July 6, 1943. A. H. MORGAN 2,323,668

FRUIT DECAPPER

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Fig. 1.

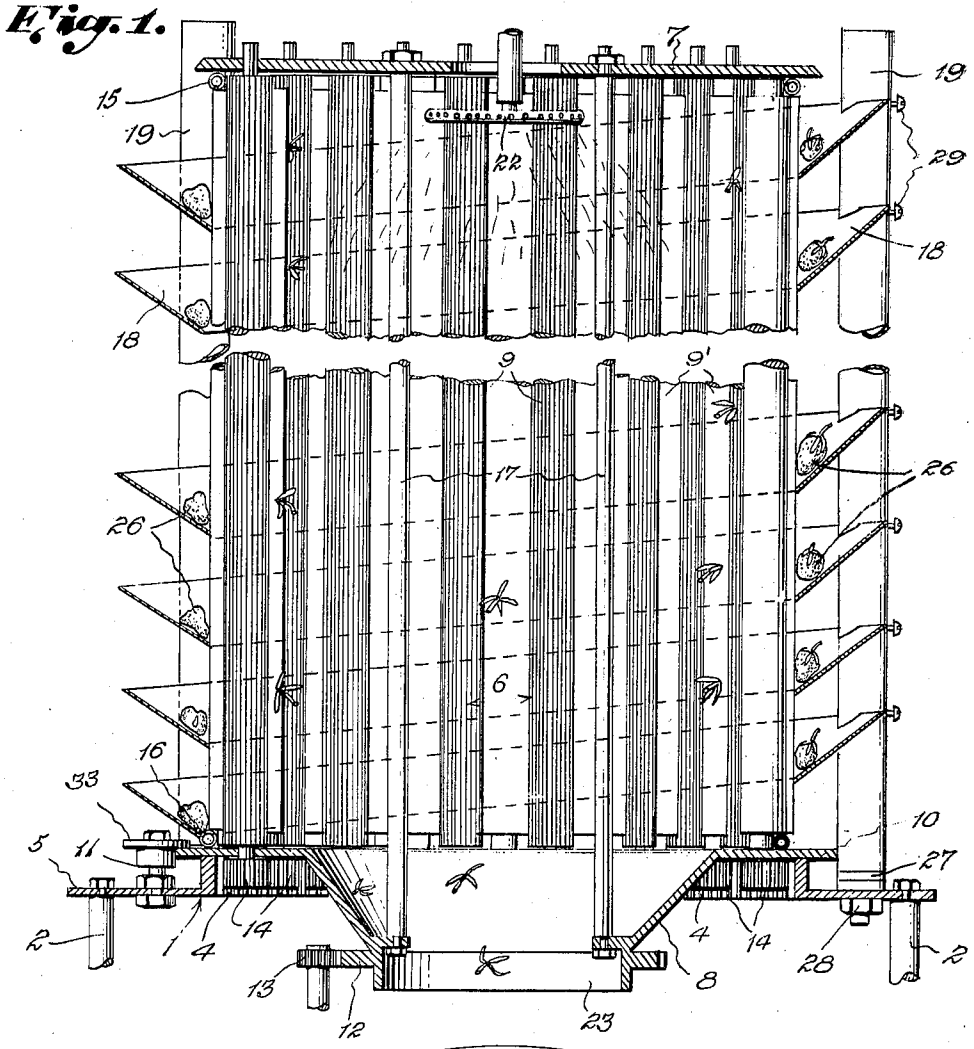

Fig. 2.

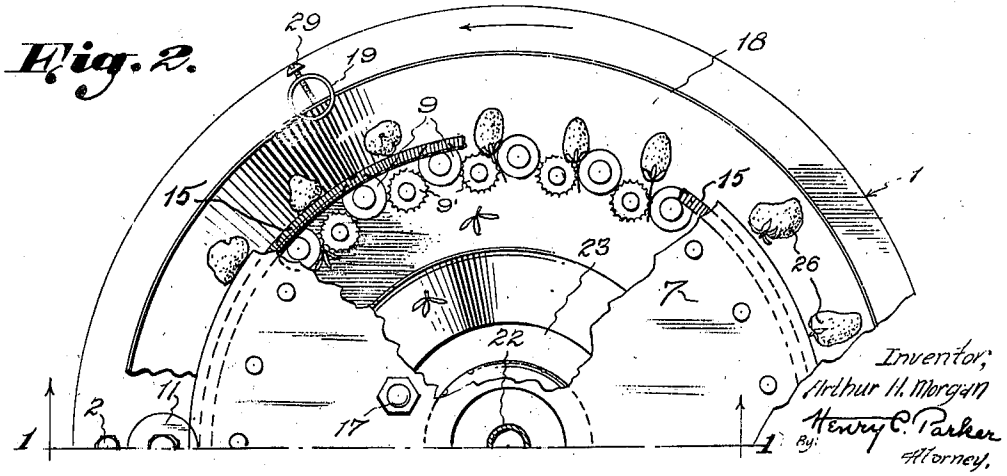

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Fig. 3.

