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Magnetic Burr Collecting Machine

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ABSTRACT: The intention of this mechanical engineering project is to fabricate a scrap collecting machine. Since complete automation is very complex and even research facilities haven't come up with one, you better design one that is operated via auto control. The automatic scrap collecting machine is designed to remove metal scraps from the work station to the disposal area with the help of Magnet and Photoelectric sensor. The use of this automated vehicle system reduces human efforts and the chances of hazard. The collecting work station consists of the work room, conveyors and iron shattering machine. The big iron scraps from the work area is collected by a conveyor and is brought to a iron shattering machine to reduce its size. This shattered iron scraps are brought away from the machine to the rail module through a conveyor for disposal.

KEYWORDS: Motor for wheel, Wheel, Frame, Conveyor , Bucket type Scraper, Vacuum cleaner, Motor for conveyor, Electric Circuit

I. INTRODUCTION:

Technology advance in today's life for industrial world drive major research focused for safety of manufacturing environment. Then metal burr produces during machining operation. The metal burr spread on the workshop floor. The method employed currently in industries to collect the metal burr includes, picking pieces by hand and manual sweeping both methods are not been effective due to. Consuming and expose the worker to injuries for safety. A modern machining industry has led to the development of technology driven burr collector. Which work with the scientific principles of magnet. The magnetic burr machine is used to collect the magnetic burr in industry or Workshop, Factory, Roadways, Scrap yards and so on. The developed magnetic burr collector replaces human labour for collecting the ferrous metal parts and can operate at faster rate by an. unskilled labour irrespective of age and technical qualification.

The scrap collecting machine is used for making scrap out of any place. We make a machine which collects the whole scrap into a place. This robot is 4 wheeled Though this project may sometimes look simple In this project we will use photo electric sensor to avoid the accident of the machine whine in working condition. We will control different functions of moving robot. As we know the value of robotics it can be used in biomedical industry, domestic, food, leather, auto parts etc.

NEED FOR AUTOMATION:

Nowadays almost all the manufacturing process is being automized in order to deliver the products at a faster rate. The manufacturing operation is being atomised for the following reasons.

- To reduce wastage time
- For collect a waste materials
- To increase the scarp collection
- To reduce the material cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- Less maintenance

II. LITERATURE REVIEW:

The literature survey is carried out for the effects of the magnetic field on the performance of the burr collector and also various study on robotics and AGV which were used in automated industries. The various research papers, articles and information on the website have been surveyed for the research work carried out on this topic. The literature referred ranges from 1980 to 2011 The work carried out by various researchers is mentioned as below.

RAKSHAN C.NAIK et al they are published research on, "Design and Development of Magnetic Chip Collector Machine"". They are concluded that the design and fabrication of the magnetic chip collector is tested for practical utility

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in the college machine shop. The magnetic chip collector is simple in construction, mechanically driven the chips. The unskilled worker is operating the magnetic chip collector. It has easy operating and maintains cost is low. The efficiency of the developed magnetic chip collector can be improved by increasing the size and incorporating powerful magnate.[3]

PROF. ROHIDAS WAYKOLE et al they are published research on, "Electromagnetic Scrap Collecting Machine with Vacuum System. They are concluded that Design and fabricated of electromagnetic scrap collector is successfully completed. The machine is used to collect metallic and non-metallic scrap in a specific area. The modular system can be extended to handle different types waste.[4]

Mr. A. A. Mohite et. al., "Review on Magnetic Burr Collecting Machine with Oil Soak Mop System", Automation is very complex and even research facilities haven't come up with one you better design one that is operated permanent rod magnets. The automatic scrap collecting machine is designed to remove metal scraps from the work station to the disposal area with the help of Magnet and Photoelectric sensor. The use of this automated vehicle system reduces human efforts and the chances of hazard. The collecting work station consists of the work room, conveyors and iron shattering machine. The big iron scraps from the work area is collected by a conveyor and is brought to an iron shattering machine to reduce its size. This shattered iron scraps are brought away from the machine to the rail module through a conveyor for disposal. Another problem faced is that of oil spillage which is adding to un-safety on the travel or transit path in industry which needs to be cleaned. The machine is also fitted with an oil cleaner mop which will soak the oil in its location without spreading it improving the safety of the road.

Salient points of literature survey:

• The literature survey indicates that the effects of the magnetic fields are studied by various investigators on robotics as well as engineering systems.

• It has been suggested that magnetic strength affects the performance of the system.

• It is evident from the literature that the power full magnetic field applied to the system gives appreciable change in the performance.

• The investigators used powerful magnetic field either by using permanent magnets or from the electromagnets.

• Most of the research work is focused on the effect of magnetic field.

• Presently, robotics and using sensors like Arduino are considered as new areas of research and further studies are being bone to establish the effects of magnetic interactions.

HARDWARE OVERVIEW:

1. Scrap Collector:

Scrap collector which is use for rotational motion which is helps to collect the scrap from floor, scrap collector which has connected to AC motor and giving motion to it.

