APPARATUS AND METHODS FOR WASHING THE CORED AREAS OF LETTUCE HEADS DURING HARVEST

Inventors: Richard S. Brown, Chualar, CA (US); Eugene D. Rizzo, Pacific Grove, CA (US)

Correspondence Address:
BRIGHT & LORIG
Ste. 3330
633 West Fifth Street
Los Angeles, CA 90071 (US)

Appl. No.: 10/727,998
Filed: Dec. 3, 2003

Related U.S. Application Data
Continuation of application No. 09/692,273, filed on Oct. 19, 2000, now Pat. No. 6,679,276, which is a division of application No. 09/295,438, filed on Apr. 20, 1999, now Pat. No. 6,298,865.

Publication Classification

Int. Cl.
B08B 3/00 (2006.01)
B08B 3/12 (2006.01)

U.S. Cl. 134/198; 134/68; 134/137

ABSTRACT

An apparatus and method for washing a plurality of cored lettuce heads as they are harvested in the field is disclosed. The apparatus incorporates a multi-segment hinged conveyor forming a loop, at least one support platform having an opening, at least one lettuce head guide connected to the support platform and an aqueous solution spraying system. Workers harvest lettuce heads, core the lettuce heads and then place them on the lettuce head guides which are moving along the conveyor. The lettuce heads are conveyed to an aqueous solution spraying system which washes the cored areas of the lettuce heads. The lettuce heads are then removed from the conveyor into a produce bin.
APPARATUS AND METHODS FOR WASHING THE CORED AREAS OF LETTUCE HEADS DURING HARVEST

BACKGROUND OF THE INVENTION

[0001] This invention relates to apparatus and methods for washing the cored area of a lettuce head.

[0002] The field to which the invention relates is that of agricultural equipment and methods used in harvesting operations.

BRIEF SUMMARY OF THE INVENTION

[0003] The invention is an apparatus and method for washing a plurality of cored lettuce heads as they are harvested in the field. The apparatus comprises a conveyor forming a loop, support platforms attached to the conveyor with at least one lettuce head guide connected to each support platform, and an aqueous solution spraying system fixedly attached at a point along said conveyor loop. The claimed method involves the steps of placing at least one cored lettuce head onto a conveyor, conveying the lettuce heads to an aqueous solution spraying system, delivering an aqueous solution into the core hole of the lettuce head(s) for a time and at a pressure sufficient to wash the core hole(s), and removing the cored lettuce head(s) from the conveyor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 is a side elevation view of the apparatus for washing the cores of cored lettuce attached to a tractor.

[0005] FIG. 2 shows a top plan view of a section of the apparatus of FIG. 1.

[0006] FIG. 3 is an exploded side elevation view in cross section of the hinged area connecting the middle and proximal end segments of the apparatus shown in FIG. 1.

[0007] FIG. 4 is an exploded side elevation view in cross section of the hinged area connecting the central and distal end segments of the apparatus shown in FIG. 1.

[0008] FIG. 5 is a side elevation view in cross section of the wash chamber in the apparatus of FIGS. 1-4.

[0009] FIG. 6 is an exploded side elevation view in cross section of the unhinged end of the distal end segment in the apparatus of FIGS. 1-5.

[0010] FIG. 7 is an exploded side elevation view in cross section of the unhinged end of the proximal end segment in the apparatus of FIG. 6.

[0011] FIG. 8 is an exploded side elevation view in cross section of the unhinged end of the proximal end segment in the apparatus of FIG. 6 showing a removal finger.

[0012] FIG. 9 is an end view of the unhinged end of the proximal end segment showing the removal fingers.

DETAILED DESCRIPTION OF THE INVENTION

[0013] FIG. 1 shows an embodiment of washing apparatus 400 which includes three hinged sections—a distal end segment 406, a middle segment 407, and a proximal end segment 408. Lifting cylinders 409 and 410, powered and controlled hydraulically, rotate distal end segment 406 and proximal end segment 408 to desired angles of inclination. See FIGS. 3 and 4 for an example. Washing chamber 411 is located on proximal end segment 408 adjacent to connecting hinge 412.

[0014] FIG. 2 shows lettuce head washing apparatus 400 as viewed from above. Apparatus 400 includes at least one support platform 401 which includes a plurality of openings 402. Platforms 401 support and are connected to guides 403. Guides 403 orient the lettuce heads so that the aqueous solution is delivered to the core holes of the lettuce heads. In FIG. 2, a preferred embodiment of guide 403 is shown as including three L-shaped vanes 404, that project upward from platforms 401. Guides 403 may also be circular, posts, spikes, or any other suitable holder used to support and orient the lettuce heads.

