



A Review on Design and Development of Citrus Fruits Cleaning, Polishing and Grading Machine

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ABSTRACT

The main aim of our project is to design the citrus fruits cleaning, polishing, and grading machine. This machine help in reducing the difficulty of existing product available in the agro as well as food industry at the same time increase the use of this product in the agricultural field. The automatic citrus fruits cleaning, polishing, and grading machine has been designed considering the entire requirement and looking at the current farmers situations in India. In this machine the process of cleaning, polishing and grading is done by a single unit without any manual labor. The machine does not require any cleaning, waxing or polishing agent for the for polishing purpose which helps in preventing the health hazard. As all the three processes takes place in a single unit thus saving floor area and requires very low maintenance. As the machine is completely automatic thus this machine eliminates human effort. The commercial machines which are used in food industries requires a lot of floor space, higher installation charges and the machines are highly complicated and the cost associated with the machine is very high, thus this machine being compact and portable in natural is very affordable and cost effective The problem which arises in the manual operation has been reduced in this machine. Taking all these into account we have designed this product which reduces the burden of manual operation at the same time increases the use of modern techniques

Keywords : Citrus Fruits Cleaning, Polishing, Grading, Machine, Vidharbha, Food Industry.

I. INTRODUCTION

High value fresh agricultural produce such as orange must be carefully handled and graded in order to meet customer demands and quality standards. Manual grading is widely adopted practice which is costly and time consuming. The existing mechanical graders grade fruits on the basis of size and owing to mechanical nature have limitations of lower capacity and efficiency. The present work describes the development of electronic grading machine on weight basis for oranges. The machine comprised of various elements such as feeding unit, weighing

assembly, dropping and collection unit. The machine is capable of individually metering fruits in weighing section and weighing of individual fruits and grading them in four different weight grades. The introduction of this machine helps in efficient work by combining the cleaning and polishing at one place. It reduces the human effort. This machine is portable and economical it not only completes the needs but also helps in total reduction of labor cost and saves time. The product is related to agro sector in citrus fruits farming, where the farmers have to deal with the work of cleaning, polishing and grading of the fruits thus includes a large amount of labor. To deal

with this problem agricultural sector is the target audience for the machine in order to deal with the problem and providing a suitable solution. This machine contributes to the helping of farmers to deal with the problem saving large amount of labor, saving time and saving every year cost related to the job related for manual labor for cleaning, polishing and grading. This machine is an one time investment for the farmers which will inculcate the reduction of labor work and thus saving money for the farmers, as the machine is designed cost effective and requires low maintenance, as the machine do not require any waxing or polishing media also aids in health benefits of the fruits which in turn will work in the favor of the farmers. Thus agro sector and farmers are our main target audiences.

The product is majorly related to agro sector where majority of farmers are indulged in citrus fruits farming, where the farmers have to deal with the work of cleaning, polishing and grading of the fruits thus includes a large amount of labor. To deal with this problem agricultural sector is the target audience for the machine in order to deal with the problem and providing a suitable solution. This helps farmers to deal with the problem saving large amount of labor, saving time and saving every year cost related to the job related for manual labor for cleaning, polishing and grading. This machine is an one time investment for the farmers which will inculcate the reduction of labor work and thus saving money for the farmers, as the machine is designed cost effective and requires low maintenance, as the machine do not require any waxing or polishing media also aids in health benefits of the fruits.

II. LITERATURE SURVEY

[1] The paper presented by (1).FMC Corporation, (1) Howard.C.Lisle, (2) James.W.Morse, Publication of

USA. They were worked on” Fruits and vegetables cleaning machine “ on May 25 1953 In which they was proposed to design a fruits and vegetable cleaning machine, using fruits and vegetable polishing facility for this machine. This invention is of a machine with the help brush the fruits for cleaning and polishing the fruits. The system of this machine comprises it is a objected machine to provide and put up a series of rollers aligned on a machine that will put the effort for reducing the 5-cline over which the fruit or vegetable is running of the roller. These collaborated steps and action are prominent for organizational purpose other than physical. Some organizations have stated to maintain and develop processes, while they not are able to define other process.

