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Design and Fabrication of Metallic-Dust Collector in Chainsaw Sharpeners

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Abstract
This paper focuses on the design and fabrication of an advanced chain saw sharpener with the ability to collect metallic dust formed during the sharpening of the chain. This chain saw sharpener is similar to the conventional chain saw sharpener but with a separate attachment. This attachment includes setup for the metallic dust collection. The dust collection can be done in two ways using a miniature vacuum machine or using an electromagnet. The attachment can be made fixed or portable as the customer opts. The cost may vary accordingly. Spreading of metallic dust to the atmosphere is not the best thing that can happen in our daily life. It is both harmful to both natures and living beings. So the attachment used in this chain saw sharpener can be of great use. Here the metallic dust is absorbed or sucked into the attachment with the help of the vacuum setup or magnetic setup used. This dust is then manually removed by the user. This reduces the spreading of the dust to the atmosphere at considerable levels.And it was thus protecting both nature and us.

I. INTRODUCTION

Products and equipment's that are made up of metal and metallic products are most common around us. And such equipment's are not that dangerous to us in their solid form. But not the same as in the case of their powdered form.Metallic dust is mainly formed during the filing of metallic surfaces. So metallic dust may be left behind when a product is manufactured. Apart from the dust that is left over during the manufacturing process, metallic dust is also formed during the re-sharpening of tools and various products. The contents in metallic dust produced are different for different material. Whatever the content is, metallic dust of any composition is harmful to us. Inhaling metallic dust is not at all good to health. So it is recommended by the doctors to wear various safety equipment's like masks, gloves etc. while dealing with metallic dust. But people usually are not well aware of the dangers of metallic dust. Excess inhalation of metallic dust may lead to cancer and in some cases, even death.

Chain saws are machines that operate on the Otto cycle. They are powerful tools that are specially designed for chopping down trees and for cutting large pieces of wood.

Chain saws are one of the most useful machines available today. Chain accompanies a cutting tool in the form of a chain. During the working of the chain saw, the cutting head of the machine with the chain accompanying the cutting edge is brought close to the piece of lumber that is to be cut. This helps in chopping of wood. But during each cut, the sharpness of the cutting edge gradually decreases in the chain due to friction, wear etc.,and after several cuts, it will be impossible to chop using the chain. This is where the chain saw sharpeners are used.

Chain saw sharpeners are used to sharpen the cutting edges of the chain of chain saw whose sharpness is lost during use. There are mainly two types of chain saw sharpeners currently available in the power tools industry. Portable and fixed type chain saw sharpeners. One of the main disadvantages of the currently available type of chain saw sharpeners is that during operation, metallic dust filed off from the chain spreads to the air, and a part of this is inhaled by the person operating the device. This causes various health problems in the operator and also causes air pollution.

A Metallic-Dust collector is a device that can be used in any industry to collect metallic dust formed during various operations like filing. Thus reducing or preventing problems due to spreading of metallic dust into the atmosphere.Thedesign of Metallic-Dust collector is simple, which includes a system to collect and to store metallic dust. The metallic dust collection procedure includes mainly to sages:

1) Automatic collection of metallic dust.
2) Storage of metallic dust
3) Manual removal of metallic dust.

II. CONSTRUCTION

Metallic-Dust Collector is an attachment which is used with a chain saw sharpener to collect worn of metallic dust from chains during the sharpening process. This attachment can also be used in various industries, where metallic dust is formed, to collect them. Here in the chain saw sharpener machine, the metallic dust collection can be done in two ways, one which includes an electromagnet and other which includes a miniature vacuum cleaner.

The main components of the Electromagnetic Metallic dust collector in chain saw sharpeners are an AC power source, AC to DC converter, electromagnet setup, protective casing with storage etc.

The arrangement of various components in an electromagnetic metallic dust collector is, as shown in figure 1. There are mainly two types of electromagnets, AC electromagnets and DC electromagnets. But the efficiency is better for a DC electromagnet. So an AC – DC converter is used. The electromagnet is made by winding copper coils around a soft iron core. Thus the efficiency will be far better than that of a normal solenoid electromagnet. The electromagnet is fixed to the base of the protective casing.

The casing has two parts, an upper part, removable, with allocations for storing the metallic dust collected during operation. The lower part is fixed to the chain saw sharpeners base. The design may slightly vary based on the type of chain saw sharpener used. On a fixed type of chain saw sharpeners this design can be used but in a portable type, the casing is to be redesigned for proper results.