[0015] Platform 401 is attached at each end to a double pitch chain 405 that forms a loop. Preferably, apparatus 400 includes a plurality of support platforms 401, each with at least two guides 403, attached at intervals along chain 405, such as shown in FIG. 2. In some embodiments platforms 401 are detachable from chain 405. The combination of guides 403, platforms 401, chains 405 and associated frame and driving mechanisms form a looped belt, sometimes called a harvester belt, that moves along an elliptical or other path. Sprockets 423, as shown for example in FIG. 6, are powered and controlled hydraulically to move chain 405, thereby moving attached platforms 401 and connected guides 403. Preferably the belt is attached, at one end, to a hitch of a puller vehicle e.g. a tractor of 40 horse power or greater.

[0016] Guides 403 are conveyed in a substantially upright position from unhinged end 413 of distal end segment 406 towards unhinged end 414 of proximal end segment 408. In a preferred embodiment distal end segment 406 is maintained in a horizontal and co-linear position with middle segment 407 during operation. Workers place cored heads of lettuce on guides 403 as they traverse distal end segment 406 and central segment 407 in an upright position. Cored lettuce heads on guides 403 then travel through wash chamber 411 to unhinged end 414 of proximal end segment 408.

[0017] FIG. 5 shows wash chamber 411. Wash chamber 411 includes one or more spray nozzles 418 that continually spray or otherwise deliver an aqueous lettuce head washing solution 419 into the core holes of the lettuce heads as they travel over nozzles 418. Solution 419 is pumped to nozzles 418 through hoses 422 from supply tank 421 located below wash chamber 411. Solution 419 may be pumped by any suitable pump. Preferred embodiments use a centrifugal pump powered and controlled hydraulically. Solution 419 emerges from nozzles 418 under pressure and travels upward as spray 420 through openings in platforms 401 into the core holes of lettuce heads. Solution 419 which drains from the lettuce is collected, filtered, and recycled by supply tank 421. A preferred embodiment of supply tank 421 used to collect, filter and recycle solution 419 is disclosed in the currently pending U.S. patent application Ser. No. 09/144, 972 filed Sep. 1st, 1998 by applicants Richard S. Brown and Eugene D. Rizzo. That application is hereby incorporated by reference.

[0018] The level of solution in supply tank 421 is kept at a predetermined level by a float valve. Supply tank 421 may
be connected to a tractor mounted nurse tank. Aqueous solution 419 may be pumped from the nurse tank to supply tank 421 by any pump. Preferred embodiments use a centrifugal pump, powered and controlled hydraulically.

[0019] In some embodiments, a single lettuce head passes over one or more nozzles 418, repeatedly washing the core hole. Nozzles 418 may deliver washing solution 419 at either high pressure and low volume, or low pressure and high volume. Preferred embodiments include both types of nozzles 418.

[0020] After exiting washing chamber 411, the lettuce heads are conveyed to unhinged end 414 of proximal end segment 408. Proximal end segment 408 is preferably elevated, as shown in FIG. 1, at an inclination angle of 25-35 degrees. The washed lettuce heads will thereby be elevated for deposit onto a conveyor or into produce bins. At unhinged end 414 the core lettuce heads on guides 403 are rotated through an angle to a substantially inverted position 415, as shown, for example, in FIG. 7. In inverted position 415 the core lettuce heads detach from guide 403. At least one fixed removing finger 424, as shown, for example, in FIGS. 8 and 9, placed adjacent to unhinged end 414 may be used to assist in unseating the lettuce heads. Inverted guides 403 return to unhinged distal end 413 of the harvester belt. There guides 403 rotate through an angle to a substantially upright position. For an example, see FIG. 6. Guide 403 then travels back towards proximal end 408 of the harvester belt for receipt of additional core lettuce heads to be washed.

What is claimed is:

1. An apparatus for washing a plurality of cored heads of lettuce comprising
a conveyor forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyor;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and
an aqueous solution spraying system fixedly attached at a point along said conveyor loop.

2. The apparatus of claim 1 wherein said conveyor further comprises
a middle segment with a first end and a second end;
a distal end segment rotatably attached to said first end;
a proximal end segment rotatably attached to said second end;
a rotator to rotate and hold in place at a desired angle said distal end segment; and
a rotator to rotate and hold in place at a desired angle said proximal end segment.