2. AC motor:

A AC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of AC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

3. Gears:

The gears serve the major working unit in the setup. Gear ratio can be selected for the required movement of the belt for the given rotation of the wheels. Gear ratio of 1 is more than sufficient for the working of the device. But if the chips are bulky then gear ratio of more than one would required. Gears should be properly meshed for effective performance of the device.

4. Shaft:

The shaft used can be of any material. The shaft1.comprises of magnets and some insulating materials. Therefore, shaft1 should be of non-ferrous material as the ferric characteristics tend to decrease the strength of the magnets. The shafts are of different length, since shaft 2 comprises of wheels at both of its ends. The shaft 3 acts as a roller and is near to the container. It is to shaft 1 and shaft 3 that the belt flows over. The distance between shaft 1 and shaft 3 is calculated on the basis of the length of the belt.

5. Magnets:

The device strength is based on the strength of the magnets. The magnets used here are of hollow type since the magnets are coaxially placed in shaft 1 . The magnets used should be of higher strength since the amount of chip collected and clearance of the shaft from the ground is dependent on the strength of the magnet. But it should be noted that magnet should not be that strong since the chip gets strongly attracted that the driving force of the belt is not enough to flow the chips over the belt. Magnets of larger diameter are preferable since the clearance reduces due to it.

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6. Conveyor Belt:

The belt acts as a path way for the flow of chips that get attracted which further gets collected in the container. The belt should be stiffer such that it doesn't tear off while rotating over the shaft. Accordingly the belt shouldn't be smooth as there are chances of chips getting thrown away before being getting collected in the container. Belts that are thin and stiff are preferable. Wheels Wheel is the only part in the device that is in contact with the ground. The wheels are Co-axially placed with shaft 2. The wheels should be highly threaded so as to resist the slippage on rotating. The direction of wheel and belt are opposite.

III. METHODOLOGY:

The proposed work will be carried out with following steps:

- Industrial Survey of Lathe burr sorting technology.
- Study of Magnetic system.
- Development of flow chart for design project.
- Study of various types of system for sorting the burr or chip.
- Calculation of Geometrical Parameters for the system.
- Actual manufacturing of chip collecting system.
- Experimentation by assembling all components.
- Testing.

EXPERIMENTAL SETUP:

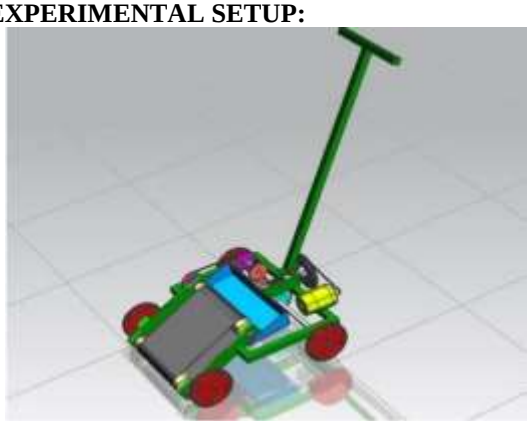

Fig. Experimental setup of magnetic burr collecting machine

It mainly consist of 4 wheels to move the setup as per working requirement. It also have handle by which we can give the direction to the setup. The motor and belt drive is used to drive the worm gear drive and conveyor is used for this application of collecting the burr. The whole set up is mounted on the frame.

WORKING OPERATION:

The main aim of "automatic electromagnetic scrap collector is to collect scrap automatic and conveyor based, easy to operate, easy construction, less space required. In this project we are collecting scrap in the machine by using bucket provided at front of it. The conveyor using dc motors (12 volt).one motor is used for connect to conveyor for guiding scrap into machine. And another motor required to connect to the wheel to giving driving motion to scrap collector chassis. After the belt conveyor a sheet metal plate is provided with magnets which separates magnetic scrap and non magnetic scrap and then to a storage container so we can recycle the scraps. This machines are some kind of heavy there for its difficult to handle manually and also we realized that automation is need of today's industrial world then we choosed auto control operating for our machine. Most of the time it is difficult collect scrap from machines shop.

DESIGN:

Parts Design consists of application of scientific principles, technical information and imagination for development of new or improvised machine or mechanism to perform a specific function with maximum economy & efficiency. Hence a careful design approach has to be adopted. The total design work, has been split up into two;.

- System design
- Mechanical Design.

System design mainly concerns the various physical constraints and ergonomics, space requirements, arrangement of various components on main frame at system, man +machine interactions, No. of controls, position of controls, working environment of machine, chances of failure, safety measures to be provided, servicing aids, ease of maintenance, scope of improvement, weight of machine from ground level, total weight of machine and a lot more.

In mechanical design the components are listed down and stored on the basis of their procurement, design in two categories namely,

- • Designed Parts
- • Parts to be purchased

For designed parts detailed design is done & distinctions thus obtained are compared to next highest dimensions which is readily available in market. This amplifies the assembly as well as postproduction servicing work. The various tolerances on the works are specified. The process charts are prepared and passed on to the manufacturing stage.

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The parts which are to be purchased directly are selected from various catalogues & specified so that anybody can purchase the same from the retail shop with given specification.

