Review of Coconut Fiber Extraction Machines

RAHUL SABALE, Dr. K. P. KOLHE

Abstract— **There are many farm equipment's which are developed for the post harvesting operations. Mostly all the post harvesting operations are tedious jobs to perform. The dehusking of a coconut is regarded as the most time consuming, tiring, and difficult operation to perform. Many attempts has been done to perform this task of dehusking manually as well as mechanized. Traditionally this task of dehusking was performed by using different hand tools. By hand tools the dehusking depends on the skill of worker and involves training. The mechanized or the power operated machines are also developed to eliminate the drawbacks of manual tools. Such a tools and machines are developed all over the world and a very few have become popular, rest got vanished due to their limitations. This work is aimed to list such tools and machines which are used for the post harvesting i.e. dehusking of coconut.**

***Index Terms*— Coconut Dehusking, Post harvesting, Manual Dehusking Tools, Power Operated Machines.**

1. INTRODUCTION

Today the agriculture is mechanized with the modern means. The agricultural activities like ploughing, sowing, harvesting nowadays involves many light weight to heavy machinery. Use of such machines is beneficial for both farmer and labor as it saves time of farmer and the tedious and cumbersome work is simplified to workers. It also enhances the productivity of farm. The agricultural activities are broadly classified into three groups. Pre-harvesting, harvesting and post-harvesting activities. All these three groups of activities are nowadays mechanized with machines. Pre harvesting operations are inserting seeds into farms, ploughing , irrigation etc. Harvesting means obtaining the fruits from the plants. Post harvesting is the operation which is required for the further processing of the fruits obtained from the plants. Amongst different post harvesting operations the coconut dehusking is regarded as a difficult task to perform.

Coconut in India is grown on a large scale because of its numerous advantages and the atmosphere in coastal areas is favorable for its cultivation. Coconut gives coconut oil, coconut powder, husk is used to manufacture ropes, its medicinal properties etc. Hence its post harvesting is important. Many attempts have been made to make its post harvesting mechanized either manually or power operated. These attempts of mechanization have their own advantages and limitations. The study of such tools and machines is necessary for the selection of suitable mechanism to satisfy the desired need of small scale or large scale.

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2. MANUAL TOOLS FOR DEHUSKING A COCONUT

2.1 The coconut spanner

The coconut spanner resembles the smithy tongs. Its structure is modified from that of a smithy tongs by expanding its legs. These elongated legs acts like a handle. These are hold into the hand and force is applied on it so that the other two ends which are inserted into the coconut moves away and loosens the coconut fiber. By using this tool the coconut can be dehusked in three to four repetitions. The coconut may be placed on the ground level and the further part of tongs which are blades can be inserted into the fiber of coconut and then by applying force the blades are separated from each other and dehusking takes place. But it is tiring operation as it involves reinsertion of tong blades. Also it consumes a lot time. So it is not suitable for mass dehusking [1].

2.2 Mini Coconut Dehusker

Mini coconut dehusking is like that of coconut spanner [2]. It can be regarded as the further version of coconut spanner. Similar to coconut spanner it has long legs which are bend at the end. This bend in legs helps to hold it proper and force can be applied easily. It also consists of the pillar to which the tongs are connected.

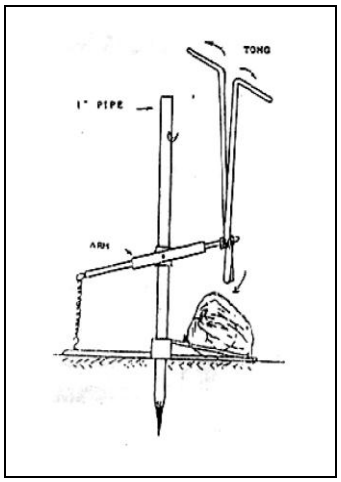

Fig1. Mini Coconut Dehusker

Also a spring is attached to the link which is hinged to pillar. The blades are impaled into the fibre of coconut and outward force is exerted on blades which leads to loosening of the husk from coconut. Such a operation has to be repeated three to four times so that the complete coconut is dehusked. The spring helps to regain the original position of handles so that the operation can be repeated quickly. Again this operation involves the bending of operator and straighten up which is not acceptable.

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2.3 Foot operated coconut dehusking tool

It is also called as coconut cracker which was developed in Japan. It is tool consisting of two blades [3]. The coconut has to be impaled into blades.

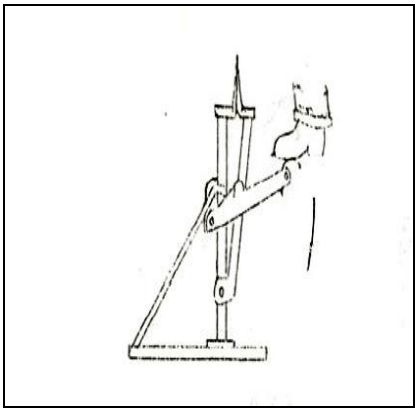

Fig2. Foot operated Coconut Dehusker

The blades are operated on the force exerted by foot. The blades are also attached to the torsion spring. When the force is released the blades goes to their own position. It requires four to five repetitions for complete dehusking the coconut. Firstly the coconut is striked onto the blades and then by foot the forced is applied so that the blades are opened i.e. moves away tearing the husk from the shell of coconut. When the force is removed due to inertia in spring the blades are forced to return to the original position. Such operation is a tiring and time consuming operation. Also when force has to applied by foot hence the operator is destabilized and it may lead to accident.

