United States Patent [19]

Long

[11] **3,834,137**

[45] **Sept. 10, 1974**

[54] **METHOD AND APPARATUS FOR HARVESTING AND TREATING TOBACCO**

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[21] Appl. No.: **337,622**

[52] **U.S. Cl.** **56/27.5,** 56/DIG. 2

[51] **Int. Cl.** **A01d 91/04**

[58] **Field of Search** ..... 56/27.5, DIG. 2, 1; 214/5.5

[56] **References Cited**

UNITED STATES PATENTS

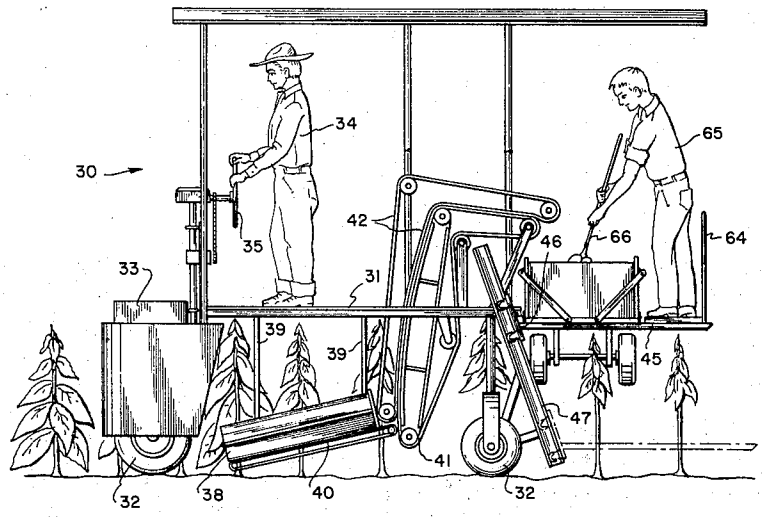
2,940,615	6/1960	Long et al.	214/5.5
3,203,562	8/1965	Long	214/5.5
3,215,288	11/1965	Long et al.	214/5.5
3,229,831	1/1966	Long	56/27.5 X
3,507,103	4/1970	Pickett et al.	56/27.5

Primary Examiner—Louis G. Mancene
Assistant Examiner—J. N. Eskovitz
Attorney, Agent, or Firm—A. Yates Dowell, Jr.

[57] **ABSTRACT**

Method and apparatus for selectively priming and removing tobacco leaves from a stalk without damage and automatically transferring such leaves onto a relatively large tobacco rack in a random haphazard manner, after which a plurality of frames, each of which includes multiple tines, are attached to the rack so that the tines pierce the tobacco leaves to hold such leaves in position. Thereafter the rack is rotated to an upright position to form a substantially uninterrupted column of tobacco leaves which is placed in a curing barn so that air under controlled conditions of temperature, humidity and pressure is caused to flow through the columns of tobacco leaves for curing the same.

