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PATENT REQUEST : STANDARD PATENT

We, being the person identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification.

Applicant: FMC CORPORATION
Address: 200 East Randolph Drive, Chicago, Illinois 60601, United States of America

Nominated Person: As above
Address: As above

Invention Title: SINGLE ROW GRAPE AND RAISIN HARVESTER

Name of actual Inventor: Phillip Ray Scott

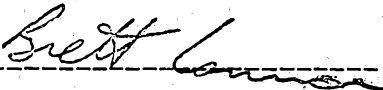
BASIC CONVENTION APPLICATION DETAILS

Applicant's Name: Phillip Ray Scott
Application Number: 07/947,626
Country: United States of America
Code: US
Date of Application: 21 September 1992

Address for service in Australia: **CARTER SMITH & BEADLE**, 2 Railway Parade, Camberwell, Victoria, 3124, Australia. (Attorney Code CD)

Dated : 14 September 1993

NO 49134 140993


CARTER SMITH & BEADLE
Patent Attorneys for the Applicant

TO: *The Commissioner of Patents*
Fee: \$339.00
Our Ref: #14177

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NOTICE OF ENTITLEMENT

I/We, FMC CORPORATION, a Delaware corporation, United States of America, with executive offices at 200 East Randolph Drive, Chicago, Illinois 60601, United States of America, being the applicant in respect of Application No.
state the following:

The person(s) nominated for the grant of the patent:

has, for the following reasons, gained entitlement from the actual inventor(s): by assignment 14 September 1992 from the inventor, Phillip R. Scott, 12657 Road 28 1/4, Madera, California 93637, United States of America, to the applicant

The person(s) nominated for the grant of the patent is/are:

entitled to rely on the basic applicant(s) listed on the patent request form by assignment

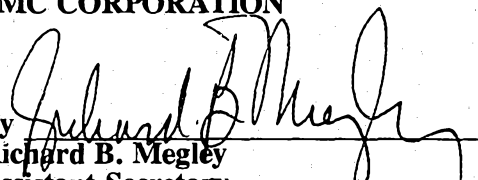
The basic application(s) listed on the request form;

is/are the first application(s) made in a Convention country in respect of the invention

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FMC CORPORATION

By 
Richard B. Megley
Assistant Secretary

Date: 31 August 1993



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(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 669559

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SINGLE ROW GRAPE AND RAISIN HARVESTER
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947626 21.09.92 US UNITED STATES OF AMERICA
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- (71) Applicant(s)
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- (56) Prior Art Documents
US 4418521
US 4329836
US 4341062
- (57) Claim

1. A harvester, for harvesting crops from plants, wherein the harvester is to be pulled by a power driven vehicle with a drawing means and with a direction of forward movement with a longitudinal axis in the direction of forward movement and a right side of the forward direction and a left side of the forward direction, the harvester, comprising:

a frame;

a vertical shaker head mounted on the frame, having tines projecting outwardly from the shaker head for engaging the plants and shaking the crop from the plants;

means for catching crop shaken from the plants;

means for connecting the frame to the power driven vehicle; and

means for moving the frame toward the right side of the forward direction, and for moving the frame toward the left side of the forward direction.

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

Name of Applicant: **FMC CORPORATION**

Actual Inventor: Phillip Ray Scott

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Invention Title: **SINGLE ROW GRAPE AND RAISIN HARVESTER**

The following statement is a full description of this invention, including the best method of performing it known to us

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to harvesters for crops such as grapes and raisins and more specifically to a tractor drawn, single row harvester for harvesting grapes supported on grape vines. Alternately, the harvester can be used to harvest crops such as dry grapes which are supported on vines that have been severed from the trunks of the vines and left to dry in the sun while supported on vines as raisins before being shook from the vines by the single row harvester and collected by the single row harvester of the present invention.

Description of the Prior Art

Assignee's Orlando Patent No. 4,336,682 and divisional Patent No. 4,432,190 covers an apparatus for shaking grapes from vines by using eccentric weights which are mounted on shaker arms which have spaced elongated striker bars that are oscillated against the trunks of the grape vines and posts which support trellis wires that have clusters of grapes trained thereover that fall on take-away conveyors for transfer to collecting means.

Assignee's Orlando Patent No. 4,418,521 is similar to the two above Orlando patents except that striker bars are used to resiliently whip the foliage hanging from the trellis wires that are supported on posts.

Assignee's Scudder Patent No. 3,341,062 discloses a coffee harvester which utilizes an eccentric weight arrangement mounted on the upper ends of two shaker units for oscillating shafts carrying tines which dislodge coffee beans from the plants.

Assignee's Scudder Patent No. 4,329,836 discloses a tractor drawn trailer having a vertical wall to which cantilever beams are pivotally connected. A single oscillating shaker unit is journaled within the two beams for moving the single oscillating shaker units different distances from the vines being harvested. A pair of hydraulic cylinders are connected to rear wheels to maintain the axis of the shaker unit substantially vertical when harvesting fruit such as berries and coffee.

SUMMARY OF THE INVENTION



The present invention relates to single row harvesters for crops such as grapes and raisins adapted to remove clusters of grapes from the vines. Alternately, the clusters of grapes may be supported on vines that have been severed from the trunk of the vines, but rest on the foliage or supported by trellis wires that are secured to posts. These clusters of grapes are left in the sun until they dry as raisins and are subsequently harvested by the grape and raisin harvester of the present invention for sale as grapes or raisins.

Accordingly, the invention provides a harvester, for harvesting crops from plants, wherein the harvester is to be pulled by a power driven vehicle with a drawing means and with a direction of forward movement with a longitudinal axis in the direction of forward movement and a right side of the forward direction and a left side of the forward direction, the harvester, comprising:

15 a frame;

a vertical shaker head mounted on the frame, having tines projecting outwardly from the shaker head for engaging the plants and shaking the crop from the plants;

means for catching crop shaken from the plants;

20 means for connecting the frame to the power driven vehicle; and

means for moving the frame toward the right side of the forward direction, and for moving the frame toward the left side of the forward direction.