[2] The paper presented by W.W. Jacobs Dated 17.1901 They were design a Cleaning and grading machine for oranges, this inventing relates to a cleaning and grading machine designed especially for handling oranges and by this process the oranges of various sizes will be thoroughly brushed and cleaned and then graded simultaneously and delivered it under particular bins are provided. During the designing of the machine they took consideration that it should be more useful and efficient than that of those manual operation and will help in reduction of the difficulty exists.

This machine had appropriate farming method which is a system comprised of standing vertical hinged supports with clothed top end with a circular cross section . The rail is given in order to carry the oranges which are traditionally removed with the help of manual hand pickup. The wheels which are provided on the surface of the bars are provided over the rail. The top end of the bars is connected across the braces, and the outer bar is to cover the upward and inward end to form the top section of frame. The

up top of the frame supports the upper top end of an identical stationary shafts which goes down to the center of the machine. The machine had its lower end protected with the base of the machine. Thus The combination of a framing a rotating table mounted using brackets taken by Frame and a stationary rail hinged using a said bracket and later mounted adjacent over the periphery of the rotating wheel, and being of irregular form, various sections of the rails are provided on varying distances from the periphery of the wheel, as set forth. If there is a case of break down and waste has to be removed is a loss of man power, thus a tremendous modification is required in this area of design which increase the advancement of the technology and reduction in loss of manpower and increasing efficiency

[3] The paper presented by Lawrence J. Larsen “Continuous fruit pitting by singularization of fruit pieces” were design and develop a machine Continuous fruit pitting by singularization of fruit pieces, which could reduce the difficulties in existing products available in the market and at same time increase the use of this product in agricultural sector. The machine comprises of a conveyor recession and wells for receiving fruit pieces to process. The conveyor receives the fruit pieces into wells, passes the fruit over pitting region where the pitting machine detaches the pits from fruit. The main problem with this machine was a matrix of punching /pitting needles. The system works in an oscillatory way in sync with the regular movement engaged on the conveyor thus degrading the quality of the fruits and thus loss of money and efforts along with that the use of needle pins requires a lot of maintenance. This study was brought up with the help of data collected from literature review, and customer survey and market study. The machine was modified according to the result from the analysis data records. A prototype model of the above

concept was designed to authenticate the design. User feedback was obtained on the new design of the machine, thus a tremendous modification is required in this area of design which increase the advancement of the technology.

[4] The paper presented by (1)J. Nayfa,(2) A. Stanley “Floor surface cleaning and polishing machine” In this designed machine a self-rotating machine which has a main housing supported on front side and rear rollers. They had a control handle over the rear. Front and rear brushes are driven in circular motion over horizontal surfaces, the brushes on front end being placed on front roller and the rear brush placed over the rear roller. A machine is used for Floor surfaces in houses having front and rear ends common relation to normal placement on Floor.

III. PROPOSED SYSTEM

The machine comprises of three stages, in the initial stage the fruits are added to the hopper which is a connecting path for the regular cleaning of the fruits over a flat bed, the bed comprises of nylon tubular roller which are responsible for the removal of dust, dirt and unwanted plant wastage in the initial stage. In the second stage the cleaned fruits are moved towards polishing rollers where the polishing buffers are used for the natural polishing of fruits where "use of wax or any polishing fluid is eliminated" thus producing a natural shine over the fruit. The fruits are further passed over the third stage where they are collected in a tray box where they are to be passed over the grading channel where the grading of fruits according to the size will be done. The whole unit is driven by motor, the rollers are driven with the help of roller chain driver, and tumbler mechanism is being used for the purpose of grading. This is a fully automated machine serving the purpose of cleaning, polishing and grading. The measurement of citrus

fruits is generally made in tons , thus the machine is designed according to perform the required task , the average time required to clean one tons of fruits will approximately done within 15-20 minutes.

IV. AIMS AND OBJECTIVES

The main purpose of “design and development of citrus fruits cleaning and polishing machine” is to provide a machine to the farmers at Low cost for Citrus fruit cleaning, Grading and Polishing Machine which is completely automatic in order to eliminates human effort.

The goals of the system are:

- All the three processes take place in a single unit thus saving floor area.
- The machine is completely automatic thus this machine eliminates human effort.
- Due to less number of moving parts it requires very low maintenance
- The machine does not require any cleaning, waxing or polishing agent for the for polishing purpose which helps in preventing the health hazard.
- The machine being compact and portable in natural is very affordable and cost effective.
- Labor cost, broker costs and dealers cost are completely eliminated.