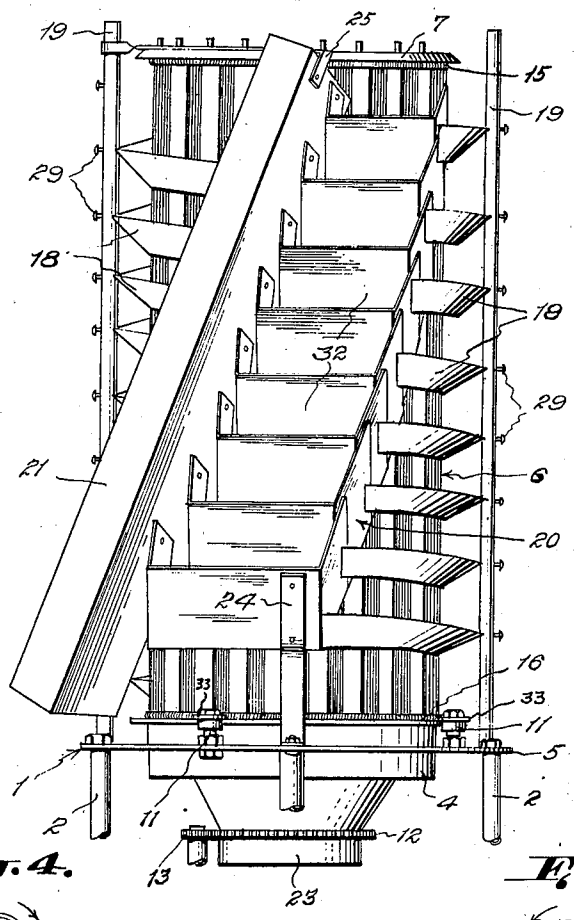


Fig. 4.

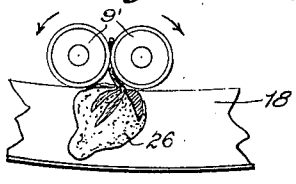


Fig. 5.

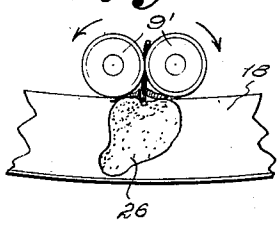
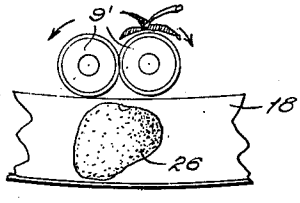


Fig. 6.



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Patented July 6, 1943

2,323,668

UNITED STATES PATENT OFFICE

2,323,668

FRUIT DECAPPER

Arthur H. Morgan, Knoxville, Tenn.

Application August 24, 1942, Serial No. 455,891

20 Claims. (Cl. 146—55)

This invention relates to fruit decappers; and it comprises a mechanism for removing caps or hulls from strawberries and the like, said mechanism comprising in combination a plurality of vertical decapping rolls usually mounted in a cylindrical, rotating cage, stationary angled trays or shelves adapted to hold the berries to be decapped against said rolls and forming runways for said berries, means for feeding said berries to said trays and means for discharging the decapped berries from said trays; all as more fully hereinafter set forth and as claimed.

Owing to the increasing cost and scarcity of hand labor, the demand for machines to decap or dehull berries has increased greatly during the past few years. A number of mechanisms have been developed for this purpose but apparently none of these have been wholly satisfactory. Most of these prior machines have employed a plurality of decapping rolls mounted with their axes having a slight slope toward the horizontal, the berries being passed longtudinally on top of the rolls toward a discharge at the lower ends of the rolls. In most of these devices gravity alone has been relied upon to force the berries against the decapping rolls and this may account for the lack of success of these devices.