3 Claims, 23 Drawing Figures



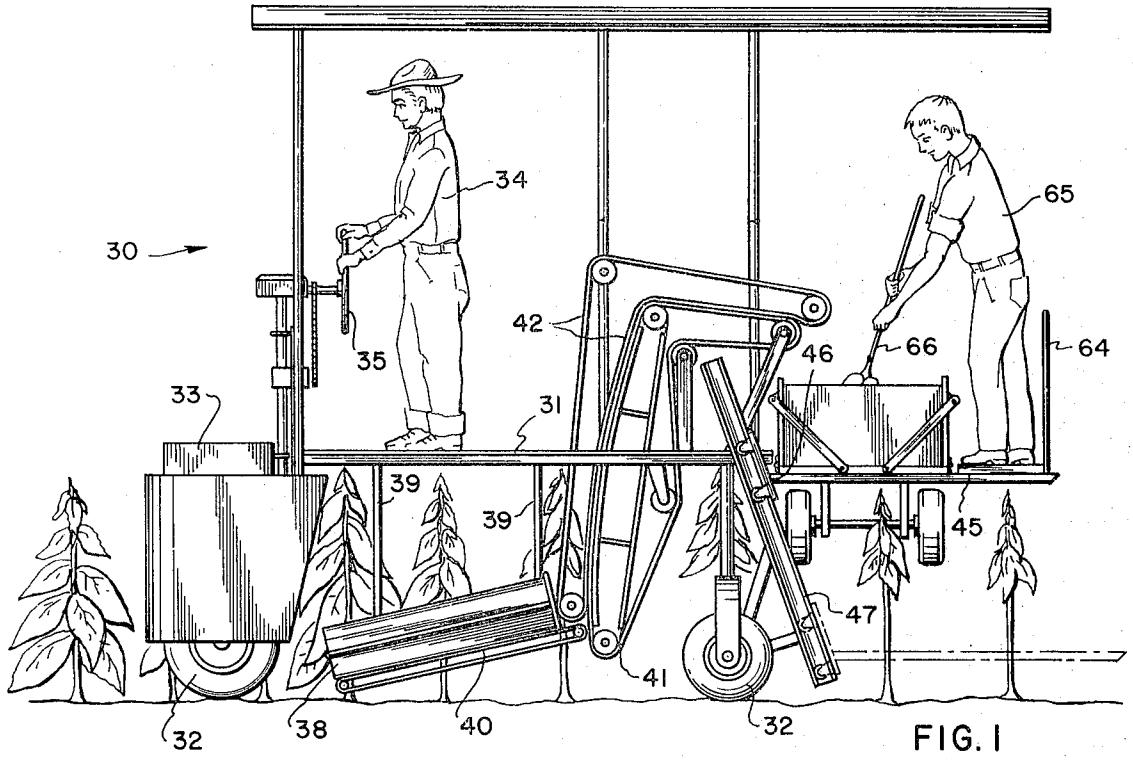

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FIG. 1

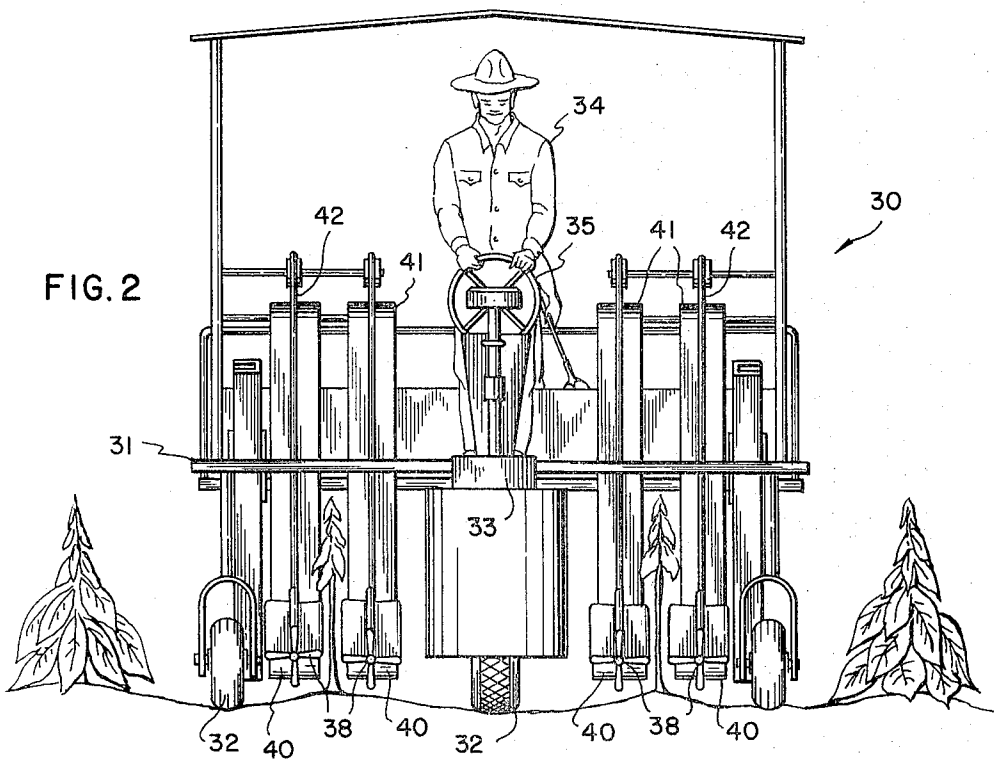
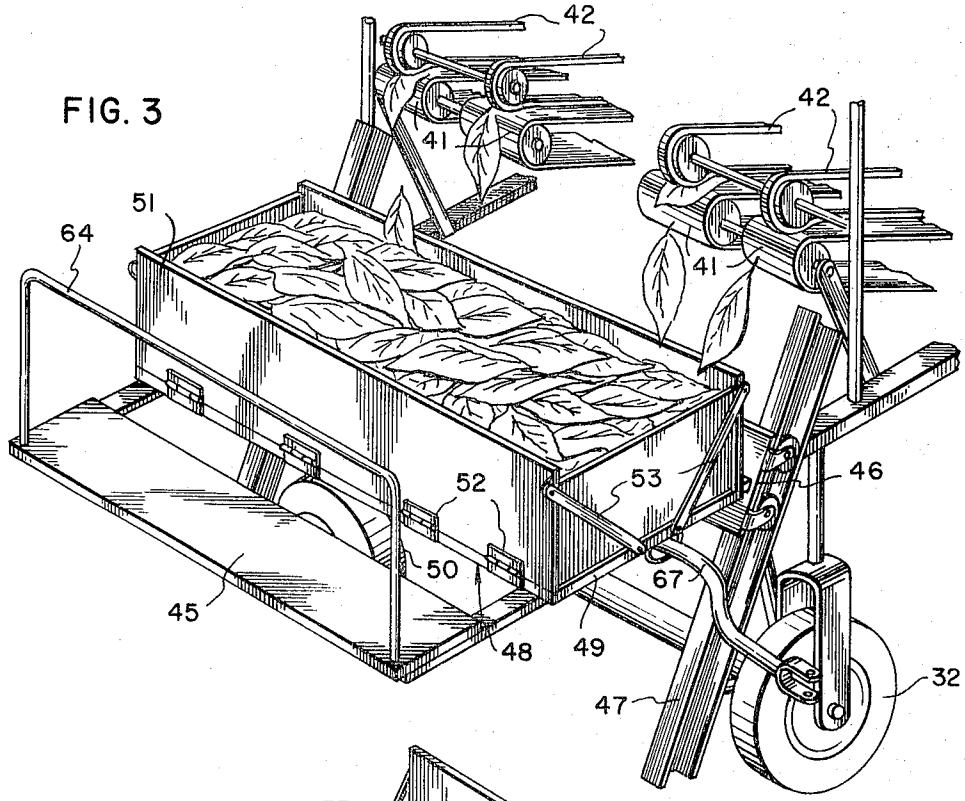