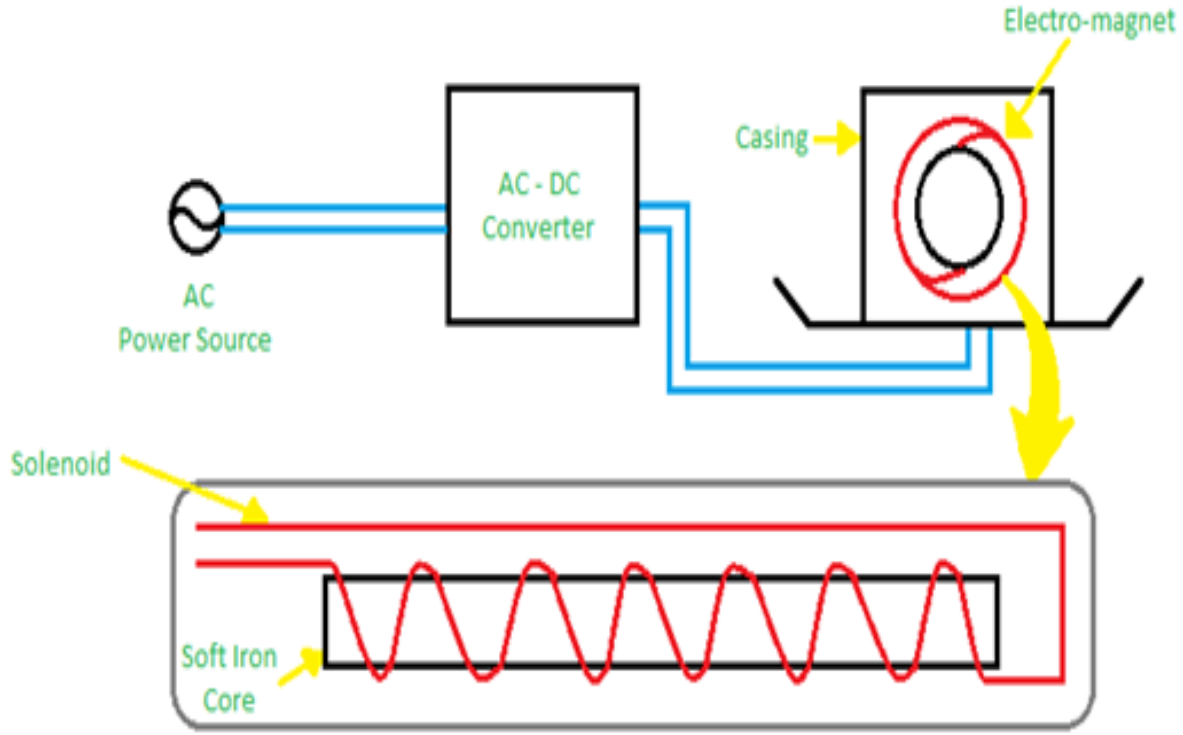

Fig 1: Electro-Magnetic Metallic Dust Collector

The main components of Suction Metallic Dust Collector in a chain saw sharpener are an electric motor, a suction fan, a filter, a removable storage space, an inlet hose, casing etc.

The arrangement of various components in the suction metallic dust collector is, as shown in figure 2. As in the name, the suction metallic includes a system which sucks in metallic dust from the surrounding and stores them in the removable storage space. The construction and design of the suction metallic dust collector are somewhat similar to that of a vacuum cleaner but at a scale downsize.

At the end of the attachment, an electric motor is fixed to which a suction fan is fixed.An AC power source powers the electric motor. A filter is placed in front of the suction fan to prevent metallic dust and various waste debris from gettinginto the motor and damaging it. The design of the casing is similar to a bottle, with a gradually increasing cross-sectional area at the inlet, then a fixed cross-sectional area, then a convergent type cross-sectional area at the end. The inlet pipe is fixed towards the inlet of the casing. The pipe isarranged close to the cutting base of the chain saw sharpener to ensure maximum efficiency.

