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Design of Cam Operated Paneer Pressing Machine with Cutting Operation

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Abstract

Paneer is milk product, develop from the milk. In India some portions of milk are converted into a value added products. And product is easy for marketable, because India is a highly populated nation in the world. There is great demand in food processing and preservation sector. Because of latest advanced machines, the food sector has gone to highly automotive functions. Paneer pressing device was designed in order to facilitate the dairy farmers and industrial type paneer producers. It is easy to handle and transport and cost effective, so it can be used small entrepreneurs. Modifications in design were made based on the feedback of the users to improve the appeal of the product and to reduce wastage while production and cutting process. This consists of bearing, cam mechanism, center piston rod, paneer holding channel, cutting die. During the operation (rotating by handle), the extraction of water (whey) from the paneer is completely pulling out by the repeated pressing operation, with the help of cam mechanism. The total paneer pressing machine with cutting operation can done through the Solid works software. Paneer manufacturing is a continuously process and it should be involving in cutting, packaging and storage process.

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Keywords

Cam mechanism, bearing, central piston rod, cutting die, paneer holding channel, Handle.

Introduction

Paneer is a south Asian milk product of soft cheese prepared by acid and heat coagulation of milk. With this paneer, every house holds member is preparing various eatables and it is rich source of high-quality animal protein, fat, minerals and vitamins. India has observed an amazing growth in milk production during the last few decades, because of dairy development programme initiated in 1970's. Paneer is popular throughout south Asia, used in raw form or in preparation of several varieties of culinary dishes and snacks. Paneer means "product obtained from cow or buffalo milk

or combination thereof, by precipitation with sour milk, lactic acid, or citric acid. Pressing of coagulated milk for a shorter time period, results in a softer, fluffier paneer. In developing countries like India, milk producers/dairy farmers are always at the receiving end due to the perishable nature of milk which must be sold immediately at whatever prices prevailing at that particular day. Now, however, there is a simple technology available for converting milk into some indigenous milk products like paneer. In India, some devices have been developed which can be employed profitably for manufacturing paneer at the farm level.

The ability of paneer to be deep fried is one feature that has led to its wider acceptance and a favorite for making snacks, fried paneer chunks (Aneja, 2007). It has been reported that the best quality could be made only from buffalo milk containing 5-6% fat (Venkatesh Shingare *et al.*, 2017).

Shahnawaz Umer Khan and Mohammad Ashraf Pal (2011) designed and fabricated a prototype machine for continuous production of chhana of 40kg/hour capacity and developed machine by using the conveyor, gravity strainer, pressure filters, vacuum filters and centrifugal filters for dewatering of chhana coagulum. Again Aneja *et al.*, (1982) observed suction or vacuum straining is more efficient than pressure application and moisture content is studied by Prabhavalkar, *et al.*, 2012.

Materials and Methods

The paneer pressing machine is one of the most important machines in dairy processing industry. Pressing operation is done by forcing a central piston rod. This cam operated pressing machine is used for high flexibility and efficient processing and it improves the quality, efficiency and cost deduction of a particular product. The main areas of application are for small and medium and large-scale industries. It results in high production rate. Methodology used for whole processing of mini cam operated punching machine is given below; this methodology gives way about machine works in systematic way.

Ball Bearings

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft).

As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling, they have a much lower coefficient of friction than if two flat surfaces were sliding

against each other. Ball bearings tend to have lower load capacity for their size than other kinds of rolling-element bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

Cam

The device used for changing rotary motion into linear motion is known as cam. A cam rotates a follower riding on the cam will either move away from or toward the cam. Cam is a rotating, oscillating or reciprocating machine. Proposed cam press having camshaft with drive mechanism is designed. A cam is a rotating or sliding piece in a mechanical linkage used especially in transforming rotary motion into linear motion.

It is often a part of a rotating wheel (e.g. an eccentric wheel) or shaft (e.g. a cylinder with an irregular shape) that strikes a lever at one or more points on its circular path. The cam can be a simple tooth, as is used to deliver pulses of power to a steam hammer, for example, or an eccentric disc or other shape that produces a smooth reciprocating (back and forth) motion in the follower, which is a lever making contact with the cam.

The cam can be seen as a device that converts rotational motion to reciprocating (or sometimes oscillating) motion. A common example is the camshaft of an automobile, which takes the rotary motion of the engine and converts it into the reciprocating motion necessary to operate the intake and exhaust valves of the cylinders.