BRIEF DESCRIPTION OF THE DRAWINGS

25 Figure 1 is a side elevation of a tractor towed and powered single row grape and raisin harvester, with only the tongue of the tractor being shown.

Figure 2 is a plan view of the single row harvester of Figure 1 with several components shown in phantom lines in different positions.

30 Figure 3 is a front view of the harvester having its discharge



conveyor projecting transversely of the longitudinal axis of the single row grape and raisin harvester with the discharge conveyor in its operative position to transfer grapes from an elevator to a truck or the like.

Figure 4 is a section taken along lines 4-4 of Figure 6
5 illustrating the cross-section of a grape or raisin discharge conveyor and elevator.

Figure 5 is a section taken along lines 5-5 of Figure 4 illustrating a plastic conveyor chain.

Figure 6 is a cut away view of a discharge conveyor-elevator
10 illustrating the internal components of the conveyor-elevator.

Figure 7 is a section taken along lines 7-7 of Figure 1 illustrating a system for selectively transferring the discharge conveyor between both sides of the harvester and a stowed position.

Figure 8 is an elevation with parts cut away illustrating the
15 drive for the discharge conveyor including means for supporting the discharge conveyor.

Figure 9 is an operational view illustrating the grape and raisin harvester moving through terraced rows of the grapes.



Figure 10 is a front elevation of a modified tractor drawn and powered harvester which shakes grapes hanging from horizontal beams which extends between two rows of grape vines and are shook from the vines into boxes by a plurality of horizontal shaker tines of the shaker head.

Figure 11 is a side elevation of the modified tractor drawn power driven harvester of Figure 10.

Figure 12 is a diagrammatic elevation illustrating two horizontal shaker heads which harvest grapes or raisins from beneath a horizontal trellis.

Figure 13 is similar to Figure 12 but has a V-shaped trellis with two inclined shaker heads positioned below the trellis for shaking grapes therefrom.

Figure 14 is similar to Figure 13 but with a first shaker head oriented vertically, and a second shaking head oriented at an angle of about 30° relative to the ground.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention relates to a small single row harvester 20 (Figs. 1-9) for crops such as grapes and raisins which is connected to a conventional tractor, only a portion of the tractor's draw bar 22 being shown in Figure 1. The tractor's draw bar 22 is pivotally connected to the harvester's frame 24 by a tongue 26 for pulling the harvester 20 through rows of grape vines as shown in Figure 9. The tractor provides hydraulic and electrical power to the harvester components for harvesting crops such as grapes or raisins during the daylight and at night.

As best illustrated in Figure 1, the harvester's tongue 26 is pivotally connected to the tractor's draw bar 22 (Fig. 1), and to the main frame 28 of the harvester 20 by a pivot pin 30. A hydraulic cylinder 31 is pivotally connected between pivot pins 33a and 33b (Fig. 2) which permits the operator to pivot the tongue 26 between the three positions illustrated in Figure 2.

The small grape and raisin harvester 20 has a length of about 19 feet, a width of about 6 feet, and a height of about 10 feet.



The rear portion of the harvester 20 is supported by pair of large rear wheels 32 journaled on the harvester's main frame 28, while the front portion of the harvester is supported by the tractor 22 as mentioned previously.

5 As best shown in Figures 1 and 2, a pivotal shaker head frame 36 (Fig. 1) includes a pair of horizontal arms 38 and 40 which are rigidly secured to a pivotal upright frame member 42 thereby forming the rigid shaker head frame 36 (Fig. 1). The frame 36 is pivotally connected to another upright frame member 44 (Fig. 10 1) of the harvester's main frame 28. As best shown in Figures 1 and 2, a single shaking head 46 is pivotally supported on the shaking head frame 36 for oscillatory movement and is of the type disclosed in Applicant's previously mentioned Scudder Patent No. 4,341,062 which is assigned to the assignee of the present invention and is 15 incorporated by reference herein. It will be noted that the Scudder patent includes shaker tines some of which are angled upwardly or downwardly rather than horizontally as in the subject invention.

As illustrated in Figures 2 and 3, the hydraulic cylinder 31 (Figs. 1 and 2) is connected between the tongue 26 of the harvester harvester's frame 24 (Fig. 2). The hydraulic cylinder 31 is 20 pivotally connected between the main frame 24 of the harvester 20 and the harvester's tongue 26 thereby allowing the operator when on the tractor (not shown) to actuate the hydraulic cylinder 31 to pull the harvester 20 along a linear path behind the tractor 22 (Fig. 1), or to pivot the harvester tongue 26 so that the path of the 25 harvester is to the right or left of the longitudinal axis of the tractor (not shown). In this way the operator when on the tractor may guide the harvester 20 by actuating the cylinder 31 (Fig. 2) right or left as required to shake the grapes off the vines while the tractor is 30 positioned to the right or left of the vines being harvested.

Having reference to Figures 1, 2 and 3, the grapes or raisins are shaken from the vines onto a generally V-shaped trough 48 (Fig. 3) having spring loaded plates 50 which are positioned to 35 contact trellis poles 52 (Fig. 3) and/or the trunks of the vines (not shown) and deflect the grapes into the V-shaped trough 48. The V-shaped trough 48 first guides the grapes or raisins into a horizontal

portion 54 of the single conveying system 56 (Figs. 4, 5 and 6). The single conveying system includes both the horizontal portions 54 (Figs. 1 and 6) and an upwardly inclined portion 58. A hydraulic motor 60 (Figs. 1 and 3) drives both the horizontal portion 54 and the upwardly inclined portion 58 of the conveyor 56.

As illustrated in Figures 4, 5 and 6, the single conveying system 56 includes a plurality of plastic links 57 and 59 pivotally connected together by elongated bolts 62 defined by an endless plastic chain 64 (Figs. 4, 5 and 6). End portions and intermediate portions of the plastic chain 64 (Figs. 1 and 6) are trained around plastic wheels 66 and sprockets 70 (Figs. 1 and 6). The upper chain supporting shaft is driven by the hydraulic motor 60 (Fig. 1).

