



Development of Paper Shredder Machine

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ABSTRACT:

A paper shredder machine is a device that can shred documents such as paper into either small strips or fine particles. Many Private companies use it to shred confidential private documents or other sensitive documents into small strips or fine particles. Thus, these machines help secure information effectively. Present paper represents the detailed study of paper shredder machine and in addition with it offers an alternative paper shredder model.

Key words: Blades, Shredder Machine, cutting system.

Introduction:

A paper shredder is a device that is designed to cut paper into small pieces, typically strips or fine particles. It is widely used by government organizations, businesses, and private individuals to destroy private, confidential, or otherwise sensitive documents. Shredders are particularly popular among privacy experts who recommend that individuals shred bills, tax documents, credit card and bank account statements, and other items which could be used by thieves to commit fraud or identity theft.

Shredders are available in different types, sizes, and designs, depending on their intended use. They can be categorized into household shredders and industrial shredders. Household shredders are generally designed for light use and can easily fit into small spaces, making them ideal for home use. Industrial shredders, on the other hand, are designed for heavy-duty shredding and can handle large volumes of paper, making them suitable for businesses and government organizations.

One of the main benefits of using a paper shredder is that it helps to protect sensitive information and prevent identity theft. By destroying documents that contain personal information, you can prevent unauthorized access to your personal and financial details. Additionally, shredding documents can also help to reduce the risk of data breaches and other security incidents that could be costly and damaging to individuals and organizations.

Another benefit of using a paper shredder is that it can help to reduce the amount of waste that ends up in landfills. After documents and paper are shredded, they can be easily transported to recycling facilities, where they can be processed and turned into new products. This not only helps to protect the environment but also conserves resources and reduces the need for new materials.

The demand for document shredders is increasing day by day as more individuals and organizations recognize the importance of protecting sensitive information. There are many different types of shredders available on the market, ranging from basic models for home use to advanced industrial shredders for businesses and government organizations.

One of the key considerations when choosing a paper shredder is its performance. A high-performing shredder should be able to handle large volumes of paper quickly and efficiently, without jamming or overheating. Additionally, it should be able to shred different types of paper, including thick envelopes, glossy paper, and other materials.

Another important consideration when choosing a paper shredder is its ease of use. A user-friendly shredder should be easy to operate, with clear instructions and intuitive controls. Additionally, it should be easy to empty and maintain, with minimal mess and fuss.

In recent years, there has been a growing demand for alternative paper shredder machines that are not only high-performing but also easy to use for individuals and households. These machines offer a range of features, including advanced safety features, automatic shut-off, and low-noise operation, making them ideal for use in homes and small offices.

Overall, the use of paper shredders can provide a range of benefits, including enhanced security, reduced waste, and environmental protection. By choosing the right shredder for your needs, you can ensure that your sensitive information remains secure while also contributing to a more sustainable future.

Types of paper cuts are:

1. Strip cut
2. Cross cut
3. Particle cut

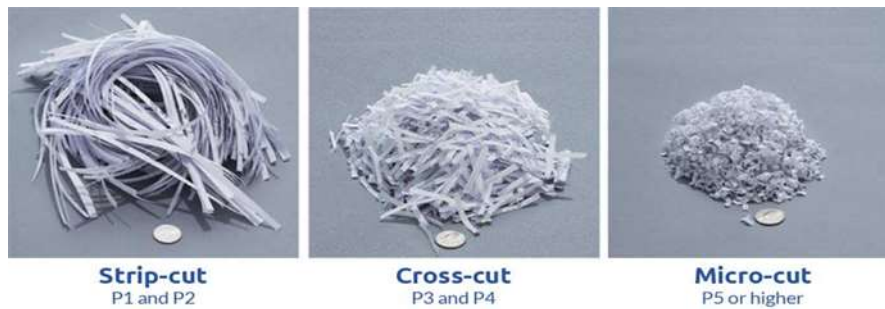


Fig-1

LITARATURE REVIEW

GU-Ming Zeng in 2006 presented the blades of the paper shredder that had serrated cutting edges which were formed by bending. This could be done by two methods. The 1st method had a blade body and serrated edge integrally formed and punched from the same base material. Cost of production there was high and even high level material was required. The 2nd method had serrated cutting edges specially thickened to reduce material consumption. They were also complex to manufacture.

