Introduction

Threshing is the process of separating grains from husk or straw and therefore a thresher is a machine used for threshing. For the purpose of this work, the machine is to be used for soybeans. The threshing machine has the following specifications by estimation

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1.370m</td>
</tr>
<tr>
<td>Width</td>
<td>0.470m</td>
</tr>
<tr>
<td>Height</td>
<td>1.310m</td>
</tr>
<tr>
<td>Weight</td>
<td>74Kg</td>
</tr>
<tr>
<td>Material</td>
<td>Steel</td>
</tr>
<tr>
<td>Engine Power rating</td>
<td>0.75 – 2.8hp</td>
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</tbody>
</table>

- As already stated above, its application potential is for threshing soybeans
- As precise as possible, the thresher has been designed to ensure easy operation, maintenance and portability.
- Spillage and breakages are minimized and material collection is easier.
2D PAPER WORK OF PROPOSED THRESHER
**Components Of The Thresher**

1. Petrol/diesel engine (0.75 – 2.8hp)
2. Fan
3. Fan shaft
4. Pulley sheave
5. B60 V-Belt 0.016m x 0.985m
6. Output sheave
7. Threshing cylinder shaft
8. Bearing housing
9. Threshing cylinder
10. Spiral fin  
11. Feed hopper  
12. Tooth/spike  
13. Frame  
14. Concave  
15. Wheel  
16. Soy Bean Outlet  
17. Chaff Outlet

The cylinder shaft extends to also carry the output sheave (to the fan shaft) driven by the prime mover at an allowable speed of (1040rpm max) including a bearing housing. The shaft has a total length of 1.040 and a varying diameter beyond the cylinder depending on the specification of the sheave. Two sheave, 0.040m are to be mounted on the frame as seen from the drawing. The belt (B60 V-Belt 0.016m x 0.985m) is used to transmit power between the prime mover and the follower.

The threshing cylinder has a pitch diameter of 0.3m made by rolling and welding sheet steel metal of dimensions 0.9 x 0.943 to form a drum. Side plates of equal diameters (0.3) are also used at the sides as soon from the diagram. Spiral fans (6 pieces) of internal diameter 0.3m and a height of 0.5 is to be developed from a 0.003m thick steel sheet. Following the path as the spiral fins move, with a pitch of 0.15m, they are to be welded one after the other until it is entirely constructed. Spikes are to be cut at length 0.06m, each from a 0.006m diameter steel rod. These must be welded to the threshing cylinder in between the fins and few to the cylinder allowing for at least 0.01m protrusions.

The concave is a crimp net (0.012mx0.012m) with dimensions 0.850mx0.700m, that is rolled into a semi-circular shape and welded to two metal bars at the ends. Holes are drilled to allow for fastening onto the main frame. As seen from the diagram, the feed hopper consists basically of 4 units to be welded together with one side inclined. This is to allow for the movement of the feed under gravity. It should be 0.2m high and 0.4m wide and tapered towards the base. The top cover is to be developed and fabricated from a 0.002m sheet of steel after marking out precisely the specified dimensions. These are to be cut, bent to size and welded together. Holes should be drilled
to allow for fastening onto the main frame. The frame as used in this context is referred to the chassis of the entire unit. Its purpose is to support other parts of the thresher to ensure stability and equilibrium. Steel metal rods are to be bent, cut (if necessary) and welded not including the side plates. Similar material is to be used for the engine platform. A steel metal plate (0.002m) thick is to be bent and inclined at an angle of repose of 29°. This is to facilitate the discharge of soybean grains through the grain outlet.

**Driving Mechanism**

The threshing cylinder is driven by the belt through the pulley system. A belt is chosen at the flexible power transmission element to ensure easy replacement when a damage occurs. The driver/prime mover is an engine that has a sheave on it (input sheave). The threshing cylinder shaft also has an output sheave on it, which can hold a belt so that the power from the engine is transmitted through the belt to drive the cylinder. On the same cylinder shaft is another sheave which serves as an input to the sheave on the fan shaft so that same power is transmitted to power the fan.

**General Mode Of Operation**

In this thresher, soybean plants are introduced into it through the feed hopper gets into the threshing chamber under gravity. This is where the beating process occurs with the help of the spikes. As the cylinder is being driven, the feed moves as axially along the length of the cylinder under the influence of the spiral fins. The stalks exit at the end of the spiral fins through an outlet at the back. The grains that fall through 0.012x0.012 crimp net of the concave with some of the husk. Separation is then carried out within the separation chamber where the fan is installed by blowing the husk to the side. The threshed grains can then be collected subsequently.

**Effectiveness of the fan**

The fan is not only meant for separation within the separation chamber but also to blow of debris that will block the holes of the concave.
**Debris discharge**

The debris discharge (0.1 x 0.15) is an opening located at the rear of the threshing cylinder. It is opposite the side with the seed discharge.

**Seed discharge**

This is where the seeds are collected.

**COST OF PRODUCTION**

The estimated price for the proposed soybean thresher is $621 including the cost of a 2.8hp patrol powered engine at $106. The conversion rate is Dollar to Cedis at 3.8 on May 6, 2016

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