Crank Operated Maize Sheller

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Abstract— As all of us are aware, maize is one of the most important constituents of our food. But do we all know, how laborious it is to shell the maize? Dehusking and shelling are important post-harvest activities in maize crop, predominantly done by women. These activities involve a lot of drudgery as these are done manually. The maize shelling with the tool makes women's lives difficult and yields very low level of output. Moreover, dehusking as a separate activity precedes shelling that brings additional burden on farmers. They may employ labourers or use machines. But in villages, there is a shortage of labourers, and their wages are also pretty high. The farmers or field owners find it difficult to afford the machines. In order to make it affordable and more convenient to shell the maize, and as a part of our academic project, we have developed a "Crank Operated Maize Sheller" using ergonomic and mechanical considerations for dehusking and shelling. It consists of feeder from where the maize is inserted. The crank is connected to the blade. When the crank is turned, the blade rotates and shells the maize. The machine is operated by 1 person and requires feeding of cobs one by one.

Key words: Supporting Frame, Blade

I. INTRODUCTION

The starch, oil and some other fatty acids are extracted mainly from wheat, power & corn. These play a major role in keeping the person healthy. Obtaining the corn seeds for extracting fatty products is difficult due to frequent power cuts in rural areas and even because of the traditional processes that are followed.

Traditionally most of the shelling work was done by hand. There were hand operated maize shellers which were cumbersome to use. Large scale shelling for commercial purposes was not possible due to fatigue. There are, of course, machines which can shell maize, but these are usually unaffordable for rural farmers. There is a need of a cost effective, eco-friendly solution for shelling maize.

After studying existing practices of maize shelling and finding the need of maize sheller with better performance and customized features, the problem statement has been formed. Traditional shelling is time consuming and there is a problem of labourers and their wages.

"Design and fabrication of low cost, portable pedal operated maize sheller".

– The objectives needed to be achieved are,
1) To shell the maize of different sizes effectively.
2) It should be manually operated, thus avoiding the need of additional power source.
3) It should not damage the corn grains while shelling.
4) Farmers should be able to carry it to the fields easily.
5) Product should be safe for the user.

– Scope of the work,
1) It can be used in small scale industries.
2) It can be used mainly by farmers.
3) The equipment can be easily operated by pedal; it can be used even for domestic purpose.

The product is supportive only to certain grades of corn grains

II. LITERATURE SURVEY

Maize shelling a post-harvest operation, is the removal of maize seeds from the cob. This operation can be carried out in the field or at the storage environment. Maize shelling, therefore is an important step towards the processing of maize to its various finished products like flour. The different methods of maize shelling can be categorized based on various mechanization technology used. These includes: hand-tool-technology, animal technology, and engine power technology. Hand technology involves the use of hand tools in shelling, while as observed animals were used in threshing on the field by marching on the maize. Engine powered technology involves the use of mechanical assistance in threshing or shelling the maize. To facilitate speedy shelling of maize in order to reduce post-harvest deterioration, mechanical shellers are recommended, because hand shelling methods cannot support commercialized shelling.

Fig. 1: Traditional Maize Shellers (Hand Shelling)

There is also engineering design factor that affect the design of mechanical Shellers. These factors are the design of the power transmission shaft, selection of the prime mover, type of pulley, appropriate belt design, key and selection of appropriate bearings support.

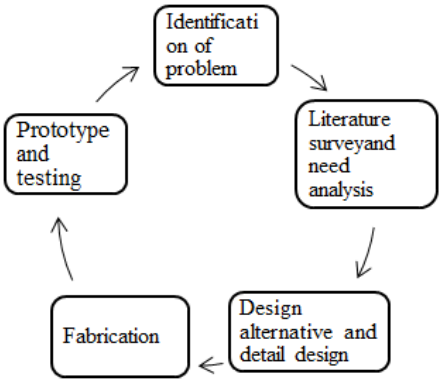

Fig. 2: Work Plan

Fig. 3: Journal Paper Referred

This table shows the difference in output between the machine & Hand Shelling for certain period of time.

III. METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to the field of study, or the theoretical analysis of the body of methods and principles associated with a branch of knowledge.

IV. FUNCTIONS

1) To convert human power into mechanical rotary energy effectively.
2) To shell or de-cob the maize.
3) To separate the maize from the husk.