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FIG. 2

FIG. 3



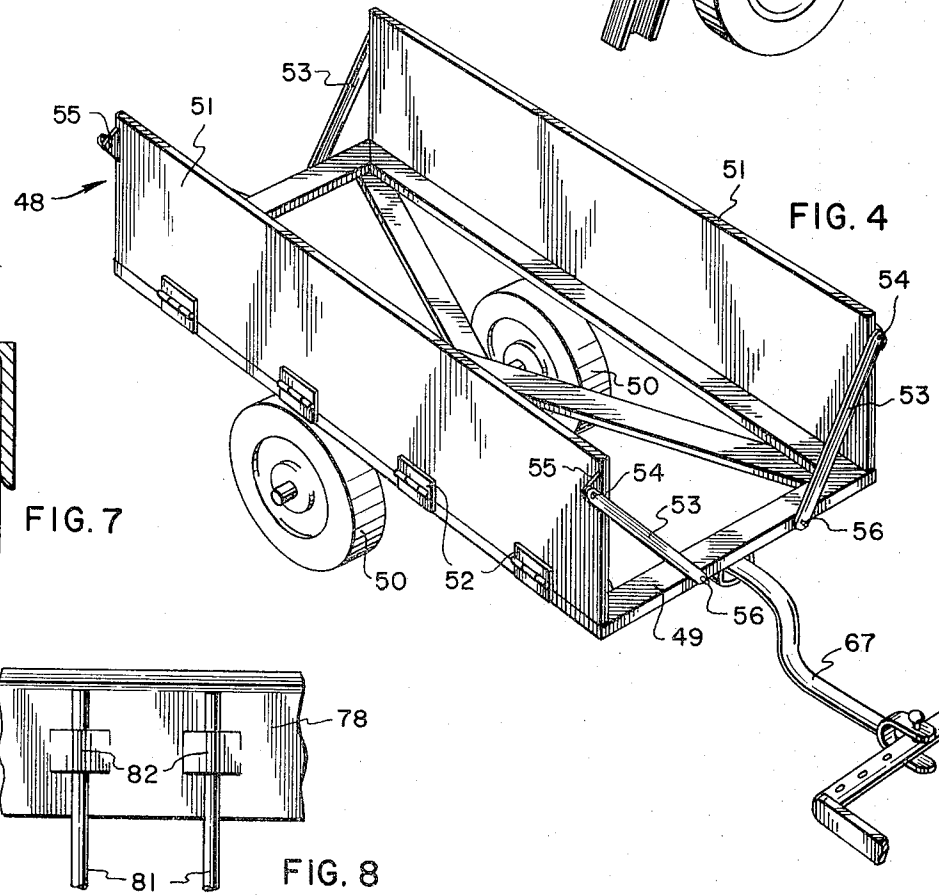


FIG. 4

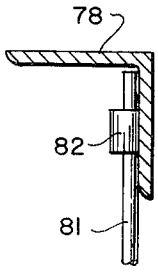


FIG. 7

FIG. 8

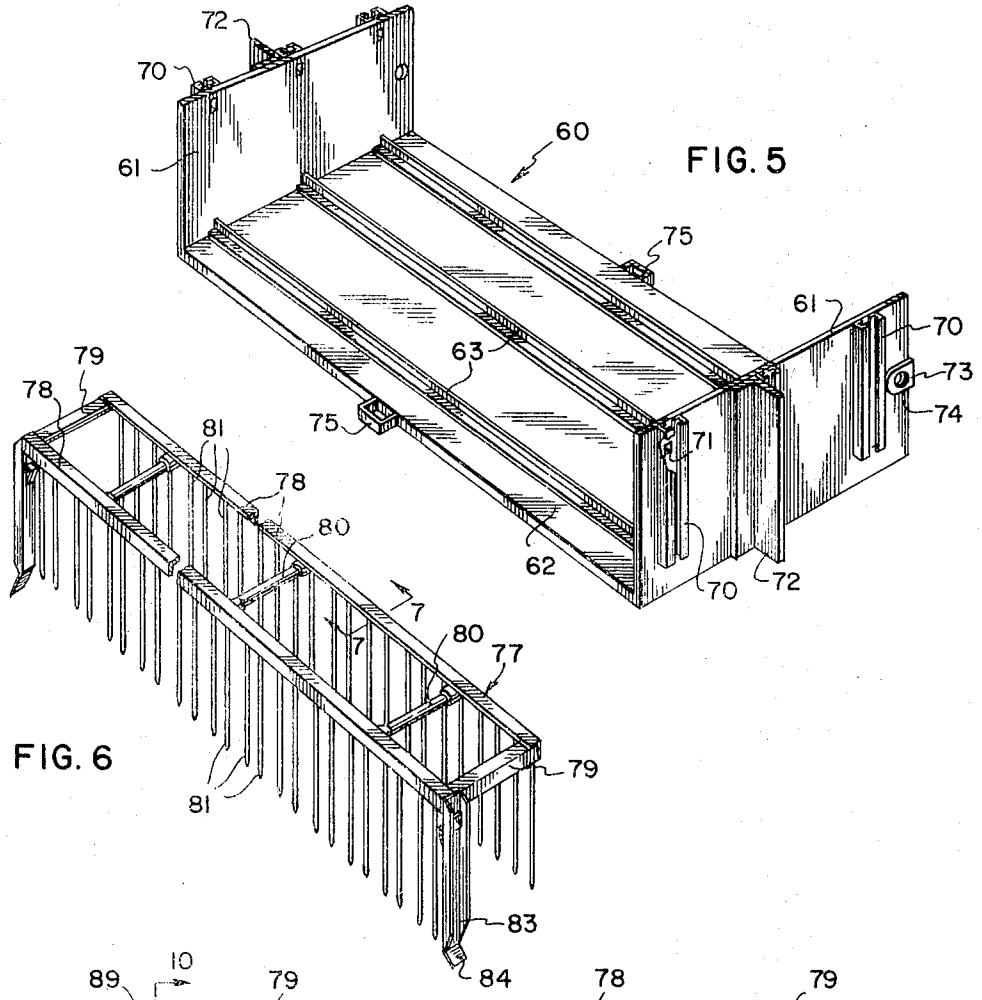