As indicated in Figures 4 and 6, a stretchable rubber belt 74 includes inclined side walls 76. A plurality of grape receiving pockets 78 are formed from the stretchable rubber belt 74, its inclined side walls 76 and a plurality of grape receiving transverse pushers 79 which define pockets 80 that maintain the grapes therein when moving up the inclined path.

The single conveying system 56 includes the stretchable rubber belt 74, the grape receiving pockets 80 and the inwardly inclined side walls 76 (Fig. 4) all of which are riveted to the steel strip 84. Also, the rubber belt 74, the grape receiving pockets 80 (Figs. 4 and 5) and the steel strips 84 are riveted together.

As illustrated in Figure 4, the rivets 86 are slidably received on the steel guide plates 88 during the travel of the conveyor 56 through the grape harvester 20.

Having reference to Figures 1-3, 7 and 8, a discharge conveyor 92 is supported in a discharge conveyor frame 94. A diagonal strut 96 (Fig. 3) is connected between a portion of the conveyor frame 94, and a vertical rotatable shaft 98 which is free to pivot within a vertical tube 100. The lower end of the shaft 98 is bolted to the lower end of the diagonal strut 96 as illustrated in Figure 3.

Figure 7 is a horizontal section taken along lines 7-7 of Figure 1 illustrating a pivot arm 102 pivotally connected within a

vertical tube 100 (Figs. 3 and 7) having the shaft 98 projecting out of the tube 100. The other end of the pivot arm 102 is connected to a tube 104 having a shaft 106 pivotable therein which shaft 106 is rigidly connected to the discharge conveyor frame 94 (Fig. 7).

5 As best illustrated in Figures 2 and 7, the hydraulic cylinder 108 is pivotally connected between the pivot arm 102 and the harvester frame 24. Actuation of the hydraulic cylinder 108 (Fig. 2) will cause the discharge conveyor 92 to be selectively extended to the right or left as illustrated in Figure 2. Alternately, the conveyor
10 92 may be moved to a transport position parallel to the longitudinal axis of the harvester as indicated in phantom lines in Figure 2.

A hydraulic motor 110 (Figs. 1-3) is provided for pivoting the discharge conveyor 92 between the three positions illustrated in Figure 2. As best illustrated in Figure 1, a hydraulic
15 motor 112 is provided to oscillate the single shaking head 46 (Figs. 1 and 3), and a hydraulic cylinder 114 (Fig. 2) is provided for pivoting the shaker head into a plurality of positions, only three positions being illustrated in Figure 2. The hydraulic cylinder 31 (Figs. 1-3) is provided to move the harvester 20 closer to the trellis posts 120 (Fig.
20 9) of the grape vines being harvested while the tractor which pulls the harvester 20 will travel along a route spaced from the vines.

Figure 9 is an operational view of the harvester in operational position on a terraced vineyard illustrating the harvester
25 20 shaking grapes from the vines in one row. The harvested grapes fall into the V-shaped trough 48 for conveyance up the single conveying system 56 for discharge on the discharge conveyor 92 which deposits the harvested grapes into a truck for transportation to the market or to a winery.

Figure 10 illustrates two rows of trellis posts 130 and
30 132 having a horizontal beam 134 connected to the top of the posts with grapes and grape vines trained over the beams 134.

A tractor (not shown) is connected to the harvester
136 for pulling the harvester between the trellis posts 130 and 132 and for providing hydraulic and electrical power to the harvester for
35 enabling the harvester to harvest the grapes and/or raisins during daylight or at night.

As illustrated in Figure 11, the harvester 136 is in the form of a two wheel trailer having a platform 138 for supporting several boxes 140 for receiving grapes shaken from the vines.

A plurality of horizontally positioned power driven shaker heads 144 are rotatably supported on two pairs of parallel beams 146. The shaker heads 144 are the same as the shaker head 46 (Fig. 1) but are oriented horizontally rather than vertically as shown in Figure 1.

As illustrated in Figure 11, the beams 146 are pivotally connected to the platform 138 by four parallelogram linkages 147, and a pair of hydraulic cylinders 148, only one being shown in Figure 11. As is apparent in Figure 11, the hydraulic cylinders 148 are actuated to raise or lower the shaker heads 144 for shaking the grapes from the overhanging vines which grapes fall into the boxes 140.

Figures 12, 13 and 14 diagrammatically illustrate different relationships between the shapes of the trellises and the orientation of the shaking heads. Figure 12 illustrates a T-shaped trellis 150 with shaker heads 152 mounted horizontally which is desirable with young grape vines having the clusters of grapes hanging only a short distance from the top of the T-shaped trellis.

Figure 13 illustrates a Y-shaped trellis 154 having their upper ends angled at 30° relative to the ground and also having the axes of the shaker heads at 30° relative to the ground. Figure 14 illustrates a trellis post having a horizontal portion 158 which intermeshes with the tines 159 of a vertically oriented shaker head 160, and a second shaker head 164 having an axis which is oriented at 30° to the ground.

From the foregoing description it will be apparent that the single row grape and raisin harvester of the present invention is adapted to harvest dry grapes which are supported on vines which are harvested as raisins. Alternately, the harvester can harvest ripe grapes still attached to the vine and nourished by nutrients in the soil and sold as wine grapes or commercial grapes consumed by the public. The single row harvester is easily adapted to harvest the grapes or raisins from terraced rows of grape vines.

Although the best mode contemplated for carrying out the present invention has been shown and described it will be understood that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

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The claims defining the invention are as follows:

1. A harvester, for harvesting crops from plants, wherein the harvester is to be pulled by a power driven vehicle with a drawing means and with a direction of forward movement with a longitudinal axis in the direction
5 of forward movement and a right side of the forward direction and a left side of the forward direction, the harvester, comprising:

a frame;

a vertical shaker head mounted on the frame, having tines projecting
10 outwardly from the shaker head for engaging the plants and shaking the crop from the plants;

means for catching crop shaken from the plants;

means for connecting the frame to the power driven vehicle; and

means for moving the frame toward the right side of the forward
15 direction, and for moving the frame toward the left side of the forward direction.