Experimental operation simulation

The most commonly used cam is the cam plate (also known as disc cam or radial cam) which is cut out of a piece of flat metal or plate. Here, the follower moves in a plane perpendicular to the axis of rotation of the camshaft. Several key terms are relevant in such a construction of plate cams: base circle, prime circle (with radius equal to the sum of the follower radius and the base circle radius), pitch curve which is the radial curve traced out by applying the radial displacements away from the prime circle across all angles, and the lobe separation angle.

Flowchart.1

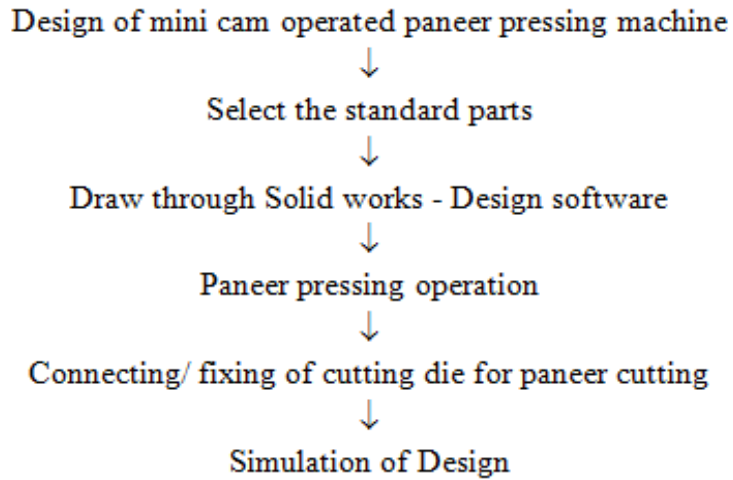


Fig.1 Three dimensional paneer pressing machine

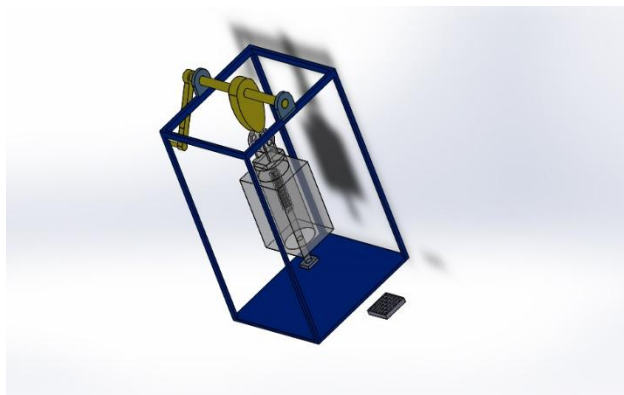
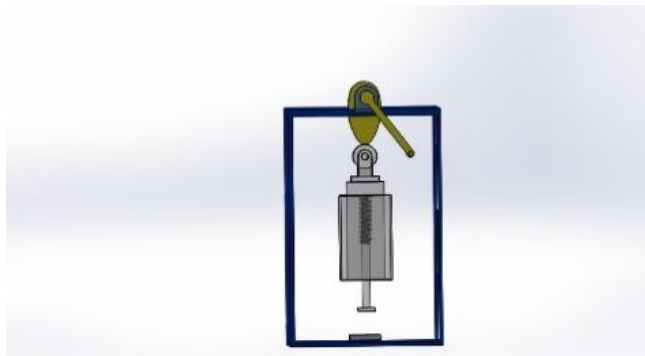


Fig.2 One dimensional paneer pressing machine.



The base circle is the smallest circle that can be drawn to the cam profile. A once common, but now outdated, application of this type of cam was automatic machine tool programming cams. Each

tool movement or operation was controlled directly by one or more cams. Instructions for producing programming cams and cam generation data for the most common makes of machine,

were included in engineering references well into the modern CNC era.

This type of cam is used in many simple electromechanical appliances controllers, such as dishwashers and clothes washing machines, to actuate mechanical switches that control the various parts.

This design project carried out by us will make an amazing feature in the field of small-scale industries. The cam operated paneer pressing machine is easy to handle, operate and increase the production. It has been designed to perform the required task at industrial level of food processing sector. Cam operated machine can perform repeatedly at specific interval for short time.

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