2.4 Coconut Fiber removing Apparatus

The coconut fiber removing apparatus consists of the blades which are located at the top of coconut [4]. These blades are movable, they can move downwards as well as outward. They are moved towards and away simultaneously upto 90 degree. These blades are attached to the rod and the rod can be lowered and raised with a handle. The coconut is placed on the lower part of machine which has bladed on it. These blades at the bottom can also be adjusted and hence it helps in proper positioning. The process of dehusking involves the impale of blades into husk of coconut by lowering the rod with the force and then moving the blades away from the centre. In this way the dehusking is carried out. But it involves large force to impale the husk at eye and some other parts. So manually to generate such a huge force is limitation of this apparatus.

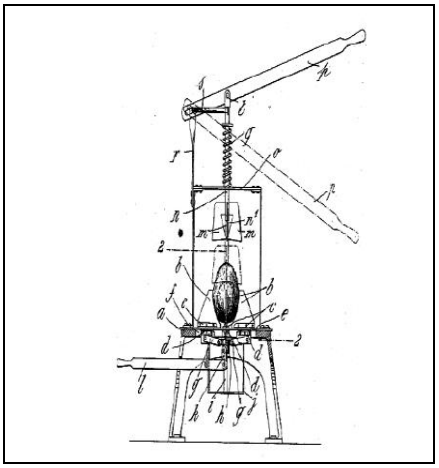

Fig3. Coconut fiber dehusking Apparatus

2.5 Coconut Dehusking Machine

A Coconut dehusking machine involves or consists of two rollers which has spikes over them [5]. The coconut is placed onto these rollers, the rollers rotates in opposite direction. The spikes on one roller holds the husks while spikes on other tears the husk from the shell. Such a machine is bigger in size due to its long rollers. Large force is required due to small mechanical advantage.

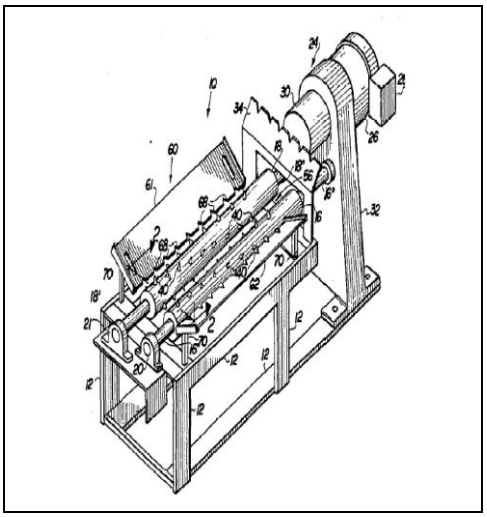

Fig4. Coconut Dehusk Machine

2.6 Coconut husk removing tool

This tool works on the principle of twin blades having wedge [6]. It consists of two blades one is stationary and the other is movable. These blades are attached to a rod. The movable blade has a handle on it. The tearing force can be applied with the help of this handle. The impale of coconut is difficult of this tool. This is the main problem associated with coconut husk removing tool. The coconut is placed in the bowl and the blades are impaled into husk.

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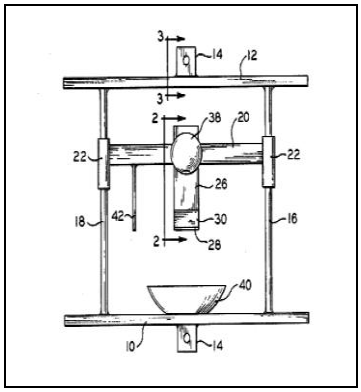

Fig5. Coconut husk removing tool

2.7 Coconut Husking Machine

Titmas and Hickish developed a machine to dehusk the coconut is called as coconut husking machine [7]. It consists of twin blades which are mounted on the wooden support and it stands upright when placed over a floor. The coconut is impaled onto the blades with hands and then the force is applied by a lever on which force can be applied with the foot. For the complete removal of husk such a operation has to be repeated three or four times.

A tension spring attached with the movable blade helps in retaining the original position. Such a springing action can lead to injury if the foot is slipped while applying force. While applying the force the operator has to stand on one foot and this destabilizes his posture which is not accepted. Such a limitation of this machine prevented its popularity and use.