Ming-Hui Ho. in 2011 presented the paper shredder which had two rotary cutters each with multiple blades. Each blade had a first cutting blade with multiple first cutting edges and a second cutting blade with multiple cutting edges. Both the first and the second cutting blades were distributed in a non-equiangular manner and each of the first cutting edges was offset to each one of the second cutting edges, so that there was only one cutting edge that engaged with the paper to be shredded. When the amount of shredded paper increased, the paper shredder did not function normally because multiple cutting edges simultaneously engaged with the paper to be shredded paper stuck in the shredder.

Willi Strohmeyer in 2014 presented a blade and a stripper assembly for a paper shredder. Between the blades of each shaft in the cutter zone, stripper bars or fingers were provided to prevent the cut material get collected around the blade shaft. Here the stripper block had the row of stripper fingers received in the interstices between the blades. Requisite stability was attained since the fingers were engaged with the support ribs of the opposite housing. Stripper block was an injection moulding part, thus was simple construction and easy to fabricate and also had low cost.

Frank Chang in 2017 presented the blade assembly for paper shredder is in a juxtaposed manner. Conventional assembly consists of long and short partition rings. The disadvantage was that even if one part malfunctioned, the whole assembly gets loosened. Instead of having partition rings it had long and short plates casted with the blade ring. The blades were arranged on the rotary shaft to form a bladed shaft such that long and short projecting about the long and short projecting plates of adjacent blades. This arrangement eliminated use of partition rings, reducing cost and enhancing assembly efficiency.

PROBLEM IDENTIFICATION:

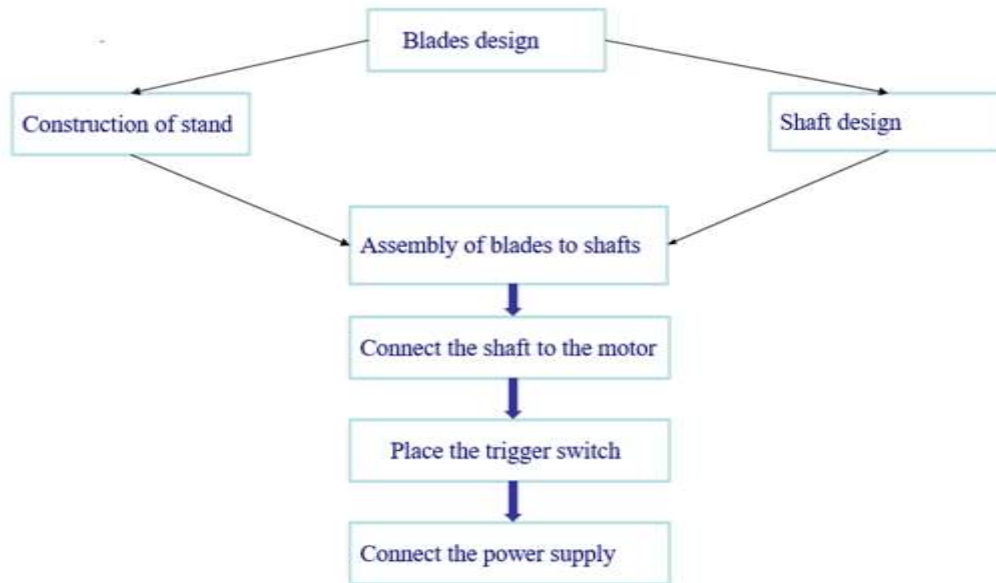
1. From the reference papers, we find out the problem in the Shredder machine that, due to the load factor noise is generated.
2. Extreme vibrations are generated and in the case of continues cutting Shredded paper stuck in the shredder machine.

Objective:

To overcome these type of problems we are introducing the strip cut paper shredder which consists of three way operating switch having three modes on ,off and reverse mode operation this will make the shredder to operate easy to the user in addition with we are providing 360 degrees rotating wheels to the machine stand to make the machine portable. And the main aim of this Paper is to make the machine automation and reduce the power consumption for this we was placed a trigger switch at the cutting edge of the blades this will cut off the circuit. Whenever the paper is placed for the cutting purpose then only the trigger switch will close the circuit and then motor will start working. Even though the power was supplied to the shredder machine. To avoid the paper jam in shredder machine we provide the reverse operation this will help the user to operate the machine easy in the case of continuous paper cutting.

