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Walnut cracking device

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Abstract

A powered walnut cracker is a device that does its job with a minimum of human effort. We offer a design consisting of an adjustable upper board, the lower board is replaced by chains or belts on which the nut is placed. The walnut moves, it touches the upper board and rotates while being cracked. The use of inexpensive bicycle parts is the advantage of this approach.

Key words: Walnut, nut size, powered nutcracker

Introduction

We designed a powered walnut cracker that is inexpensive because inexpensive bicycle parts were used to build it. Parts, such as chains, sprockets, hubs, and bearings are mass produced which results in lower prices as compared with custom made parts specially to this purpose.

One of the first powered nutcrackers was introduced by Dragon (1938). The latest work by Andreasen (2009) also contains useful references. The idea is to use an upward pointing conical rotating central member that is centered in a vertical cylinder. The annular space between the cone pointing upward and cylinder is narrower at the bottom since the radius of the cone is increasing. The nut rotates and is cracked transversally and proceeds in its spiral path being pulled by the gravity. Such devices are expensive.

Materials and methods

We offer an affordable approach. The cross-section is shown in Fig. 1. The upper board (1) is fixed while the horizontal lower board (3) moves in the direction indicated by an arrow. The nut (2) is placed on the lower board and, as this board moves, the nut touches the upper board and begins to rotate due to the friction between the boards and nut. The nut is squeezed and cracked because the distance between the boards on the input side is greater than that on the output side.

Fig. 2 depicts a device in which the lower board is replaced by chains or belts (3). The motion of chains or belts is made possible by sprockets or pulleys (4) and (5).

The chains or belts serve four purposes: a) they provide the power, b) they carry nuts to the cracking area, c) they crack the nuts, d) they carry the nuts away.

Even though a high tension of the chains is preferable, this tension decreases in time and should be adjusted or a slack will be formed. It was observed that nuts are frequently cracked at the end of their path by the sprockets. That is why these sprockets should be large if it is possible. On the other hand, the power is transmitted to chains by the sprockets at the other end and the size of these sprockets