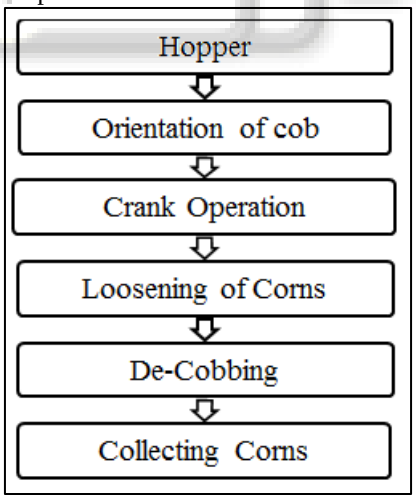

Fig. 4: Flow Diagram

V. SELECTION OF THE DESIGN

1) There is no power consumption as it works on human power & hence suitable for remote areas
2) Suitable for small scale industries as the investment is low.
3) Maintenance cost is low.

Fig. 5: Crank Operated Maize Sheller

VI. DETAILED DESIGN

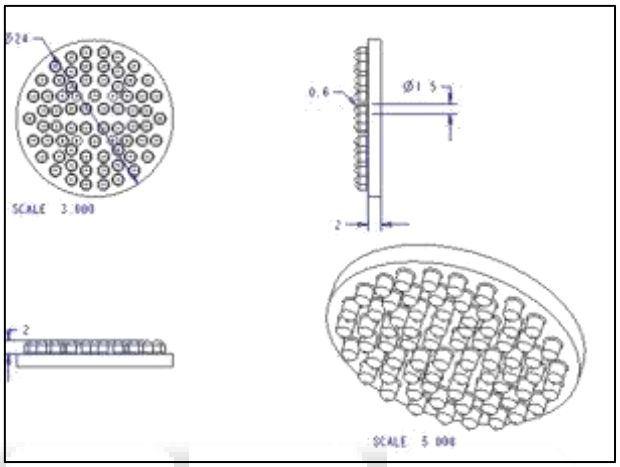

Fig. 5: Blade Design

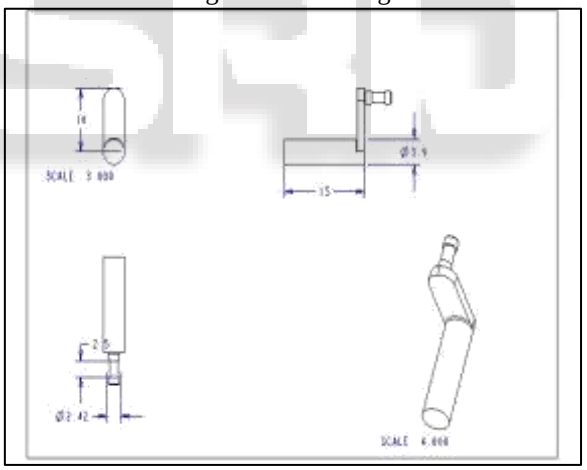

Fig. 6: Crank Design

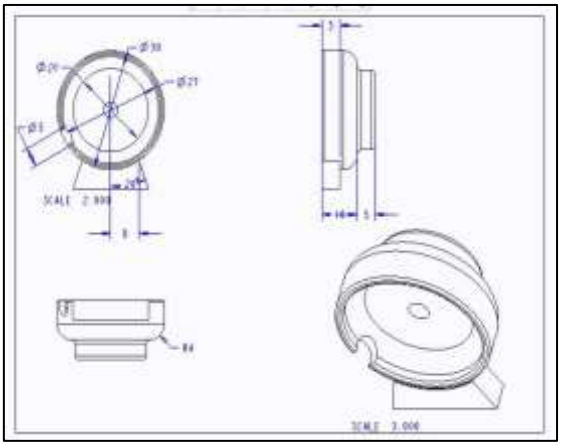

Fig. 7: Cover Design

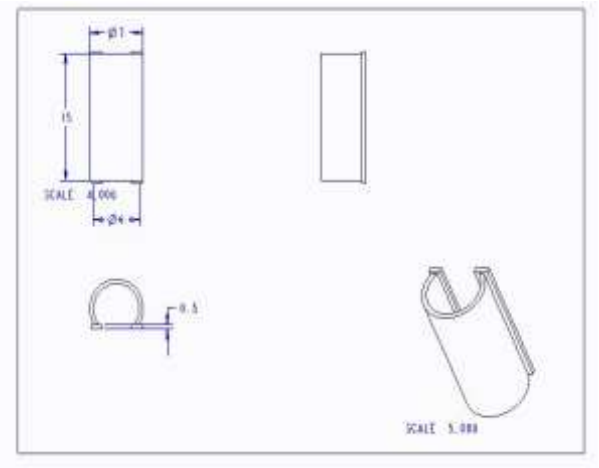

Fig. 8: Feeder Design

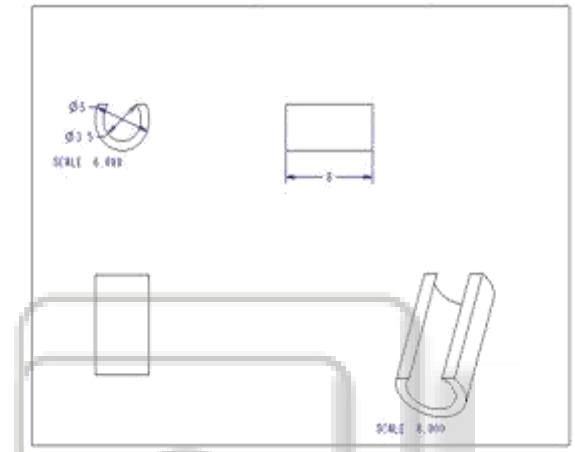

Fig. 9: Pipe Design

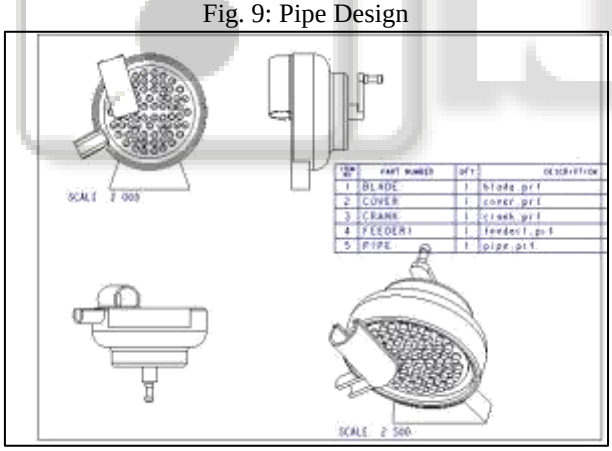

Fig. 10: Assembly

VII. FABRICATION

This chapter presents the various manufacturing processes used in the fabrication of the machine. The manufacturing processes like welding, gear cutting, drilling are discussed in detail.

1) Supporting frame- Mild steel circular disk is used for constructing the supporting frame. Circular disk is welded to the blade as per the drawings mentioned in the detailed design. For this purpose arc welding is used.
2) Blade- Mild steel of round shaped for shelling the maize. Blade is manufactured as per the drawings mentioned in the detailed design.
3) Crank handle-Mild steel L angle is used for rotating the blade. Arc welding is used for the joining process.

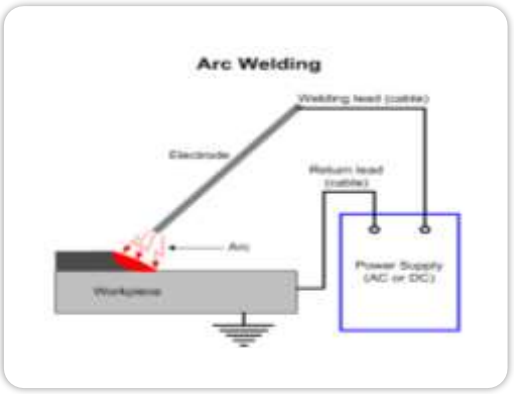

Fig. 11: Arc Welding

4) Gear assembly- Gears are manufactured by gear cutting and the gear ratio is 1:6.

VIII. TESTING