METHODOLOGY

1. The very basic and important step was to study the basics of the shredder machine. It included the machine element. The main component of a paper shredder machine is the blade.
2. Once the blade type is fixed, the second important thing is the machine design.
3. The main aspect while design is the space occupation. Our main aim is to create a horizontal machine (like a Xerox ones) such that the space occupied will be horizontal in nature.
4. In this step all the components are made.
5. And finally it is necessary to test the blade design, whether it works or not.



METHODOLOGY

MACHINE CONSTRUCTION:

1. Stand construction
2. Cutting system
3. Transmission system

Stand construction:

The process of constructing a stand for a paper shredder machine can vary depending on the design and materials used. However, here are some general steps that may be involved in constructing a stand for a paper shredder machine:

Determine the dimensions: The first step is to determine the dimensions of the stand based on the size of the shredder and the intended use. The stand should be sturdy enough to support the weight of the shredder and any shredded paper waste that accumulates in the collecting tank.

Gather materials: The materials needed to construct the stand will depend on the desired design and dimensions. Common materials for constructing a stand include wood, metal, or plastic. You will also need screws, bolts, and other fasteners to assemble the stand.

Cut and assemble the frame: Using the appropriate tools, cut the wood or metal pieces to the desired length and assemble the frame of the stand. Make sure to use strong joints and secure the pieces with screws or bolts.

Attach the legs: Once the frame is complete, attach the legs to the bottom of the stand. Make sure the legs are level and secure to prevent wobbling or tipping.

Install the shelf: If desired, you can add a shelf to the stand to provide extra using brackets or screws.

Paint or finish the stand: Finally, you can paint or finish the stand to match the decor of the room or to provide additional protection against wear and tear.

Overall, constructing a stand for a paper shredder machine requires careful planning, precise measurements, and attention to detail to ensure that the stand is strong, stable, and functional.

The machine frame is made of steel angle-shaped profile with a size of 75 x 75 x 5 mm which is connected through welding process. The material used for the machine frame is steel so that the welding process can use arc welding.



Fig- 2 stand

Main Shaft:

When selecting shafts for a paper shredder machine, there are several factors that should be considered to ensure the best performance and longevity of the machine. Here are some key factors to consider when selecting shafts:

Material: The material used for the shafts should be strong and durable enough to withstand the forces generated during the shredding process. High-strength materials like steel or other alloys are commonly used for this purpose. It is important to select a material that is resistant to wear, corrosion, and fatigue.

Size: The size of the shafts should be matched to the size of the shredder and the blades. A larger shredder with multiple blades will require larger shafts to ensure adequate power transmission.

Configuration: The configuration of the shafts can vary depending on the shredder design. Some shredders use a single shaft to drive the blades, while others use multiple shafts in a parallel or series configuration. It is important to select the right configuration to ensure that the shredder operates efficiently and effectively.

Alignment: Proper alignment of the shafts is critical to ensure smooth operation and prevent premature wear. The shafts should be aligned to ensure that they are parallel and centered, and that the blades are properly aligned with the paper feed.

Maintenance: Regular maintenance is important to ensure that the shafts remain in good condition and do not become damaged or worn. It is important to follow the manufacturer's recommended maintenance schedule and procedures to keep the shredder operating at peak performance. The main shaft serves as the cutting blade holder. The main shaft having 20mm diameter and 25 cm length. It is a hexagon shape in the position of cutting blade holder and has a round shape at both ends in the position of the holder main bearings and gears.



Fig-3 shaft

Construction of blades:

The cutting blades are a critical component of a paper shredder machine. They are responsible for cutting the paper into small pieces, which is the main purpose of the machine. Without the cutting blades, the machine would not be able to shred paper effectively.

The cutting blades are typically made of hardened steel or other high-strength materials. They are designed to be sharp and durable, so that they can cut through paper quickly and effectively. The blades are usually located in a chamber within the shredder, where they rotate rapidly and slice the paper into small pieces.