I have found that, if the decapping rolls are placed with their axes vertical and if angled shelves or trays are provided forming runways for the berries and mounted in such fashion that the berries are forced against the rolls by the trays, the action of the rolls in producing decapping is much more positive. There is less danger that berries, which are slightly lighter in weight than the average will merely chatter or roll along on top of the rolls without the hulls ever being forced firmly against the rolls so that they can be grasped and pulled off. Such vertical decapping rolls can be mounted in a line or row with adjacent berry-holding trays serving as runways and holding the berries against said rolls, said strays being sloped downwardly from the feeding end to the discharge end. But I have found it much more convenient to mount the rolls in a circular cage which itself rotates as the rolls are rotated. In this case the rotation of the cage tends to push the berries along their runways and the runways can therefore be made substantially horizontal. It is also advantageous in this construction to produce rotation of the rolls by means of pinions placed at their ends which mesh with a ring gear mounted on a stationary base. As the cage with the rolls mounted therein is rotated, the rolls are then simultaneously rotated by the pinions meshing with the ring gear. Horizontal berry holding trays can be placed around the cage and substantially the entire surfaces of the rolls can then be utilized for the decapping operation.

The angle between the berry-holding trays and the decapping rolls can be varied to produce more or less pressure between the berries and the rolls and to accommodate berries of different sizes or kinds. My device is therefore highly flexible. Its capacity can be increased to substantially any desired extent merely by increasing the speed of rotation of the cage, or by the use of sufficiently long rolls, the number of rolls being kept constant but the number of berry runways being increased vertically. If desired the diameter of the machine and the number of the rolls may be increased.

My invention can be explained in greater detail by reference to the accompanying drawings which show, more or less diagrammatically, an illustrative embodiment of my decapping device. In this showing,

Fig. 1 is a vertical cross section through my berry huller, with feeding and discharging mechanism removed, taken along the line 1—1 of Fig. 2.

Fig. 2 is a plan view, with parts broken away to show the internal structure, with feeding and discharging mechanism removed,

Fig. 3 is a front elevation on a reduced scale of the huller showing the feeding and discharge mechanisms in place, with parts broken away to show the feeding and discharging ends of the trays, while

Figs. 4, 5 and 6 are partial views of a modification showing how the rollers of the huller serve to remove hulls from strawberries.

In the various figures of the drawings like parts are designated by like reference numerals. Referring particularly to Fig. 1, the huller includes a base portion, shown generally at 1, supported by four posts 2, this base portion consisting of an internal ring gear 4 mounted inside a supporting ring 5. The top of the ring gear furnishes a bearing surface for the cage portion of the device which is shown generally at 6. The cage is formed of a plurality of vertical decapping rolls 9 and 9' mounted in the form of a cylinder and supported between a head 7 and a base 8. The head and base are fastened together by means of rods 17. Fluted rolls 9 alternate with smooth rolls 9', which are preferably covered with rubber. The base of the cage is formed of a horizontal flange portion 10 which bears on top of the ring gear and is confined between the rollers 11 and under the flanges 33, which prevent the cage from tipping. The lower part of the base tapers down to a discharge spout 23 and an outer spur gear 12, which meshes with a driving pinion 13, is mounted on the outside of this spout. The entire cage is rotated during the operation of the huller by

means of the driving pinion and the rolls are rotated simultaneously by means of pinions 14, mounted on the lower ends of the fluted rolls, which mesh with the ring gear 4 on the base 1. The provision of the internal ring gear and cooperating pinions, as shown, produces correct rotation of the rolls and provides clearance for the discharge of stems and caps.

It will be noted that the fluted rolls only are driven by pinions meshing with the ring gear, while the smooth rolls are driven by friction, being held against the rotating fluted rolls by means of the tension of the spiral springs 15 and 16 at the upper and lower ends, respectively, of the smooth rolls. The smooth rolls are not journaled in the roll cage and can be removed by slipping off one or both of the springs 15 and 16. This construction constitutes a safety factor since, if a small stick or piece of metal should be present in the berries, the smooth rolls will yield sufficiently to enable such foreign body to pass through the rolls without damaging them. When the rolls are mounted in this fashion it is advantageous to have them staggered, as shown best in Fig. 2, with the axes of the smooth rolls arranged in a circle which is concentric with but slightly larger than that of the fluted rolls. The top plate 7 is broken away in Fig. 2 to show this arrangement of the rolls.