2.8 Tool to dehusk a Coconut

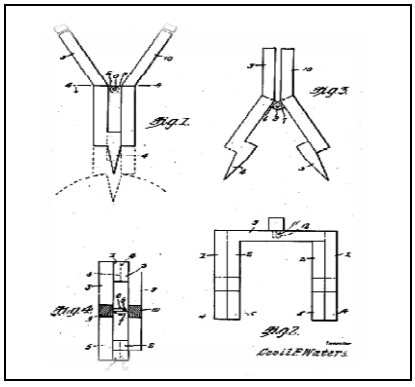

Fig6. Coconut Dehusking Tool

It is very simple in construction [8]. It has two blades which are inserted or impaled into the husk of the coconut and then force is applied to make the blades to move outward to loosen the fiber. Such a operation needs to be performed for three to four times to completely dehusk the coconut.

2.9 Keramithra Coconut Husking Tool

Keramithra is very popular in south India [9]. It is widely used there to dehusk the coconut.Such a tool consists of two blades one is fixed to the upright column and the other is movable.The movable blade is attached to the handle. As force is applied on the handle the jaw rotates which helps in dehusking. While dehusking the coconut is impaled onto the blades in closed position, and then handle is lifted up to dehusk.

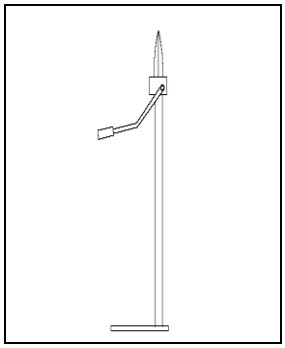

Fig7. Coconut Husking Tool

Such a repetition or two to three times dehusks the coconut completely.

3. Power operated Dehusking Machine

3.1 Hydraulic Coconut Dehusking

It is very popular in the power operated coconut dehuking machines [10]. Such a machine involves large force. It consists of movable jaws which are hydraulically operated. These jaws can be lowered and moved away from the center. The coconut is placed on the bottom base. The jaws are impaled into the eye of the coconut with a reaction support from the base. Once impaled into the husk of coconut the jaws are forced to move outwards and the base on which the coconut is fixed is pushed in upward direction. Due to these movements the kernel is separated from the shell of coconut.

Fig8. Hydraulic Coconut Dehusking Machine

This type of hydraulic dehusking machine is suitable for mass production. Its cost is more and requires skilled operator.

3.2 Power operated Dehusking Machine with twin blades

As the name suggests it consists of two blades which are power operated. One is used to hold and other to peel off the husk of a coconut. It has a motor having rating in the range of 1 to 2 hp.

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Fig9. Twin Blade Coconut Dehusking Machine

The limitation of this arrangement is safety to operator due to long blades and skilled operator is required for performing the operation.

3.3 Mechanical Coconut Husking Mechanism

The mechanical coconut husking mechanism consists husking mechanism, one inlet and one outlet[11]. The husking mechanism has two rollers on which curved blades are mounted. These rollers are powered by electric motor of rating in the range of 1 to 2 hp. The operation starts with inserting the coconut into the inlet. The coconut is then comes in contact with the rollers with curved blades onto it.

Fig10. Mechanical Dehusking Machine

This blade gets impaled into husk and due to roller movement the husk is separated from the shell. The rollers are spiked as well as spring loaded.

3.4 Rotary Coconut Dehusker

As the name suggests this type of dehusker has a rotary arrangement of blades [12]. The blades are fixed over the drum as well as on the concave surface. It has one inlet with bigger size as compared with the outlet with smaller size. It is suitable for the large scale dehusking. When the coconut is placed in the space between drum and concave surface it is pressed and moved forward. The blades on the drum punctures the husk on coconut and shear force peels it off.Some coconuts are completely dehusked and some are only punctured. Such a coconut then requires the secondary handling to remove the husk from its shell.

3.5Continuous Power Operated Coconut Dehusking Machine

It is the modification of the rotary type of husking machine [13]. It has one inlet through which the coconuts are inserted and then the rotary blades puncture the husk of coconut in different planes. The dehusking is done by the two knurling rollers.

3.6 Twin Blade Type Coconut Dehusking Machine

The twin blade type power operated machine to dehusk coconut was developed with a intension to satisfy the small scale farmers [14].

Fig11. Twin Blade Type Coconut Dehusking Machine

It has two blades one is fixed the other is movable. The movement of the movable blade is achieved by a cam and follower mechanism. The movable blade rotates and moves away from the fixed blade. The rotation and its juxtaposed positions were set by designing the dwell period of the cam and follower. Such a arrangement requires 12-20 seconds to dehusk a coconut completely. Its limitations are it requires skill operator and size and cost are high.

4. CONCLUSION

The coconut dehusking is one of the most difficult post harvesting operation. In India coconut is cultivated on a large scale. To process such a large number of production of coconuts some suitable mechanism needs to be identified or developed. Several attempts have been made to mechanize the dehusking of coconut. Some of them were manually operated and others were power operated. These mechanisms have their own advantages and disadvantages. Few of them required skill worker. Some of them were bulky, time consuming, power consuming, uneconomical. There is a need to develop some mechanism which would work satisfactory and must be economical. Depending upon the necessity the suitable mechanism needs to be selected.

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