3. The apparatus of claim 2 wherein said aqueous solution spraying system is fixedly attached at a point along said proximal end segment.

4. An apparatus for washing a plurality of cored heads of lettuce comprising
a conveyor forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyor;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and
an aqueous solution spraying system fixedly attached at a point along said conveyor loop.

6. An apparatus for washing a plurality of cored heads of lettuce comprising
a conveyor forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyor through a double pitch attachment style chain;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and
an aqueous solution spraying system fixedly attached at a point along said conveyor loop.

7. An apparatus for washing a plurality of cored heads of lettuce comprising
a conveyor forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyor;
said conveyor comprising:
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and
an aqueous solution spraying system fixedly attached at a point along said conveyor loop.

8. An apparatus for washing a plurality of cored heads of lettuce comprising
a conveyor forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer through a double pitch attachment style chain; said conveyer comprising:
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

9. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer;
said conveyer comprising:
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

10. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer through a double pitch attachment style chain;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and

an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

11. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

12. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer through a double pitch attachment style chain;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising outward facing vanes; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

13. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer;
said conveyer comprising:
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising an elliptical ring; and
an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

14. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer through a double pitch attachment style chain;
said conveyer comprising;
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising an elliptical ring; and
an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

15. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer;
said conveyer comprising;
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising an elliptical ring; and
an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

16. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached through a double pitch attachment style chain to said conveyer;
said conveyer comprising;
(A) a middle segment with a first end and a second end;
(B) a distal end segment rotatably attached to said first end;
(C) a proximal end segment rotatably attached to said second end;
(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and
(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising an elliptical ring; and
an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

17. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising a spike; and
an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

18. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;
at least one support platform having at least one opening;
said at least one support platform attached to said conveyer through a double pitch attachment style chain;
at least one lettuce head guide connected to said at least one support platform;
said lettuce head guide comprising a spike; and
an aqueous solution spraying system fixedly attached at a point along said conveyer loop.
19. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;

at least one support platform having at least one opening;

said at least one support platform attached to said conveyer;

said conveyer comprising:

(A) a middle segment with a first end and a second end;

(B) a distal end segment rotatably attached to said first end;

(C) a proximal end segment rotatably attached to said second end;

(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and

(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;

said lettuce head guide comprising a spike; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop.

20. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;

at least one support platform having at least one opening;

said at least one support platform attached to said conveyer through a double pitch attachment style chain;

said conveyer comprising:

(A) a middle segment with a first end and a second end;

(B) a distal end segment rotatably attached to said first end;

(C) a proximal end segment rotatably attached to said second end;

(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and

(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;

said lettuce head guide comprising a spike; and

an aqueous solution spraying system fixedly attached on a point along said conveyer loop.

21. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;

at least one support platform having at least one opening;

said at least one support platform attached to said conveyer;

said conveyer comprising:

(A) a middle segment with a first end and a second end;

(B) a distal end segment rotatably attached to said first end;

(C) a proximal end segment rotatably attached to said second end;

(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and

(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;

said lettuce head guide comprising a spike; and

an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

22. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;

at least one support platform having at least one opening;

said at least one support platform attached through a double pitch attachment style chain to said conveyer;

said conveyer comprising:

(A) a middle segment with a first end and a second end;

(B) a distal end segment rotatably attached to said first end;

(C) a proximal end segment rotatably attached to said second end;

(D) a rotator to rotate and hold in place at a desired angle said distal end segment; and

(E) a rotator to rotate and hold in place at a desired angle said proximal end segment;

at least one lettuce head guide connected to said at least one support platform;

said lettuce head guide comprising a spike; and

an aqueous solution spraying system fixedly attached at a point along said proximal end segment.

23. The apparatus of claim 1 further comprising at least one finger located substantially adjacent to said proximal end.

24. An apparatus for washing a plurality of cored heads of lettuce comprising

a conveyer forming a loop with a distal end and a proximal end;

at least one support platform having at least one opening;

said at least one support platform attached to said conveyer;

at least one lettuce head guide connected to said at least one support platform; and