The berries 26 are held against the decapping rolls by means of angled trays or guides 18 having substantially the shape of truncated cones which circle the cage and may be mounted either horizontally or with a slight downward slope toward their discharge ends. The trays are mounted on posts 19 which are slotted to receive them, the trays being fastened by means of screws 29. The posts are mounted on the stationary base 1. The trays are sufficiently resilient so that the inward slope of the trays may be varied to some extent by raising or lowering the posts 19, for example by means of the nut 28 and washers 27 (Fig. 1). The pressure of the berries against the rolls can be varied by this adjustment, since the smaller the angle between the trays and the rolls, the greater the pressure of the berries against the rolls. The rotation of the cage gradually propels the berries along the trays from the feeder to the discharge trough, which elements are shown generally in Fig. 3 at 20 and 21, respectively. The removed berry hulls or caps are washed down the rolls by means of water introduced by the sprayer 22 and are discharged through the spout 23. In Fig. 2 the spring 15 and the top plate 7 are broken away to show how the caps are removed when the rolls are in staggered relation, the rolls being alternately fluted and smooth.

In Fig. 3 the berry feeder 20 and the discharge trough 21 are shown diagrammatically only, since any type of feeding and discharge mechanisms can be used which are adapted to feed and discharge berries to and from a series of horizontal trays arranged as in my decapper. In its simplest form the feeder may comprise merely a series of vertically superposed troughs 32, one for each of the trays, as shown in the figure. These troughs serve to supply the berries to the feeding ends 41 of the trays. The discharge trough 26 merely serves to catch the decapped berries as they fall off the discharging ends 40 of the trays 18 and to guide them away from the machine. The feeding and discharge troughs are supported by the bracket 24, mounted on the base 2, and the strap 25, which is fastened to the head of the case. If desired the decapped berries can be discharged on a belt or other conveyor, not shown, placed beneath the discharge trough.

It is advantageous in the construction of the trays to provide horizontal portions of the trays at the points where the berries are fed into them. Beyond the feeder, however, it is advantageous to provide a slight slope downwardly to the discharge trough in a helical path for the reason that this tends to spread out the berries on the trays. This prevents the berries from rubbing against each other and thus causing a delay in the assumption of positions such that their caps can come in contact with the decapping rolls. The trays can, of course, slope downwardly from their feed ends to their discharge ends.

Figs. 4, 5 and 6 show the operation of the decapping rolls in removing the hull from a strawberry 26 when the rolls are smooth in line. In Fig. 4 the stem has been grasped between two of the rolls; in Fig. 5 the hull has been pulled from the berry, while in Fig. 6 the hull is being discharged on the inside of the cage while the decapped berry is free to move along the tray.

In Figs. 4 to 6 the axes of the rolls are smooth and in line while the trays are substantially straight. Both rolls are smooth. When mounted in this manner all rolls must be positively driven, as will be evident to those skilled in the art.

The rotating cage can be driven by any suitable means. A motor and a reducing gear are satisfactory for this purpose. A chain or belt drive may be employed. The cage can be advantageously rotated at a speed of the order of 30 R. P. M., for example, while the rolls may operate at a speed of about 540 R. P. M. But these speeds can be increased up to about 100 R. P. M. and 1800 R. P. M., respectively, if desired, while very slow speeds are also satisfactory if a high rate of production is not required. For strawberries the diameter of the rolls should be of the order of ⅜ inch, while for larger or smaller fruits this diameter may be increased or diminished accordingly. Ordinarily the smaller the rolls the better their operation but, with the cage construction shown in the drawings, the minimum diameter of the rolls is determined by the size of the pinions employed for driving them. When my decapper is made with a roll length of about 20 inches and with a cage diameter of about 12 inches, it is light in weight, easily moved from place to place and can be readily installed in any processing line. This machine has a capacity of about one ton per hour and an efficiency of over 90 per cent.

It is desirable to rotate the cage of the decapper in such fashion that the leading decapping roll of each pair is the fluted roll. In this case, when the stem or cap is pinched between the rolls during the decapping operation, there is a tendency for the fruit to be impinged and pressed against the rubber covered roll rather than against the fluted roll. This causes less damage to the fruit.

If the fruit tends to progress too slowly along the runways provided by the angled trays, it is possible to remove one or more of the lower trays and to slope the other trays more steeply towards their discharge ends.