2. The harvester, as claimed in claim 1, wherein the means for
connecting the frame to the power driven vehicle, comprises a tongue capable
of being pivotably connected to the drawing means of the power driven
vehicle and pivotably connected to the frame.

3. The harvester, as claimed in either of claims 1 or 2, wherein the
20 means for moving the frame, comprises a hydraulic cylinder mechanically
connected between the tongue and the frame.

4. The harvester, as claimed in any one of claims 1-3, wherein the
vertical shaker head comprises:

25 a vertical brush; and

means for oscillating the vertical brush.

5. The harvester, as claimed in claim 4, further comprising, a
power means for arcuately moving the vertical brush into contact with the
plants.

30 6. The harvester, as claimed in any one of claims 1-5, wherein the



means for catching crop, comprising:

a platform;

a first plurality of spring loaded plates on the right side of the platform; and

5 a second plurality of spring loaded plates on the left side of the platform.

7. The harvester, as claimed in claim 6, further comprising, a conveyor passing through the platform.

8. The harvester, as claimed in claim 7, wherein the conveyor
10 comprises a horizontal section, which conveys the crops in a substantially horizontal direction, and an upwardly inclined section, which conveys the crops in an upwardly direction.

9. The harvester, as claimed in either claim 7 or 8, wherein the platform is V-shaped, wherein the conveyor is at the bottom of the V-shape.

15 10. The harvester, as claimed in any one of claims 1-9, further comprising:

a discharge conveyor; and

means for swiveling the discharge conveyor to the right of the forward direction, to the left of the forward direction, or to the rear of the harvester.

20 11. A harvester substantially as hereinbefore described with reference to any one of Figures 1-9 of the accompanying drawings.

DATED: 11 January 1996

CARTER SMITH & BEADLE

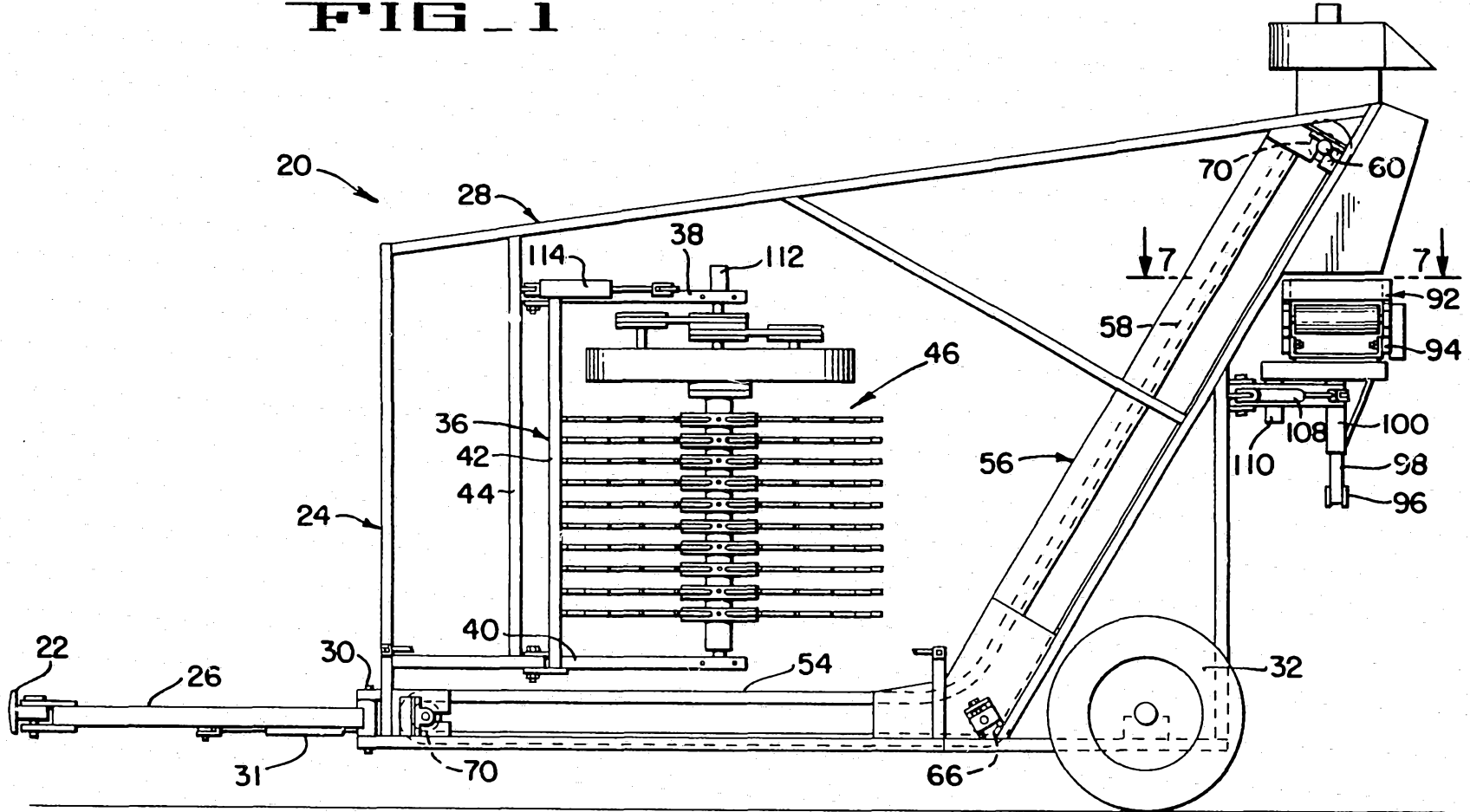
Patent Attorneys for the Applicant:

FMC CORPORATION



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FIG. 1

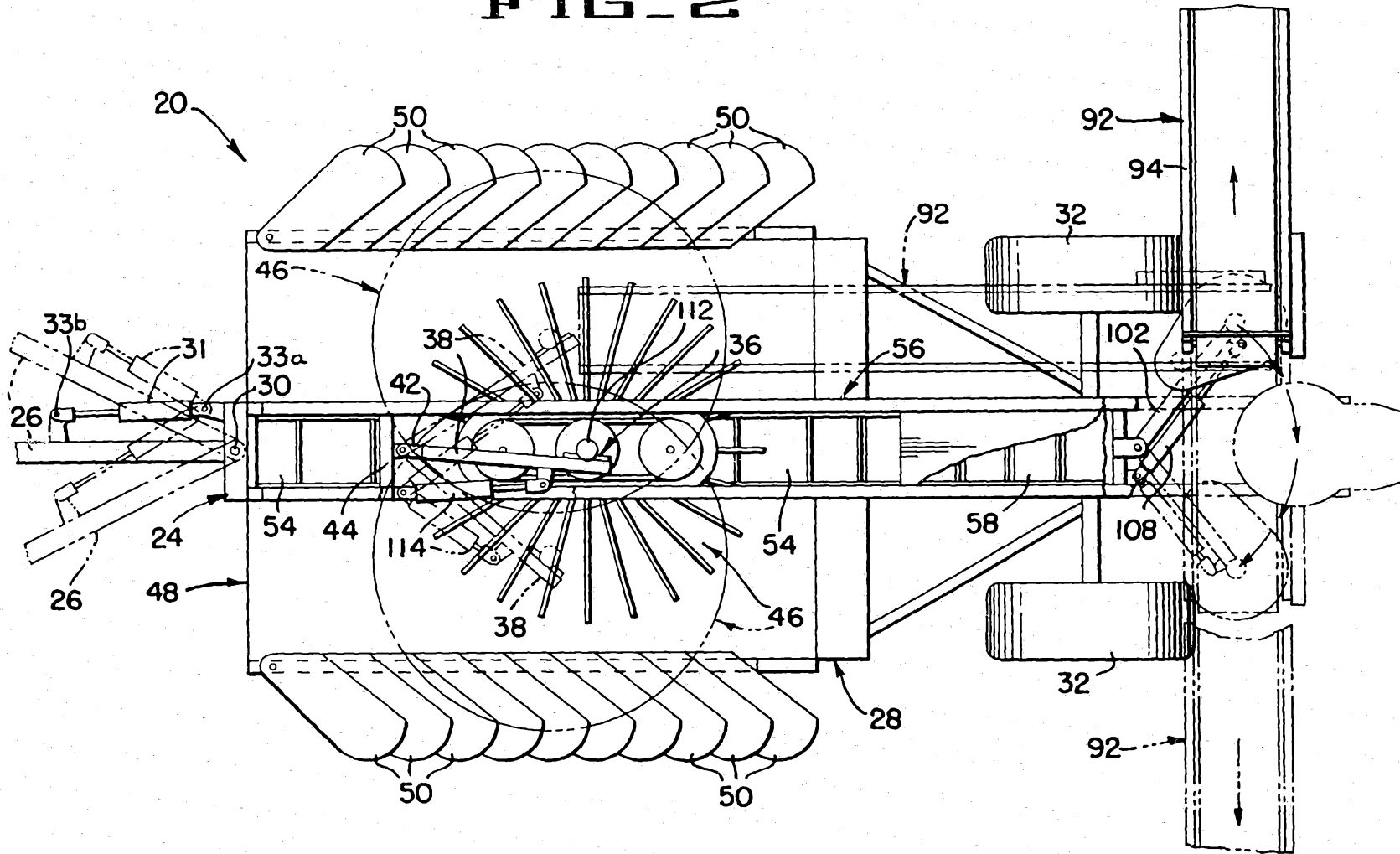


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FIG. 2

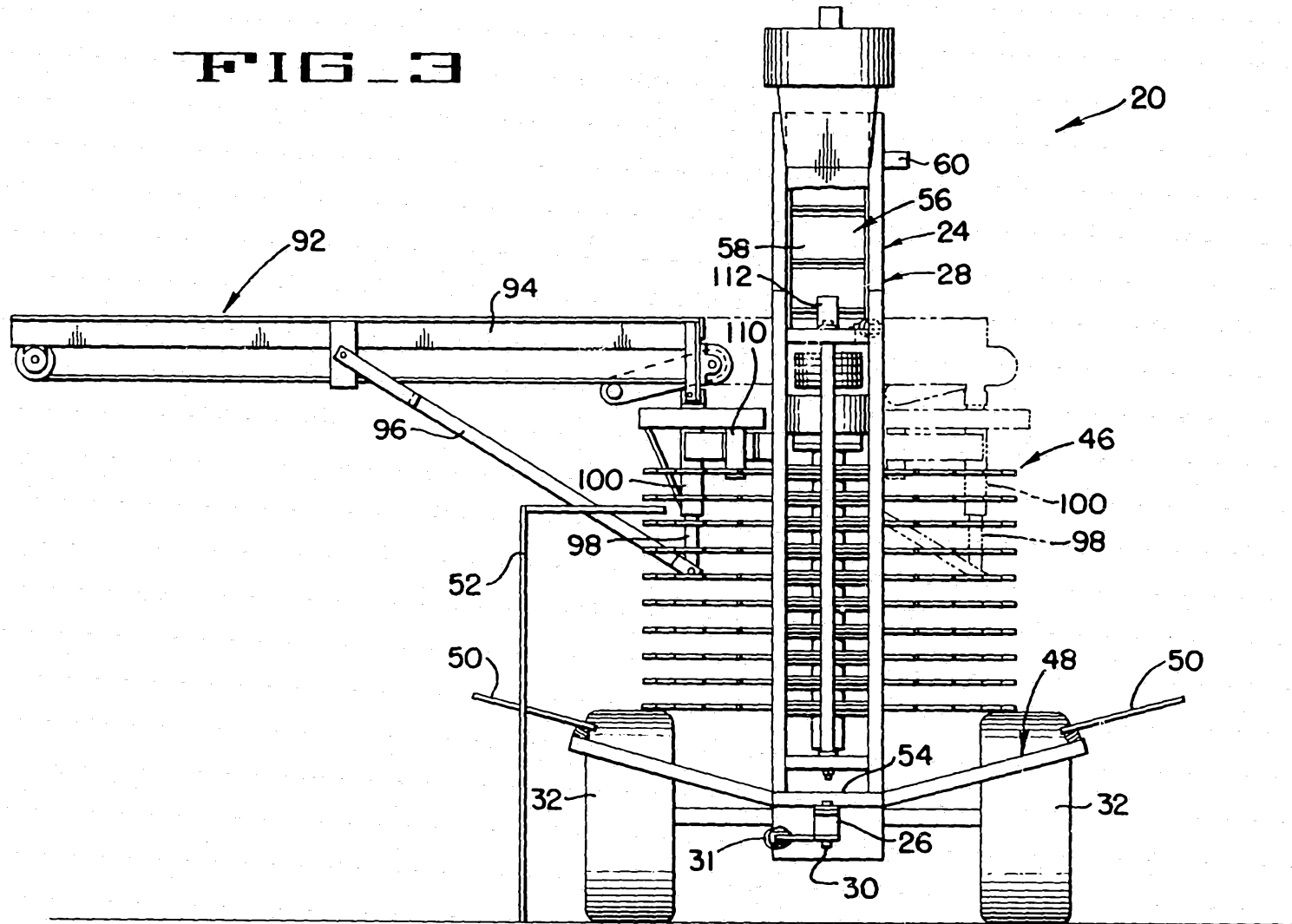