Testing of the product is carried out to find the advantage over the hand shelling. The shelling of corn is done for a period of 10mins and the mass of grain is weighed and noted down in the table.

	Hand Shelling		Crank Shelling		Difference
SL. NO	Time (seconds)	Weight (gms)	Time (seconds)	Weight (gms)	(gms)
1	600	450	600	980	530
2	600	480	600	890	410
3	600	460	600	910	450
				mean	463

Table 1: Experimental Output

As per the values obtained by the practical experiments it is found that the weight of the corn seeds obtained in the crank shelling for 10mins is more than that of the hand shelling as shown in the above table. Three readings are taken down & the mean difference is found to be 463gms in comparison with the hand shelling.

IX. CONCLUSIONS

The crank operated maize sheller is designed and fabricated to meet the objectives and constraints specified.

1) The crank operated maize sheller does not require electricity to work. It is manually operated.
2) The machine is easy to operate and repair.
3) It accommodates different sizes of maize.
4) The maize grains do not get damaged during shelling process.

X. FUTURE SCOPE

1) The process of maize shelling can be automated by using motors to turn the crank and providing timer circuits for reducing human interaction with the process.

2) The crank operated maize sheller produces noise during operation. To avoid this, improvements can be made in the design.

To increase the productivity, the design can be modified in such a way that more than one cob can be inserted at a time.

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