IV. SYSTEM DESIGN:

In system design we mainly concentrated on the following parameters: -

1. System Selection Based on Physical Constraints:

While selecting any machine it must be checked whether it is going to be used in a largescale industry or a small-scale industry. In our case it is to be used by a small-scale industry. So space is a major constrain. The system is to be very compact so that it can be adjusted to corner of a room.

The mechanical design has direct norms with the system design. Hence the foremost job
is to control the physical parameters, so that the distinctions obtained after mechanical
design can be well fitted into that.

2. Arrangement of Various Components:

Keeping into view the space restrictions the components should be laid such that their easy removal or servicing is possible. More over every component should be easily seen none should be hidden. Every possible space is utilized in component arrangements.

3. Components of System:

As already stated the system should be compact enough so that it can be accommodated at a corner of a room. All the moving parts should be well closed & compact. A compact
system design gives a high weighted structure which is desired The friendliness of a machine with the operator that is operating is an important criteria of design. It is the application of anatomical & psychological principles to solve problems arising from Man – Machine relationship.

5. Chances of Failure:

The losses incurred by owner in case of any failure is an important criteria of design. Factor safety while doing mechanical design is kept high so that there are less chances of failure. Moreover periodic maintenance is required to keep unit healthy.

6. Servicing Facility:

The layout of components should be such that easy servicing is possible. Especially those components which require frequents servicing can be easily disassembled.

7. Scope of Future Improvement:

Arrangement should be provided to expand the scope of work in future. Such as to convert the machine motor operated; the system can be easily configured to required one.

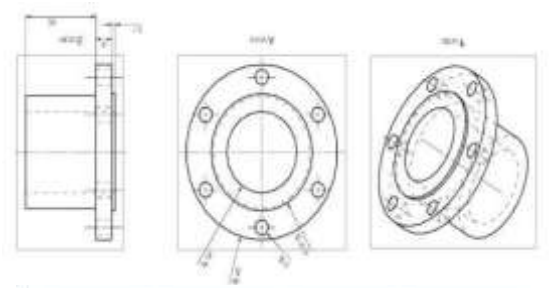
8. Height of Machine from Ground:

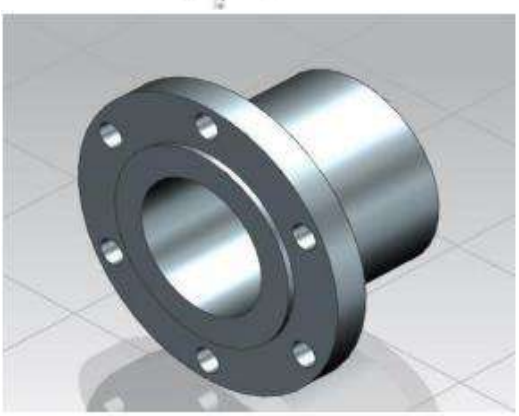
For ease and comfort of operator the height of machine should be properly decided so that he may not get tired during operation. The machine should be slightly higher than the waist level, also enough clearance should be provided from the ground for cleaning purpose.

9.Weight of Machine:

The total weight depends upon the selection of material components as well as the dimension of components. A higher weighted machine is difficult in transportation & in case of major breakdown, it is difficult to take it to workshop because of more weight.

DESIGN OF WHEELHUB:





DESIGNATION	ULTIMATE TENSILE STRENGTH N/mm2	YEILD STRENGTH N/mm2
EN8	520	360

V. RESULTS:

The various outcomes are tested after the design procedure to analysis the result of the project work.In analysis process we expected to collect the burr from the industry by our burr collector.

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ADVANTAGES:
1. Easy to operate
2. No fuel required
3. Simple in construction
4. Occupies Less area
5. Limited labour and time allocation.
6.Low maintenance cost
7.Fast in operation.
8.Low Noise.

DISADVANTAGES:
1. Mechanical parts subjected to wear and tear
2. limitations of speed
3. Automation is slightly costly
4.Suitable for light to medium duty pipes,as the motar power is low.
5.Not suitable for Non-ferrous Chips.

APPLICATIONS:
1. Basically it is used for collecting the scrap from any Industries
2. Small machining workshops
3. School/college workshops
4. On road
5. Urban cities
6. Shops and mall

FUTURE SCOPE:
1.Full automatic chip collector with microprocessor control is possible.
2.Vehicle can be made to steer automatically using remote.
3.Chips from tray can be automatically disposed in bin.
4.InbuiLt furnace for melting Metal chips.

VI. CONCLUSION:

1.Parts of the drive mechanism mainly shaft,roller etc were designed using therotical and checked anatically using ANSYS-16,the result obtained proved that parts are safe.
2.The developed magnetic chip collector met the desired requirements that could pick the chips, in turn transfer on to the belt and collector, thus help to clean the floor area. Simple in construction, mechanically driven, ease to handle and discharge off chips, unskilled labour, low operating and maintenance cost are unique features of the developed magnetic chip collector.
3.Result of trial indicates that the actual chip collection increases with increase in vehicle speed.
4.Result of trial indicates that the effectiveness of chip collection is better at lower vehicle speeds.

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