breathing airborne dust on a regular basis can result in permanent respiratory illness. Reduce your risk by wearing a respirator and capturing the dust with a dust collection system. Here, we designing a tool to cutting with dust collection application.

Keywords — Cutting Machine , Dust Collector, Vaccum Gauge.

I. INTRODUCTION

The ceramic tile cutter works by first scratching a straight line across the surface of the tile with a hardened metal wheel and then applying pressure directly below the line and on each side of the line on top. Snapping pressure varies widely, some mass-produced models exerting over 750 kg. The cutting wheel and breaking jig are combined in a carriage that travels along one or two beams to keep the carriage angled correctly and the cut straight. The beam(s) may be height adjustable to handle different thicknesses of tiles. The base of the tool may have adjustable fences for angled cuts and square cuts and fence stops for multiple cuts of exactly the same size. The scoring wheel is easily replaceable. The first tile cutter was designed to facilitate the work and solve the problems that masons had when cutting hydraulic mosaic or encaustic cement tiles (a type of decorative tile with pigmented cement, highly used in 50s, due to the high strength needed because of the high hardness and thickness of these tiles). Over the time the tool evolved, incorporating elements that made it more accurate and productive. The first cutter had an iron point to scratch the tiles. It was later replaced by the current tungsten carbide scratching wheel. Another built-in device introduced in 1960 was the snapping element. It allowed users to snap the tiles easily and not with the bench, the cutter handle or hitting the tile with a knee as it was done before. This was a revolution in the cutting process of the ceramic world.

II. DUST CONTROL

Stones, rocks, sands and clays can contain large amounts of crystalline silica and are used to make kerbs, flags, bricks, tiles and concrete. Cutting these materials produces airborne dust containing very fine respirable crystalline silica (RCS) particles. These particles are small and it is not always possible to see the RCS dust in normal lighting. Serious health effects, such as lung cancer or silicosis, can result from exposure to RCS. This is because fine RCS particles can penetrate deep into the lungs.

There are following ways to reduce or control the dust:

- Wet cutting with adequate water supply.
- If possible, diamond saw blades should be used instead of abrasive saw blades to cut.
- When operating, the operator should always wear personal protective equipment (PPE).

There are some other risks during the cutting process which will also need to be controlled to protect the operator and the passers-by, for example, noise, flying debris, hand-arm vibration, manual handling, electricity and refuelling

III. LITERATURE REVIEW

- Rahul Ranjan, SS Solanki, Vivek Keshri, "**Automatic metal sheet cutting machine**", (International Journal of Advanced Engineering Applications, Vol.1, Iss.4, pp.1-2).

➢ This paper presents a simple way of designing and implementing an automatic metal sheet cutting machine using easily available low-cost micro-controllers.

- B.P.Numbi, X.Xia and J. Zhang, have presented an "**optimization technique for the vertical cutting machine"**.

➢ They have proposed optimum methods to reduce the power consumption by varying the conveyor feed flow rate, the vertical shaft impact crusher rotor feed rate and the bi-flow or cascade flow rate.

- Department of Design and Technology, Lough borough University, has presented a paper "**emphasizing the need for recycling the wastes:"** .

➢ The paper insists that the requirement for environment accountability has become a feature of consideration for the engineers, especially for mechanical engineers.

- M.L.indqvist and C.M.Evertsson, Department of Applied Mechanics Chalmers University Of Technology, Sweden have presented a paper to" **develop and fabrication a wear model for the cone cutting"**

➢ It suggest the use to crush/cutting the rocks minerals which are in the form of ores in mines. Disagreements between predicted and measured geometry and several effects were suggested to explain the discrepancy in the model.

IV. CONCEPT DESIGN

V. HARDWARE

Cutting Machine:-

Controls and Component

Become familiar with the names and locations of the controls and features shown below to better understand the instructions in this manual.