The cutting blades can vary in number and size, depending on the type and size of the shredder. Some shredders have a single blade, while others have multiple blades arranged in a cross-cut or micro-cut pattern. The size of the blades can also vary, with larger blades being used for heavy-duty shredding and smaller blades being used for lighter-duty shredding.

One of the key factors that determine the effectiveness of the cutting blades is their sharpness. Over time, the blades can become dull or damaged, which can reduce their cutting ability. Regular maintenance of the shredder is important to ensure that the blades remain sharp and effective.

In addition to cutting paper, the cutting blades can also cut through other materials that may accidentally be fed into the shredder. This can include staples, paper clips, and credit cards. The blades are designed to be tough enough to handle these materials without being damaged.

Overall, the cutting blades are a crucial component of a paper shredder machine. They are responsible for cutting the paper into small pieces, which ensures that sensitive information is destroyed and kept confidential. The blades must be sharp and durable to be effective, and regular maintenance of the shredder is important to ensure their longevity. The cutting blade is round-shaped blade with 3 (three) cutting edges, given a hexagon shaped hole in the middle, mounted on the main shaft and main shaft move together. This blade is used to cut the paper in vertical direction. Cutting blades are designed with Mild Steel material with the specification are 18 blades, 10 mm thick and 51-degree of cutting angle.



Fig-4 Blades



Fig-5 dimensions of blade

Transmission System:

The transmission system in a paper shredder machine is responsible for transferring power from the motor to the shredding mechanism. The shredding mechanism consists of blades that are used to cut and shred paper into small pieces. The transmission system ensures that the blades are powered by the motor and that the shredding process is carried out smoothly and efficiently.

The transmission system typically consists of several components, including gears, belts, and pulleys. These components work together to transfer power from the motor to the shredding mechanism. The motor is usually located at the base of the shredder and is connected to the transmission system via a drive shaft.

The drive shaft is a long, cylindrical rod that transmits power from the motor to the transmission system. The shaft is typically made of steel or other high-strength materials to ensure that it can withstand the forces generated during the shredding process. The drive shaft is also designed to be flexible, allowing it to bend and adjust to changes in the position of the shredding mechanism.

The gears in the transmission system are responsible for transferring power from the drive shaft to the shredding mechanism. The gears are typically made of metal and are designed to mesh together perfectly to ensure that power is transferred smoothly and efficiently. The number and size of the gears can vary depending on the size and power of the shredder.

The belts and pulleys in the transmission system are responsible for transferring power from the motor to the drive shaft. The belts are typically made of rubber or other high-strength materials and are designed to wrap around the pulleys. The pulleys are usually made of metal and are designed to be driven by the motor. The belts and pulleys work together to transfer power from the motor to the drive shaft, which in turn powers the shredding mechanism.

In summary, the transmission system in a paper shredder machine is responsible for transferring power from the motor to the shredding mechanism. The system typically consists of a drive shaft, gears, belts, and pulleys, which work together to ensure that the shredding process is carried out smoothly and efficiently. The components in the transmission system are designed to withstand the forces generated during the shredding process and to transfer power accurately and efficiently.

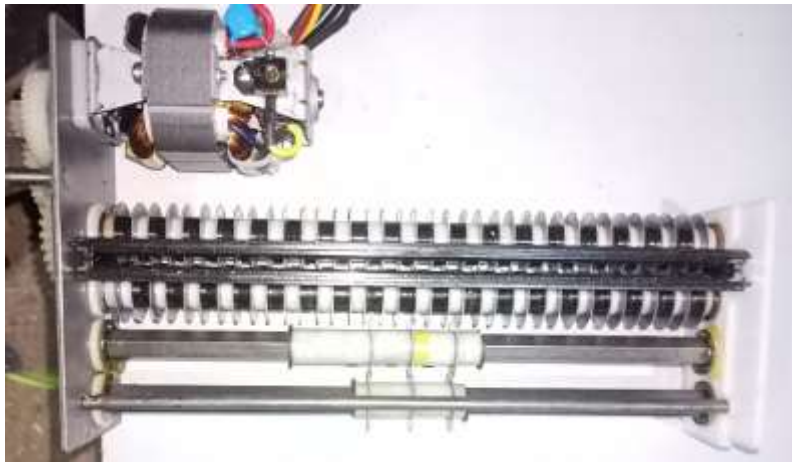


Fig-6 Transmission system

COLLECTING TANK:

The collecting tank in a paper shredder machine serves as a container or receptacle to collect the shredded paper waste.