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FIG. 3



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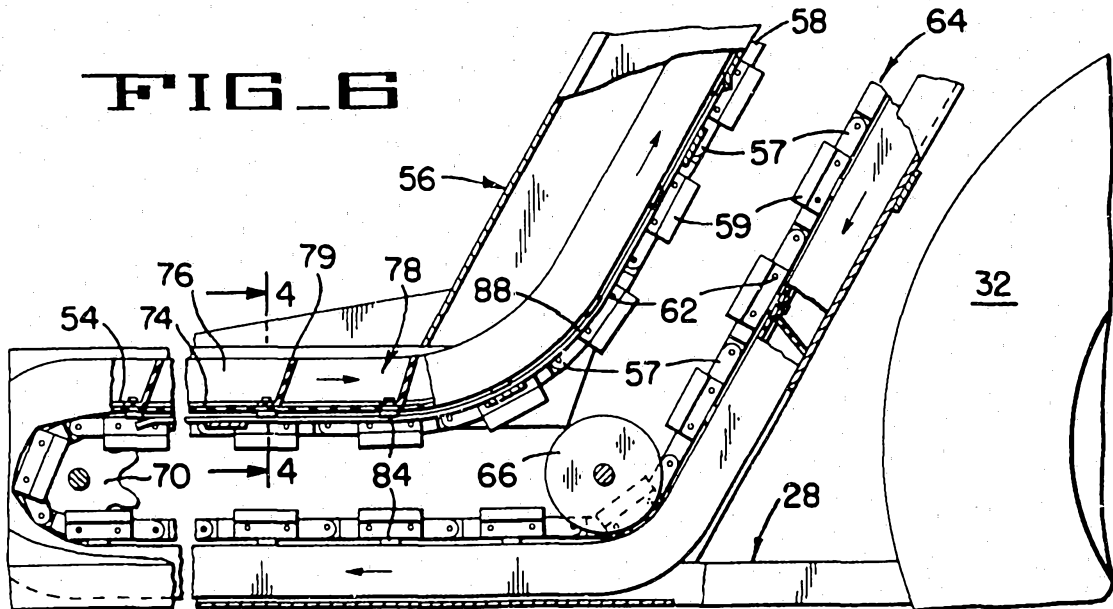
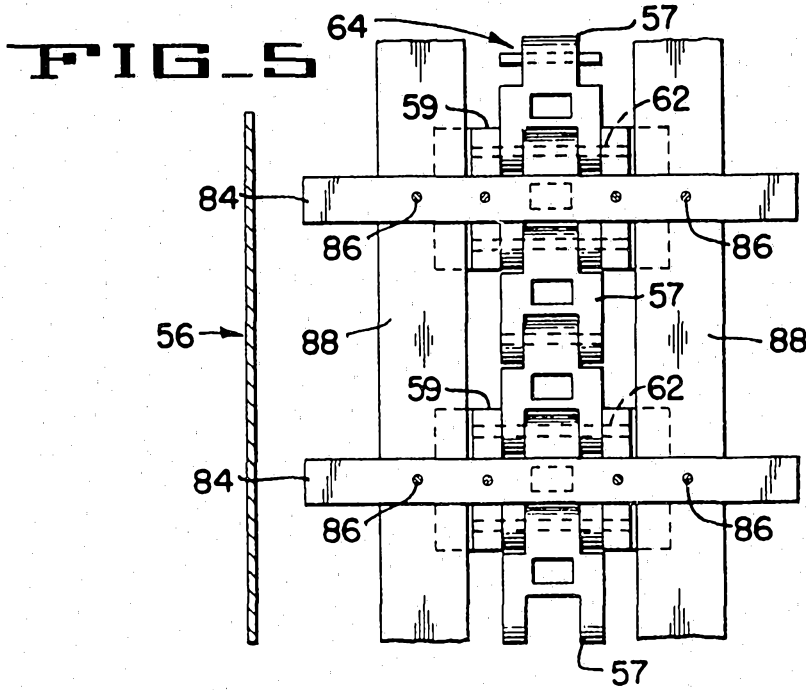
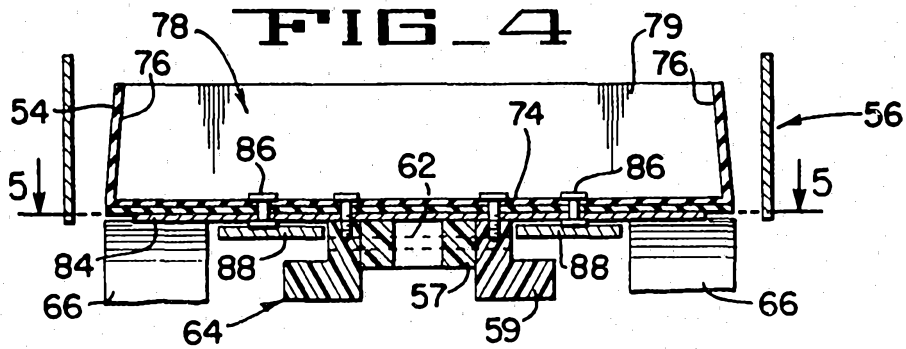