FIG. 5

FIG. 6

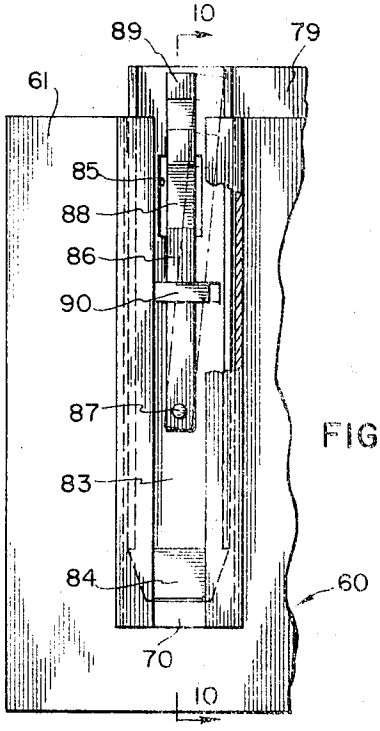


FIG. 9

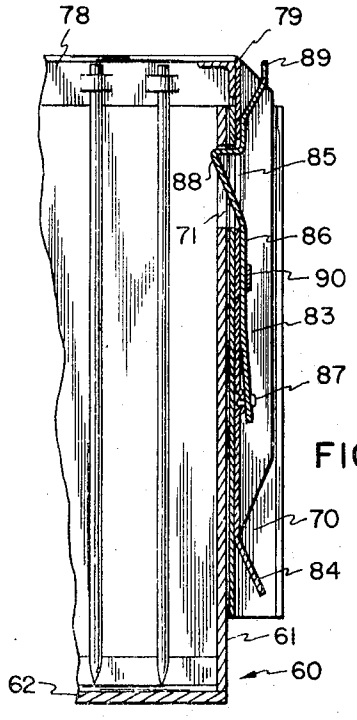


FIG. 10

FIG. 11

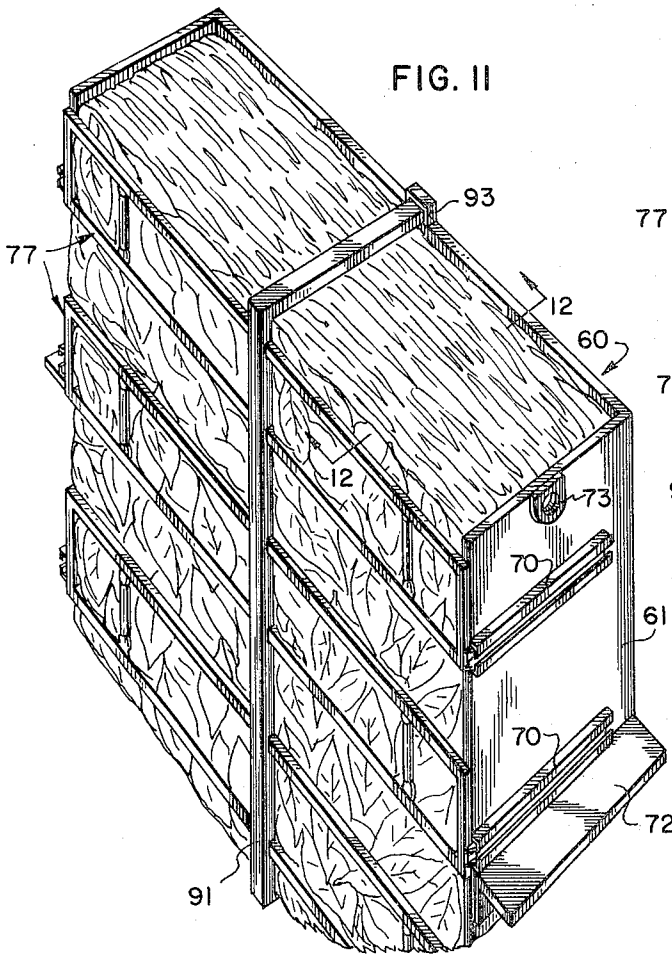


FIG. 12

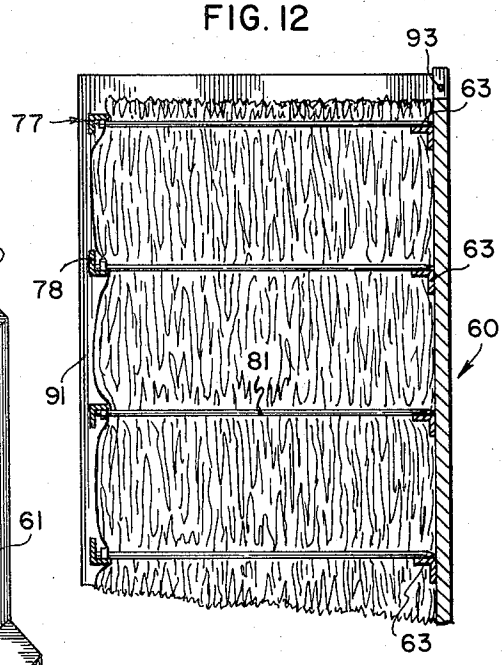