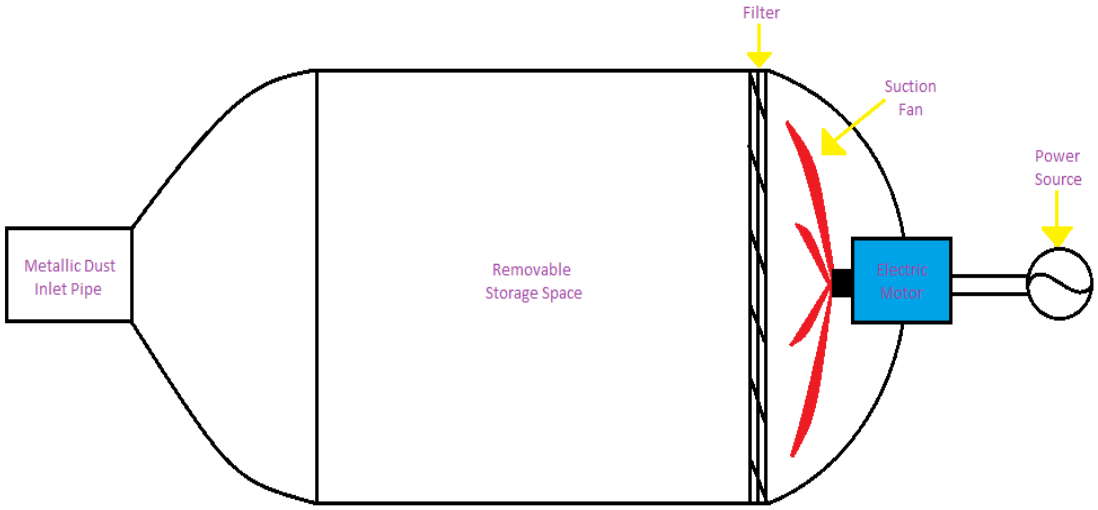

Fig 2: Suction Metallic Dust Collector

III. WORKING

The Metallic Dust Collector used in a Chain Saw sharpener is a semi-automatic device that collects metallic dust automatically during operation of the machine and removes the dust to a separate unit for discharge with the help of humanitarian aid. Metallic dust collection is not currently available in the present-day chain saw sharpeners. But it is a necessary task since spreading of metal to the atmosphere and its inhaling may cause many environmental problems as well as health issues. The stages included in the collection of metallic dust in chain saw sharpeners are as follows:

1. The automatic collection of metallic dust.
2. Storage of metallic dust.
3. Manual removal of collected dust.

The first two stages of the metallic dust collection can be done in two ways. Using an electromagnet and using a suction system.

In the method which includes an electromagnet, an AC source is used to power the system. The electromagnet used here operates on DC power source. DC electromagnets are used since they are better at efficiency than AC electro-magnets. The AC power given to the system is converted to DC using an AC-DC converter. The DC electric current thus obtained is fed to the copper coil wound around the soft iron core, thus making it an electromagnet. During filing operation of chains in chain saw sharpener, metal chips in the form of debris and dust is worn off from the chain. This metallic dust is magnetised by the electromagnet and is attracted towards it. The casing prevents the metallic dust from reaching the electromagnet, thus protecting it.

On each use of the chain saw sharpener, metallic dust begins to accumulate on the casing. This metallic dust is manually removed to dust bins. I am thus reducing spreading and inhalation of metallic dust.

The efficiency of the device can be increased by increasing the number of turns of the solenoid and by increasing the current flowing

The system which includes a suction setup is similar to a vacuum cleaner but is smaller than normal vacuum cleaners. In a suction metallic dust collector as similar to anelectromagnetic metallic dust collector, the power source used is AC. The AC input is used to run the electric motor. As the shaft of the motor rotates, the suction fan mounted to it also rotates, generating a vacuum inside the chamber.This vacuum effects the metallic dust formed during filing operation of the chain. The metallic dust begins to move from the higher pressure surrounding to the lower pressure interior of the dust collector.

The metallic dust hits on the filter and gets deposited in the removable storage space after several uses, the storage space is removed manually by the operator, and the metallic dust inside is moved to dust bins. I am thus reducing the effects of spreading of metallic dust to the atmosphere.

The metallic dust obtained can be recycled to some suitable form and can be reused again. The cost of making a metallic dust collector is so low that it can be made under 10$. However, the cost may slightly vary based upon the type of system used, and the type of chain saw sharpener where it is used.

The efficiency also may vary slightly on various models; however, it will be better on electromagnetic ones. The design of the electromagnetic metallic dust collector is simpler than the suction metallic dust collector.

IV. CONCLUSION

Metallic dust is a harmful entity, proper methods to collect and store it is not available currently. But it is necessary to protect people and to save nature. Metallic dust collector in chain saw sharpeners is a device that helps to collect metallic dust properly. The design of the device is simple.The attachment can be made at low cost, and it doesn't cause any pollution. The cost of attachment is so low. The efficiency is better in electromagnetic one.

V. FUTURE SCOPE

Deforestation is not a good thing. But people are not ready to change. There will always be chopping of trees and cutting of wood until there is not a tree left to cut. For this chain saw sharpeners would be greatly used. But on each uses the sharpness of chain decreases. So sharpening of the chain is necessary. As a result, metallic dust formation is sure. So to decreases issues due to metallic dust, the metallic dust collector is compulsory. A more advanced type of dust collector with automatic dust collection and removal is to be developed for much convenient use.

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