V. CONCLUSION

After referring to the literature and modification one regarding this topic some ideas were put forward thus in this machine the process of cleaning, polishing and grading is done by a single unit without any manual labor. The machine does not require any cleaning, waxing or polishing agent for the for polishing

purpose which helps in preventing the health hazard. As all the three processes takes place in a single unit thus saving floor area and requires very low maintenance. As the machine is completely automatic thus this machine eliminates human effort. The commercial machines which are used in food industries requires a lot of floor space , higher installation charges and the machines are highly complicated and the cost associated with the machine is very high, thus this machine being compact and portable in natural is very affordable and cost effective. The product is majorly related to agro sector where majority of farmers are indulged in citrus fruits farming, where the farmers have to deal with the work of cleaning, polishing and grading of the fruits thus includes a large amount of labor. To deal with this problem agricultural sector is the target audience for the machine in order to deal with the problem and providing a suitable solution. This machine contributes to the helping of farmers to deal with the problem saving large amount of labor, saving time and saving every year cost related to the job related for manual labor for cleaning, polishing and grading. This machine is an one time investment for the farmers which will inculcate the reduction of labor work and thus saving money for the farmers, as the machine is designed cost effective and requires low maintenance, as the machine do not require any waxing or polishing media also aids in health benefits of the fruits which in turn will work in the favor of the farmers. India is one of the biggest market for tremendous amount of various citrus fruits, being part of India, thus involves excessive amount of labor work for the purpose of cleaning, polishing and grading of the fruits .Thus in order to counter the excessive amount of labor work and time allotted for the work to be done, we are here proposing a mechanically designed machine for complete reducing of the labor and time wasted for the purpose of cleaning, polishing and grading of the fruits. In

today's time all the work related to polishing and grading is done manually by hand cleaning and grading which is time consuming and high wages are required, in order to counter the economic condition and have an economic perspective this machine is an economic machine for the reduction of time money and saving human labor.

The agricultural and trading activities being inter-linked there is a good scope for low cost citrus fruits polishing and grading machine. As the cost of this unit is minimum as compared to the units available in the market there will be high demand for this machine in the market. As the citrus fruits been cultivated on large scale here there will be huge demand for this machine as it is cost is minimum it can be affordable by a farmer in order to make maximum profit. It's one time investment machine with minimum maintenance. As the citrus fruits is widely consumed all over the country the demand for machine will be there among the traders as well as the farmers

(1) High speed rotation of the brush helps in cleaning the citrus fruits effectively and the rotating brush attached to the same the shaft helps in polishing the citrus fruits effectively, and the cleaning and polishing the grading purely based on size is done provided just below the cleaning and polishing unit.

(2) This machine is very useful for the farmers in India as the maximum production of citrus fruits takes places in vidharbha, thus yielding more profits by the farmers and neglecting the human labor to clean polish and grade the fruit or selling the lot to the food processing company at low prices.

(3) Thus we can conclude from the above that the usage of citrus fruit cleaning polishing and grading machine is useful and affordable to local farmers to take more profits at very low one time investment.

VI. REFERENCES

- [1]. FMC Corporation, (1) Howard.C.Lisle, (2) James.W.Morse, Publication of USA. "Fruits and vegetables cleaning machine "on May 25 1953
- [2]. W.W. Jacobs Dated 17.1901 "Cleaning and grading machine for oranges" Publication of US689089A on Jan. 16, 1901.
- [3]. Lawrence J. Larsen "Continuous fruit pitting by singularization of fruit pieces" Publication of US 20120070555A1 on June 12 2012
- [4]. (1) J. Nayfa, (2) A. Stanley "Floor surface cleaning and polishing machine" Publication of US3761987A on 02 October 1973
- [5]. Roger Pellenc, Jean-Marc Gialis "Sorting table with sorter rolls for elimination of foreign matter remaining mixed in a harvest of small fruit" Publication of US20090057208A1
- [6]. Bruce David Nyborg, William C. Geyer "Cleaning and separation system for tubers" Publication of US20100096301A1