FIG. 13

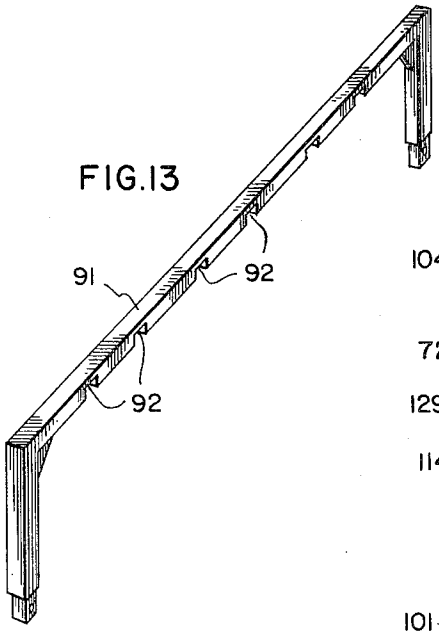


FIG. 16

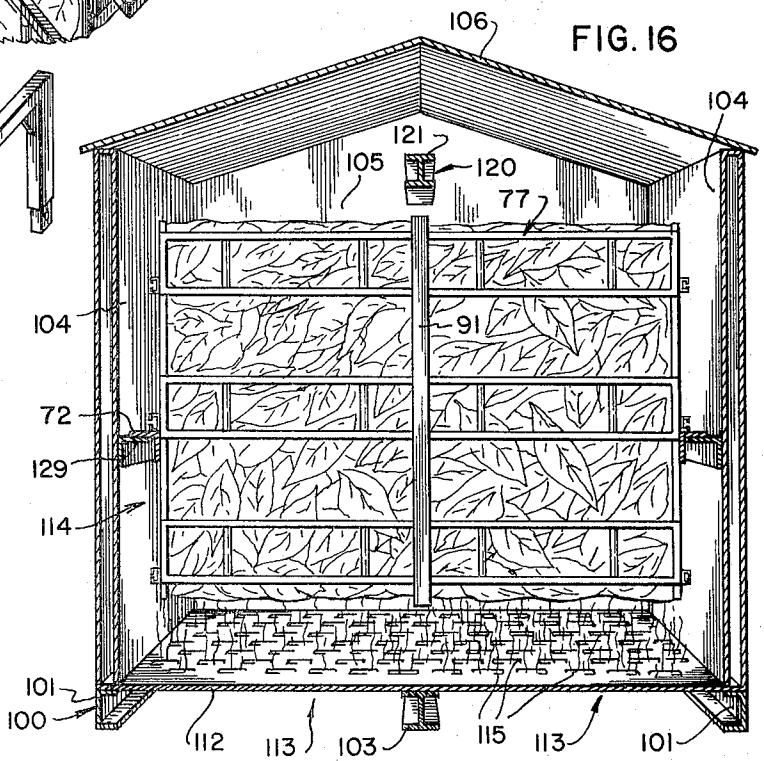


FIG. 14

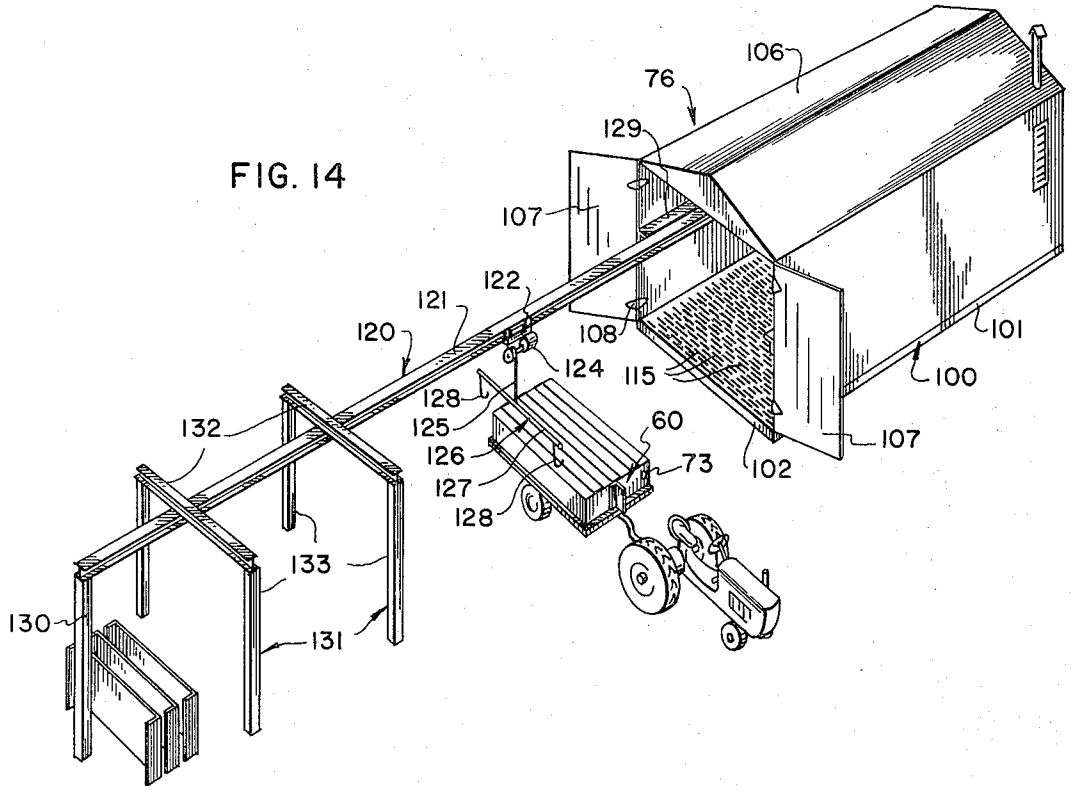
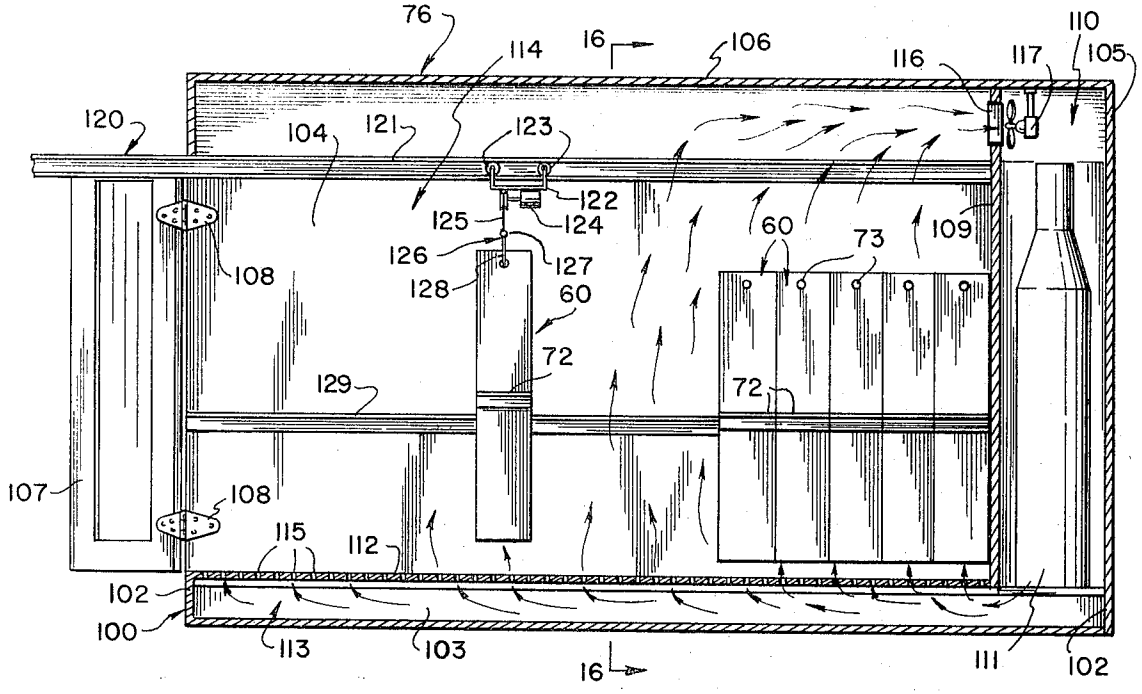