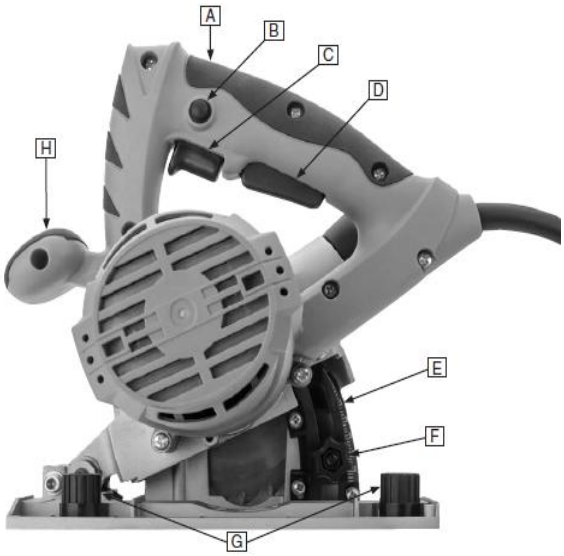

Figure: Controls and features (side view).

Figure: Controls and features (front view).

1. Primary Handle: Used to plunge saw and to advance its position on work piece/rail track.
2. Safety Button: Helps prevent accidental startup of saw. Must be engaged for ON/OFF trigger to function.
3. ON/OFF Trigger: Starts/stops saw blade.
4. Plunge Release: Allows saw blade to pivot down and plunge into work piece.
5. Depth Scale: Indicates maximum depth of cut.
6. Depth Stop & Lock Knob: Sets maximum depth at which saw blade will plunge.
7. Rail Adjustment Knobs: Allow for adjustment of play in how saw slides along rail track to ensure accurate cuts, and help to prevent saw from accidentally lifting off track.
8. Secondary Handle: Used to steady saw while making a cut.
9. Dust Collection Port: 1 1⁄2" port for connection to a dust collection system or shop vacuum (not included).
10. Saw Blade: This saw is designed for a blade that has a 115mm diameter, a 22mm arbor hole, and is 1.15mm thick. A 20-tooth, carbide-tipped blade is included.
11. Arbor Bolt: Holds saw blade in place on the arbor. Remove it to change blades.
12. Cutting Indicator Arrows: These three arrows indicate maximum blade reach for front, rear, and center point of blade.
13. Base Plate: Can be attached to optional rail track or placed directly on work piece if track is not used.

Dust Collection

This machine creates substantial amounts of dust during operation. Breathing airborne dust on a regular basis can result in permanent respiratory illness. Reduce your risk by wearing a respirator and capturing the dust with a dust collection system.

To connect a dust collection hose:

1. Fit a 1 1⁄2" dust collection hose or shop vacuum hose over the dust port and secure in place with a hose clamp.
2. Tug hose to make sure it does not come off.

Note: A tight fit is necessary for proper performance.

Figure: Dust port location.

Dust Collection Hose

Vacuum hose for use with dust collection system or shop vacuum.

Figure: Vacuum Hose.

Vacuum Cleaner

Figure: vacuum cleaner model

1. On-off switch
2. Automatic cord winder
3. Dust bag full indicator
4. Variable power control
5. Suction end
6. Blower end
7. Flexible hose pipe
8. Rear wheel
9. Top hood opening button

VI. ADVANTAGES

- Smooth Cutting
- Harmless
- More Accuracy
- Health efficient
- Eco-friendly
- Less waste material
- Less pollution
- Low Cost maintenance

VII. APPLICATION

- Construction Industry
- Automobile Industry
- Process Industry
- Household Application

VIII. CONCLUSION

For applications on the low end side of technology that do not require very high precisions, low cost automation can be provided using this scheme. These machines are simpler to design and have good accuracy. Along with this, Dust Collection issue solved by above design. Many more similar products (like drilling machine, ramming machine, punching machine etc) can be developed at much lower development costs and thereby, making them within the reach of medium and small scale industries.

IX. REFFERENCES

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