While I have described what I consider to be the best embodiments of my decapping machine, it is evident that various changes may be made

in the specific constructions described without departing from the purview of this invention. It is evident, for example, that the berry-holding trays may be rotated instead of the cage which holds the decapping rolls. It is merely necessary that there be a relative motion between these parts. The decapping rolls may both be made smooth, as shown in Figs. 4 to 6, if desired, and of metal or of flexible material. If metal rolls are employed, these may be roughened in order to increase their tendency to adhere to the caps and stems. If the rolls are covered with resilient material, this may be rubber, cloth, or other flexible, water-resistant material. If the decapping rolls are off-set or staggered, the degree of off-set may be varied, if desired, in order to handle fruit of different sizes. In general it is desirable to have the off-set as small as possible in order that the outside rolls may not tend to crush the berries. The angle between the vertical decapping rolls and the berry-carrying trays can be varied, as mentioned previously to accommodate fruit of different sizes, as well as to vary the pressure of the berries against the rolls. This angle can be varied from about 15° to 65°, for example.

While I have described the use of my decapping device in connection with the decapping of strawberries, it is evident that many other types of berries can be decapped or destemmed in the same manner. Examples of other fruit which can be employed are grapes, dewberries, loganberries, mulberries and any other fruits which have hulls or stems which can be removed by a pulling operation. Other modifications of my decapping device which fall within the scope of the following claims will be immediately evident to those skilled in this art.

What I claim is:

1. A device for decapping and destemming small fruits, which comprises a plurality of decapping rolls mounted substantially vertically, at least one angled tray having a feed end and a discharge end, running transversely with respect to said rolls, forming a runway for said fruit and adapted to hold said fruit against said decapping rolls, means for causing relative motion between said rolls and said tray, means for rotating said rolls, means for feeding fruit to be decapped and destemmed into the feed end of said tray and means for discharging decapped and destemmed fruit from the discharge end of said tray.

2. The device of claim 1 wherein the angle between the vertical decapping rolls and the angled tray lies between about 15° and 65°.

3. The device of claim 1 wherein said vertical decapping rolls are mounted in a cylindrical rotating cage.

4. The device of claim 1 wherein the said angled trays have a slight downward slope towards their discharge ends.

5. The device of claim 1 wherein said decapping rolls are staggered and every other roll is positively driven by said rotating means while the intermediate rolls are driven by being resiliently held against said positively driven rolls.

6. The device of claim 1 wherein every other roll is fluted.

7. The device of claim 1 wherein every other roll is fluted, the other rolls having smooth resilient surfaces.

8. The device for decapping and destemming small fruits, which comprises a plurality of decapping rolls mounted vertically in a cylindrical cage, a plurality of angled trays having a feed end and a discharge end and forming a runway for said fruit, said trays being adapted to press fruit against said rolls and being mounted substantially horizontally around the greater part of the circumference of said trays, means for rotating said rolls, means for feeding fruit to be decapped and destemmed into the feed end of said trays and means for receiving decapped and destemmed fruit at the discharge end of said trays.

9. The device of claim 8 wherein the angle between the vertical decapping rolls and the angled tray varies between about 15° and 65°.

10. The device of claim 8 wherein the angle between the vertical decapping rolls and the angled tray lies between about 15° and 65° and wherein means are provided to vary said angle.

11. A device for decapping and destemming small fruits, which comprises a stationary base, a ring gear mounted on said base, a plurality of decapping rolls mounted approximately vertically in a cylindrical cage, pinions mounted on the ends of at least every other one of said decapping rolls, said cage being rotatably mounted on said base in such manner that said pinions engage said ring gear, whereby rotation of said rolls is caused by the rotation of said cage, a plurality of angled trays, having a feed end and a discharge end, forming a runway for said fruit, adapted to press said fruit against said rolls and mounted substantially horizontally around the greater part of the circumference of said cage, means for rotating said cage, means for feeding fruit to be decapped and destemmed into the feed end of said trays and means for receiving decapped and destemmed fruit at the discharge end of said trays.

12. The device of claim 11 wherein the top surface of said ring gear furnishes a bearing surface for said cage.

13. The device of claim 11 wherein means are provided in the inside of said cage for washing the removed hulls and stems from said rolls.

14. The device of claim 11 wherein said pinions are mounted on the ends of every other roll and wherein the rolls having no pinions are driven by being resiliently held against the rolls having pinions.

15. The device of claim 11 wherein fluted decapping rolls alternate with rolls which have smooth surfaces.

16. The device of claim 11 wherein every other roll is provided with a resilient surface.

17. The device of claim 11 wherein every other roll is of fluted metal.

18. The device of claim 11 wherein the rolls are staggered, the outer rolls being driven by being pressed resiliently against the inner rolls.

19. The device of claim 11 wherein the rolls are staggered, the outer rolls being provided with resilient surfaces so that these rolls are the last to be contacted with said fruit during the decapping operation.

20. The device of claim 11 wherein the said trays have a slight downward slope towards their discharge ends.

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