FIG 7

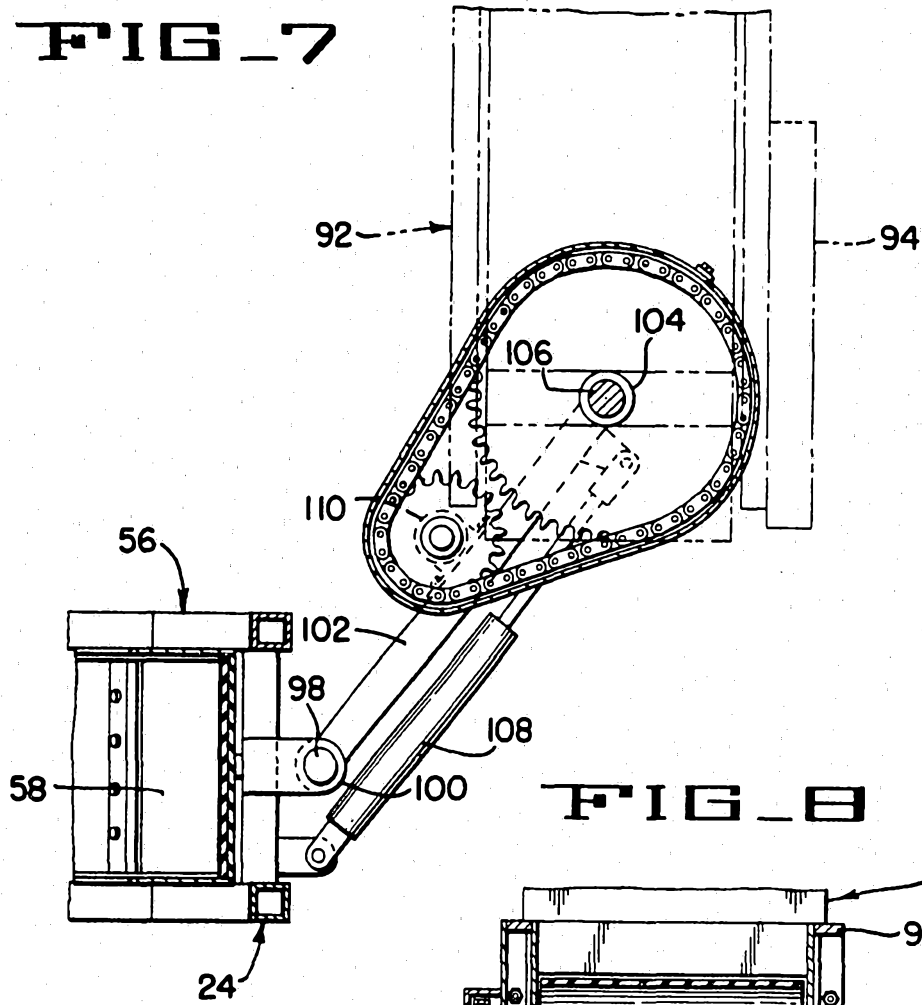
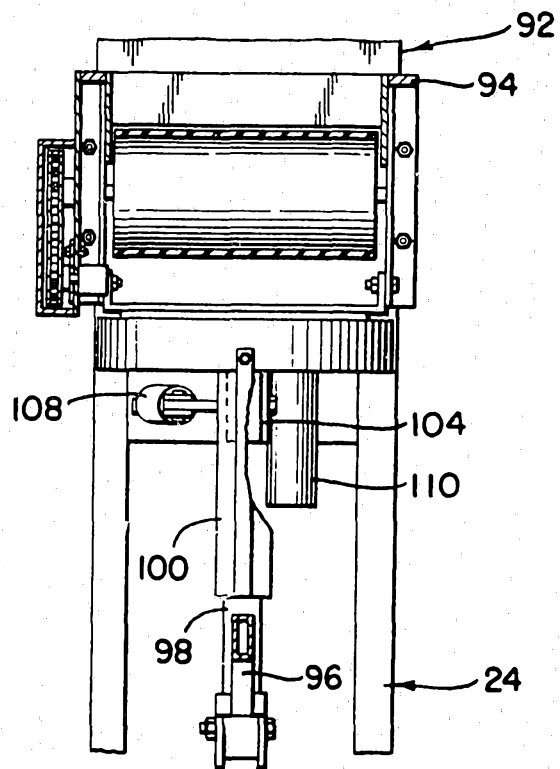
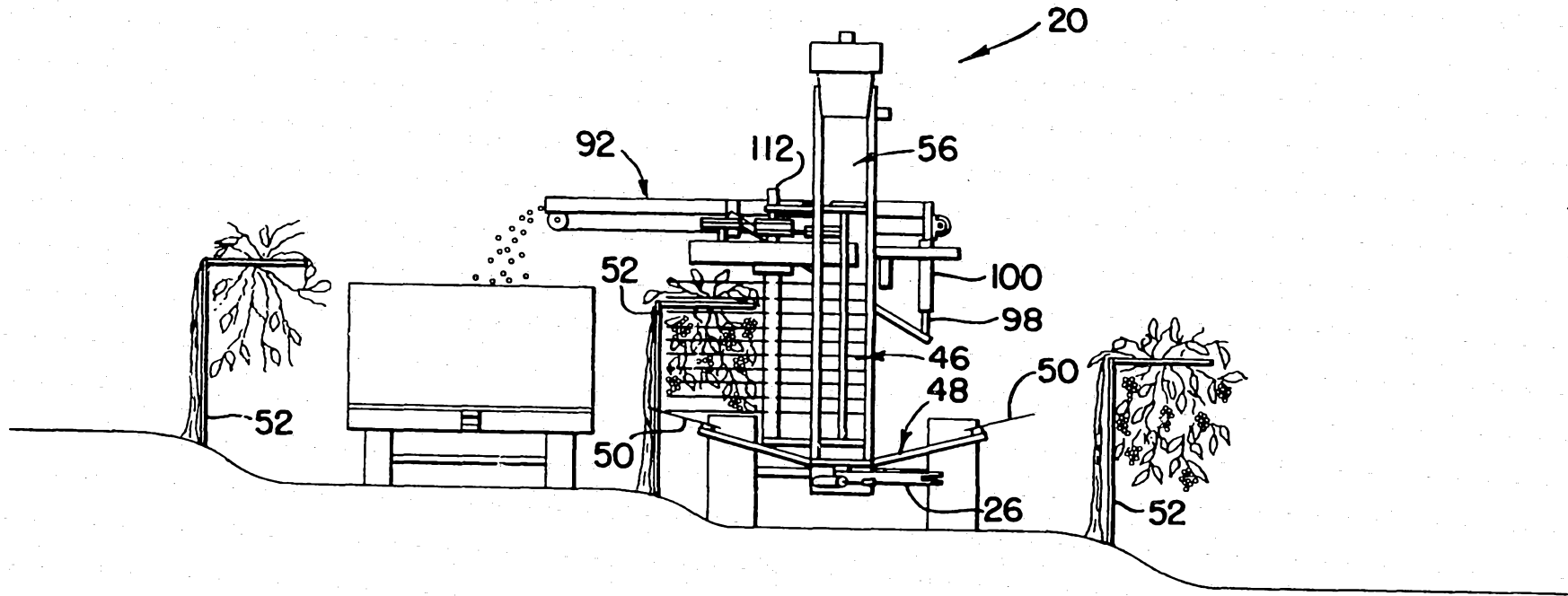