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FIG. 15


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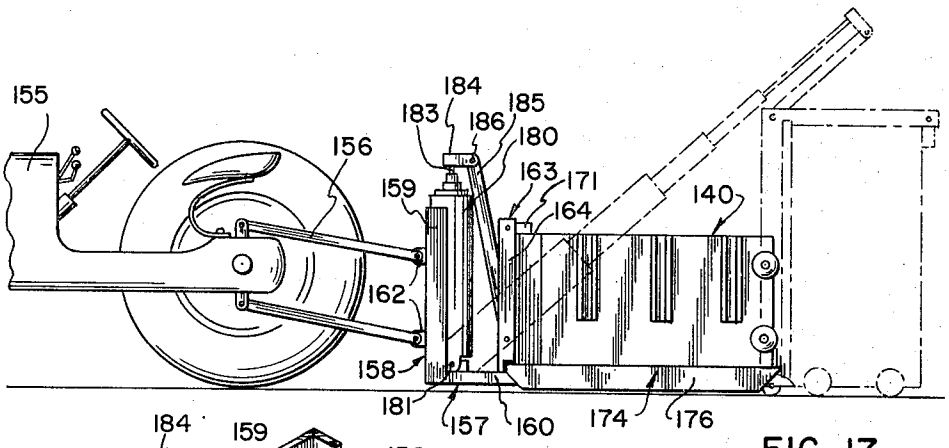