When you feed paper into a shredder machine, the machine cuts the paper into small pieces or strips. The collecting tank underneath the shredder's cutting mechanism collects the shredded paper particles as they fall down.

The tank typically has a capacity that can hold a considerable amount of shredded paper before it needs to be emptied. Once the tank is full, you can easily remove it from the shredder and dispose of the shredded paper waste properly.

The collecting tank plays an important role in keeping the workspace clean and organized. Without the tank, the shredded paper would fall onto the floor or desktop, making a mess and creating potential safety hazards. Additionally, having a collecting tank allows for more efficient shredding, as you can shred multiple sheets of paper at once without needing to constantly stop and dispose of the waste.

A tank is placed under the head portion of the shredder machine which is used to collect the paper strips after shredding. This tank is made by using the card board sheets having dimensions 35x16x35 cm.



Fig-7 collecting tank



Fig-8 machine body



Fig-9 top view



Fig-10 wheels

CONCLUSION:

In today's world, where data breaches and identity theft are major concerns, the importance of secure information disposal cannot be overstated. Paper shredder machines have proven to be an effective solution for companies to securely dispose of confidential information. However, the proposed alternative model of the water shredder offers an innovative and environmentally friendly alternative to traditional shredders. It provides a new way to safely dispose of sensitive documents without the risk of information being retrieved. In conclusion, paper shredder machines and the water shredder model are both valuable tools for ensuring the protection of confidential information and should be considered essential for any organization that handles sensitive data.

REFERANCES

- [1] Joseph Y. Ko, 2002, "Paper Shredding Device", US 6390397 B1.
- [2] Frank Chang, 2000, "Blade Assembly For Paper Shredder", US 6089482, BO2C 18/06, BO2C 18/18. [3] Gu-Ming Zeng, 2006, "Blade Of Paper Shredder", US 2008/0040934A1.
- [4] Li-Ming Wu Huang, 2002, Taipei (TW), "Blade Of Paper Shredder", 6390400B1.
- [5] Ming-Hui Ho, 2003, Taipei Shein, "Blade Of Paper Shredder", 6513740B2.
- [6] S Nithyananth, Nithin Mathew, Libin Samuel, S Suraj, 2014, "Design Of Waste Shredder Machine", ISSN : 2248- 9622, Vol. 4, Issue 3(Version 1), March 2014, pp.487-491.
- [7] Emily Lo, 2010, Taipei Shein (TW), "Paper Shredder Blade", 7748656B1.
- [8] Tsai, 2000, Taiwan, "Dual Function Shredder", 6065696, App. No.-09/320948.
- [9] [9] Bruce R. Kroger, Raymond R. Ferriss, 2001, "Paper Shredder Shaft", 6260780B1.

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- [10][10] Frank Chang, 2001, Taipei, "Gear Protection Device Of A Paper", 6325309B1.
- [11] Emily Lo, 2008, Taipei Shiepei (TW), "Blade For Paper Shredder Cutting Tool", 7328867B1.
- [12] Simon Hunag, 2006, San Chung (TW), "Elliptical Acetabuliform Blade For Shredder", 6981667B2, App. No. 10/682198.
- [13] Frank Chang, 2005, Taipei (TW), "Linkage Mechanism Of Paper Cut And Antiblock Of Double Duty Shredder", 6966513B2.
- [14] Chen, 2010, Shanghai (CN), "Cutter Structure Of Shredder Blade", 7641136B2.
- [15] Simon Hunag, 2011, Shan chung (TW), "Rotation Speed Controlling System For Shredder Motor", 8008882B2. [16] Simon Hunag, 2006, Shan Chung, "Shredder Blade Made By Punching And Bending", 7048218B2. [17] Tie Chun Wang, 2008, San Chung (TW), "Device For Reducing Vibrations And Noises Of Paper Shredder", 7445173B2. [18] Mark S. Allen, Butter cup Legacy, LLC, Orem, UT (US), 2007, "Lubricant Carrying S