FIG 8



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FIG. 9



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FIG. 10

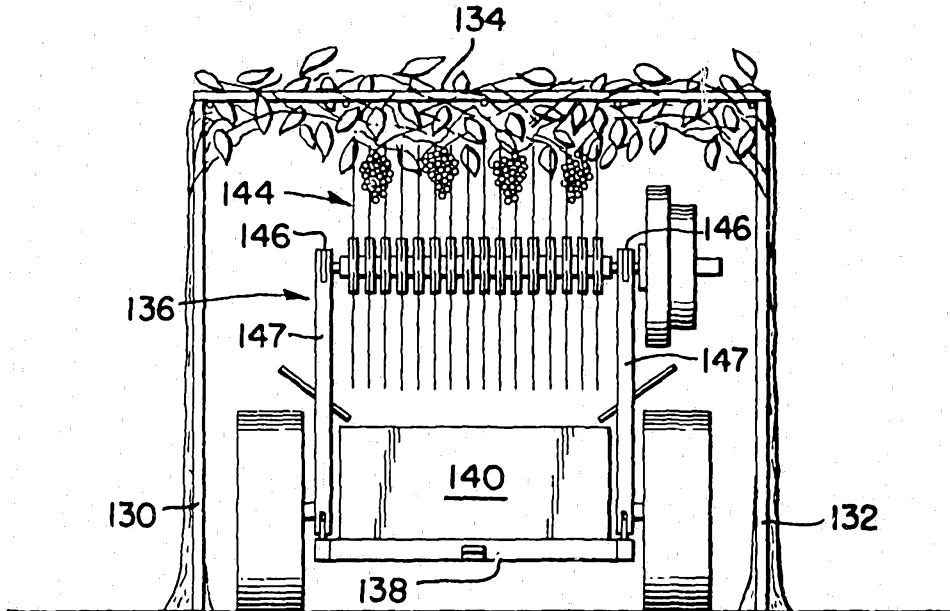


FIG. 11

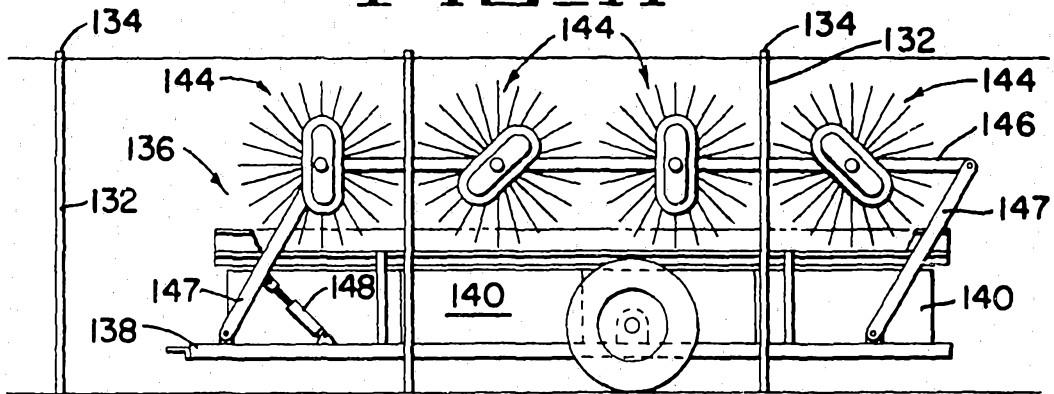


FIG. 12

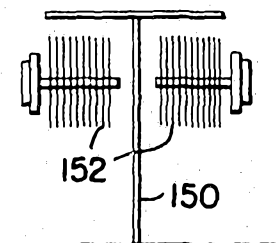


FIG. 13

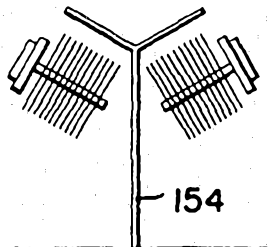


FIG. 14