FIG. 17

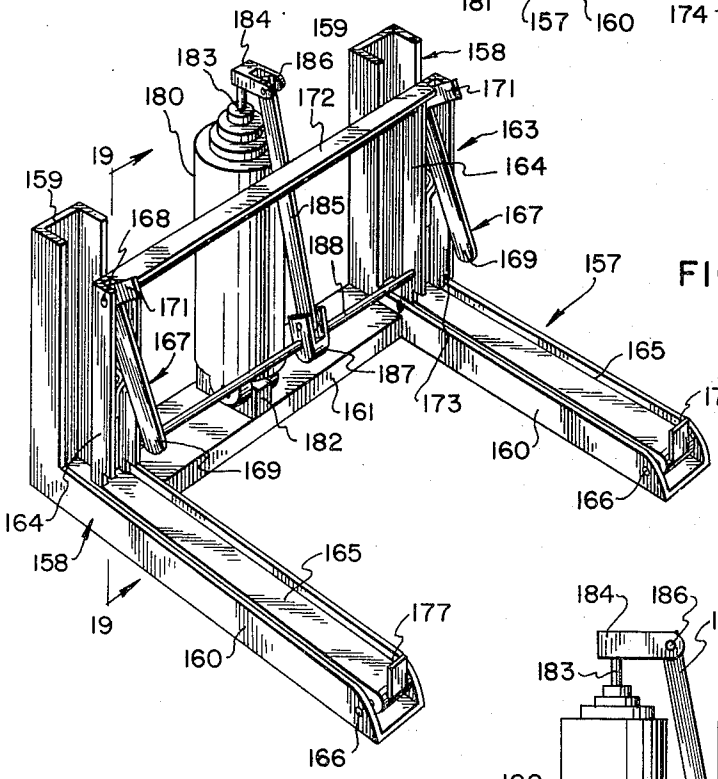


FIG. 18

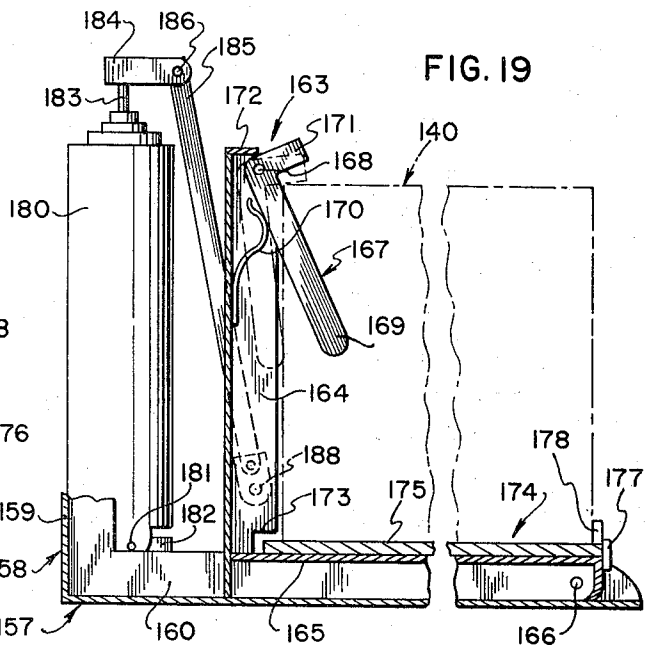


FIG. 19

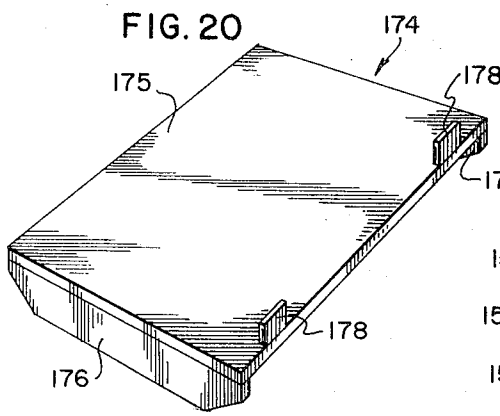


FIG. 20

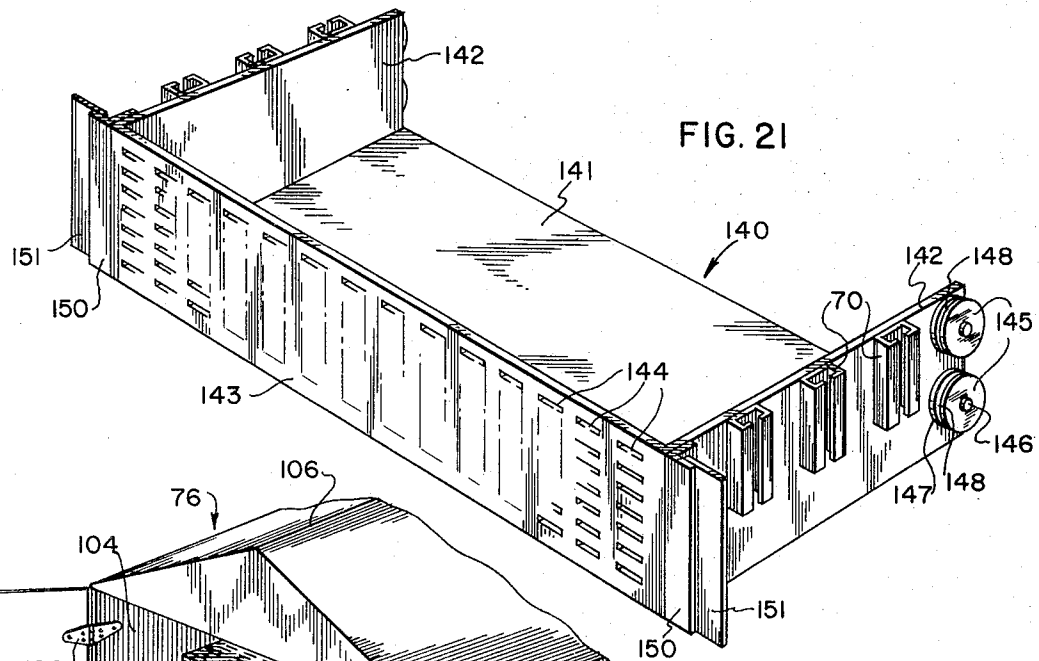


FIG. 21

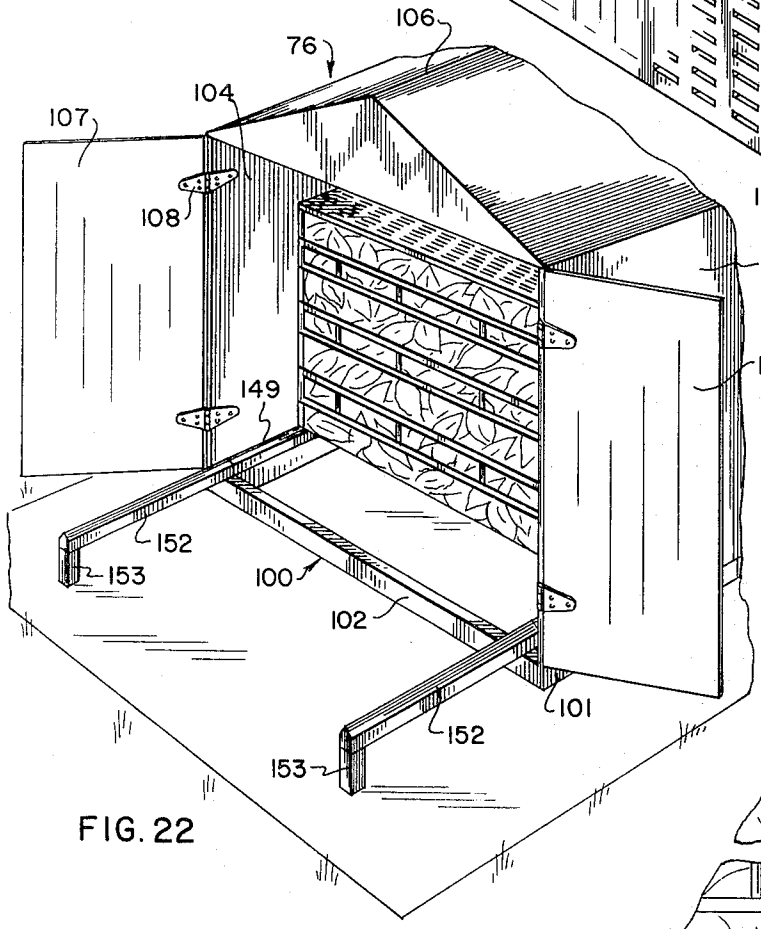


FIG. 22

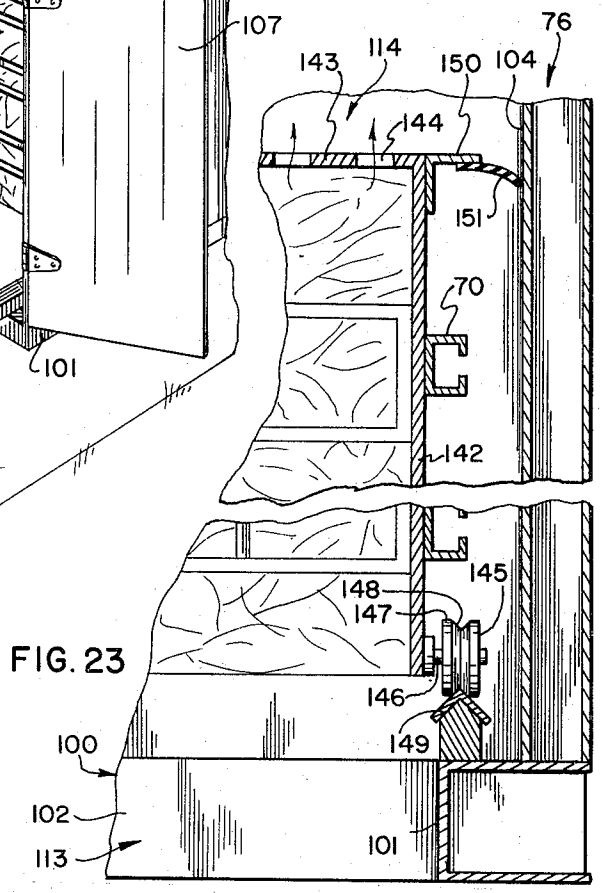


FIG. 23

METHOD AND APPARATUS FOR HARVESTING AND TREATING TOBACCO

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to the harvesting and treating of field crops and relates particularly to the method and apparatus utilized in the harvesting and treating of tobacco leaves automatically in an efficient manner requiring a minimum of labor.

2. Description of the Prior Art

Flue cured bright leaf tobacco matures from the ground up with the lowermost leaves reaching the curing stage several weeks in advance of the upper leaves. In order to obtain prime tobacco, it has been necessary to harvest the leaves at a critical period of the leaf development, and specifically when some of the starches have begun a physiological breakdown and have been converted to sugars.

Historically workmen have passed through the tobacco fields where they "primed" tobacco plants by selectively removing the mature leaves. The leaves then were taken to a tobacco barn where a small number of leaves were gathered together in a "hand" and placed astraddle a stick, and the sticks were placed in a tobacco curing barn where the leaves were cured. The curing process interrupts the physiological breakdown of the leaf so that the chlorophyl oxidizes under controlled conditions of heat and humidity in a manner that the leaf initially yellows after which the heat is raised to dissipate the water content of the leaf.

The harvesting of tobacco has been hard, monotonous labor which involved entire families with the men normally priming the tobacco plants, while the women and children gathered the leaves into hands, placed the hands on sticks and put the sticks into the barn. Some efforts have been made to decrease the labor and drudgery involved by providing tobacco harvesters such as the U.S. Pat. to Long Nos. 2,952,370 and 3,215,288 in which workmen were carried through a tobacco field and such workmen were located close to the ground so that they could prime the tobacco leaves, after which such leaves were conveyed upwardly where other workmen arranged the leaves on sticks or in racks with the leaves lying in the same direction and with the stems uppermost. The use of a tobacco harvester reduced the backbreaking work of bending over all day while priming the tobacco leaves; however, it did little for the drudgery and it still required seven or eight people for the proper operation of the harvester.

In recent years several agricultural colleges and universities have experimented with bulk curing of tobacco including the placing of tobacco leaves in a random haphazard manner within a tobacco rack of a height substantially equal to the length of a tobacco leaf. Some examples of this type of rack are the U.S. Pat. to Long No. 3,233,339; Hassler Nos. 3,105,713; 3,110,326 and 3,251,620. Additionally, a few larger tobacco racks such as disclosed in the U.S. Pat. to Bayette No. 3,088,603 and Whitley No. 3,659,889 have been provided in which the tobacco leaves have been arranged in a predetermined manner.