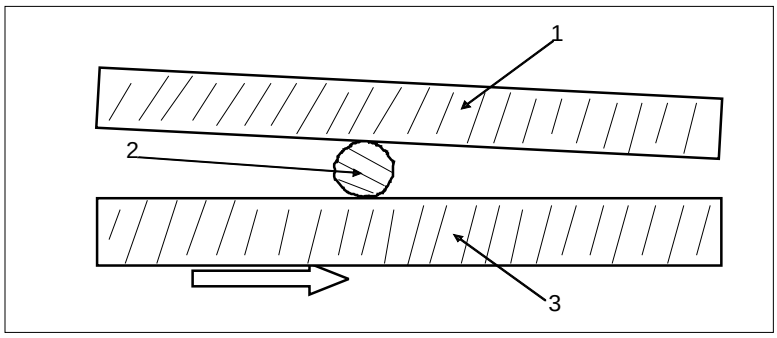

Fig. 1

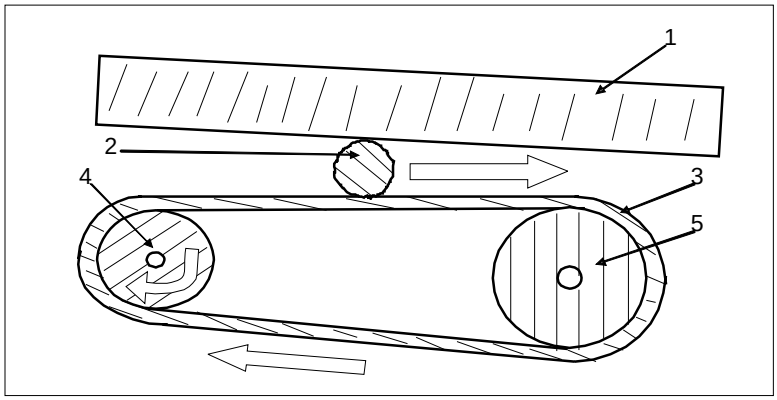

Fig. 2

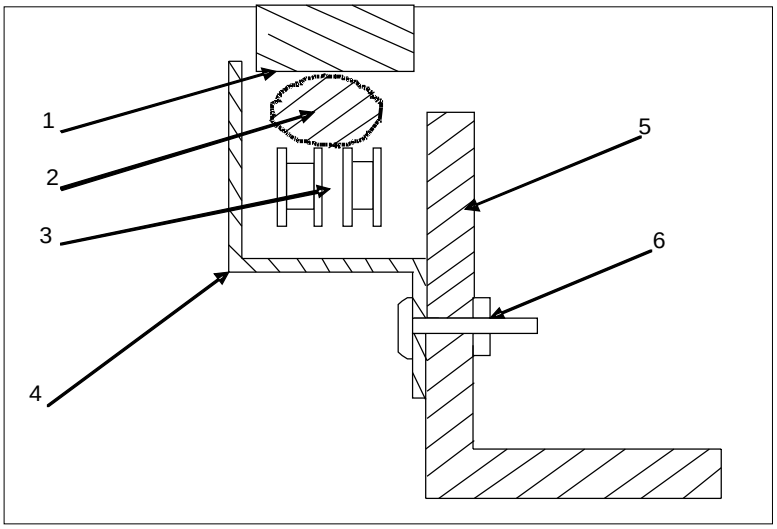

Fig. 3

should be smaller to yield a higher force while making the motion of the chains slower.

Discussion

It is important to use at least two chains to form a moving flat board because the nuts fall down from a single chain easily. This means we need two pairs of sprockets if we want to use two chains. Duplex or triplex sprockets would be expensive but we may use a pair of inexpensive single bicycle sprockets on one hub.

When the nut is dropped on the chains the movement of chains may cause the nut to fall off the chains. To avoid this, we use guardrails. The secondary purpose is to prevent fingers from accidentally touching the moving chains. It should also be mentioned that sometimes a nut, typically an oversized nut, is stuck between the chains and the cracking board. If there is a gap between the guardrail and the cracking board we may use some tool, such as a screwdriver, to help the nut move forward from the cracking area. The gap should be small allowing the use of some tool but preventing fingers from entering the cracking area.

The guardrails are indicated in Fig. 3. The parts are attached to the L-profile steel (5). The cracking board (1) is above the nut (2) placed on the chains (3) while the guard rail (4) prevents a nut (2) from falling down. The guard rail (4) is attached to the L-profile (5) by a screw (6) and nut.

The nuts are delivered by a feeder or small chute to the chains preferably in the area near the powered smaller sprockets. The chute also forces the user to stand aside from all the moving parts. The chains also help to separate the nuts to prevent congestion if they are dropped in clusters accidentally. Individual nuts are then moved to the cracking area.

The cracking board is textured on its cracking side to increase the friction. This board may be made of wood for it is easier to provide a useful texture on such material. The chains may be equipped with grooves. Such improvements provide smoother operation of the device.

The device allows cracking nuts of approximately the same size. The nuts of a smaller size pass through without being cracked posing no other difficulty. When a nut is of a larger size within the batch, it may get stuck between the chain and the cracking board. We have already discussed how to remove it with a tool instead of fingers. Another way of getting rid of a nut that got stuck is to allow for a forced movement of the cracking board. The cracking board may be attached to the device with springs holding it from below but allowing it to move downward when a sufficient extra pressure from above is exerted while being fixed firmly from above with respect to the force from the nut. This set up would allow us to press the board by hand from above which results in squeezing the nut and when the cracking board is released the nut continues to move along its path.

Various sizes of nuts require various setups of a cracking board. The said device has an advantage of easy access to the cracking board which in turn allows us to adjust the cracking board easily. Both the distance and angle may be adjusted quickly whenever it is necessary to work on a new batch with nuts of a different size.

The movement of the chain should be slow. We may prefer to use the term revolutions of sprockets to the speed of the chain. Those should be something like 1 to 2 revolutions a second or 60 to 120 rpm. Transmissions that would reduce the speed of an electric motor would be easy to order but they would be expensive. Since our goal was to design a device that would be made out of bicycle parts, we may use a rear wheel of a bicycle with two sprockets mounted on its hub. The sprockets power the chains and the wheel is powered by an electric motor such as the one on the electric drill. This way the chuck of the electric drill and the tire of the wheel are in contact forming a friction gear. A friction gear may be considered as a safety measure in case anything wrong happens.

Fan can be used to separate the shells and the meat. It is obvious that the rest of work has to be done by hand. The nuts that are small within a batch obviously pass through without being cracked. A process is required to somehow automatically separate them from the cracked nuts.

The patent application is waiting for approval and it will take time. In the meantime we may allow anybody who reads or knows about this paper to build one device for personal use. Many improvements are possible and the final performance will depend not only on the principle involved but also on details in the design.

References

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