an aqueous solution spraying system fixedly attached at a point along said conveyer loop;
said aqueous solution spraying system comprising;  
a tank for holding an aqueous solution;  
a pump;  
said pump delivering said aqueous solution under pressure to at least one nozzle.  
25. An apparatus for washing a plurality of cored heads of lettuce comprising  
a conveyor forming a loop with a distal end and a proximal end;  
at least one support platform having at least one opening;  
said at least one support platform attached to said conveyor;  
at least one lettuce head guide connected to said at least one support platform;  
an aqueous solution spraying system fixedly attached at a point along said conveyor loop;  
said aqueous solution spraying system comprising;  
a tank for holding an aqueous solution;  
a determiner of a level of said aqueous solution in said tank;  
said determiner connected to an inlet valve;  
said inlet valve connected to a reservoir containing said aqueous solution;  
a pump; and  
said pump delivering said aqueous solution under pressure to at least one nozzle.  
26. An apparatus for washing a plurality of cored heads of lettuce comprising  
a conveyor forming a loop with a distal end and a proximal end;  
at least one support platform having at least one opening;  
said at least one support platform attached to said conveyor;  
at least one lettuce head guide connected to said at least one support platform;  
an aqueous solution spraying system fixedly attached at a point along said conveyor loop;  
said aqueous solution spraying system comprising;  
a tank for holding an aqueous solution;  
a pump;  
said pump delivering said aqueous solution under pressure to at least one nozzle; and  
where said at least one nozzle delivers said aqueous solution at a high pressure and a high volume.  
27. An apparatus for washing a plurality of cored heads of lettuce comprising  
a conveyor forming a loop with a distal end and a proximal end;  
at least one support platform having at least one opening;  
said at least one support platform attached to said conveyor;  
at least one lettuce head guide connected to said at least one support platform;  
an aqueous solution spraying system fixedly attached at a point along said conveyor loop;  
said aqueous solution spraying system comprising;  
a tank for holding an aqueous solution;  
a pump;  
said pump delivering said aqueous solution under pressure to at least one nozzle;  
and  
28. An apparatus for washing a plurality of cored heads of lettuce comprising  
a conveyor forming a loop with a distal end and a proximal end;  
at least one support platform having at least one opening;  
said at least one support platform attached to said conveyor;  
at least one lettuce head guide connected to said at least one support platform;  
an aqueous solution spraying system fixedly attached at a point along said conveyor loop;  
said aqueous solution spraying system comprising;  
a tank for holding an aqueous solution;  
a pump;  
said pump delivering said aqueous solution under pressure to at least one nozzle;  
where said at least one nozzle delivers said aqueous solution at a low pressure and a high volume.  
29. A method for washing at least one head of lettuce with a cored hole comprising the steps of  
placing said at least one cored lettuce head in a position such that the cored hole faces substantially downward;  
conveying said at least one cored lettuce head to an aqueous solution spraying system;  
delivering an aqueous solution into said core hole for a time and at a pressure sufficient to wash said core hole; and  
removing said at least one cored lettuce head from said position.  
30. The method of claim 29 wherein said placing step comprises seating said cored lettuce head on a guide which has a path for said aqueous solution, said guide being attached to a support platform which has at least one opening.  
31. The method of claim 30 wherein said conveying step comprises conveying said guide along a path forming a loop.  
32. The method of claim 31 wherein said path forming a loop has a distal end, and a proximal end, such that said guide is conveyed in a substantially upright position from
said distal end to said proximal end, and in a substantially inverted position from said proximal end to said distal end.

33. The method of claim 32 wherein said proximal end is elevated in relation to said distal end.

34. The method of claim 29 where said step of delivering an aqueous solution into said core hole further comprises using
   a tank containing said aqueous solution;
   at least one nozzle; and
   a pump to deliver said aqueous solution to said at least one nozzle.

35. The method of claim 34 where said at least one nozzle sprays said aqueous solution at a high pressure and a low volume.

36. The method of claim 34 where said at least one nozzle sprays said aqueous solution at a low pressure and a high volume.

37. The method of claim 34 where at least two nozzles are used, where at least one nozzle sprays said aqueous solution at a high pressure and a low volume, and where at least one nozzle sprays said aqueous solution at a low pressure and a high volume.

38. The method of claim 34 comprising the further steps of collecting, filtering, and recycling said aqueous solution which drains from said lettuce heads.

39. The method of claim 34 comprising the further step of maintaining a level of said aqueous solution in said tank at a predetermined level.

40. The method of claim 39 wherein said level of said aqueous solution is maintained by using a float level which is connected to an inlet valve connected to a reservoir tank.

41. The method of claim 30 wherein the step of removing said at least one lettuce head from said guide further comprises rotating said lettuce head through an angle to a substantially inverted position.

42. The method of claim 41 wherein the step of removing said at least one lettuce head from said guide further comprises using at least one finger.