Some effort has been made to provide a harvester for automatically priming tobacco plants by removing tobacco leaves within a predetermined range above the ground. Some examples of this type of device are the U.S. Pats. to Wilson Nos. 2,816,411; 2,834,173; and 3,083,517; Suggs et al. U.S. Pat. No. 2,834,174; Splinter U.S. Pat. No. 3,093,949; and Pickett et al. U.S. Pat. No. 3,507,106. Initially automatic harvesters were not successful since the harvesters were non-selective and removed not only desired tobacco leaves but also any other vegetation including immature leaves, suckers, weeds and the like which had to be separated before the tobacco leaves were cured. Some experimenting has been done in which tobacco leaves were randomly placed in bulk tobacco racks; however, the suckers, weeds and the like reduced the quality of the material within the racks.

Bulk harvesting and curing of tobacco only become feasible upon the development of a machine which separated cured tobacco leaves from the leaves of other plants by color. Cured prime tobacco leaves are yellow or light brown in color, while suckers, weeds and other vegetation either remain bright green or turn very dark during the curing process. With the advent of the tobacco leaf separating machine, bulk curing became acceptable to tobacco buyers who now pay as much or more for bulk cured tobacco as they do for hand picked and cured tobacco.

SUMMARY OF THE INVENTION

The present invention is a method and apparatus for harvesting and treating tobacco in which the mature leaves of tobacco plants are stripped from the stalk automatically and such leaves are discharged into a relatively large rack in random haphazard manner, after which the leaves are secured in position. The rack is turned on one edge and placed in a curing barn with such rack extending substantially the full width and height of the barn and forming a substantially uninterrupted column of tobacco leaves. After the barn has been filled, the columns of tobacco leaves are treated under controlled conditions of temperature and humidity in a rapid efficient manner using a minimum of personnel and labor.

It is an object of the invention to provide a method of harvesting and treating tobacco leaves in a minimum of time and with minimum personnel by automatically stripping leaves from tobacco plants and placing such leaves directly into bulk curing racks which are inserted into a barn for curing.

Another object of the invention is to provide a relatively large bulk tobacco curing rack which supports randomly arranged tobacco leaves in a column within a curing barn in a manner such that the leaves in the column are cured without transferrng the leaves to other supporting structure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a tobacco harvesting machine.

FIG. 2 is a front elevational view thereof.

FIG. 3 is a rear perspective view of the harvester in use.

FIG. 4 is a perspective of a cart used in conjunction with a bulk tobacco rack.

FIG. 5 is a perspective view of a bulk rack.

FIG. 6 is a perspective view of a tine frame.

FIG. 7 is an enlarged fragmentary sectional view on the line 7—7 of FIG. 6 and illustrating a tine mounting apparatus.

FIG. 8 is a fragmentary side elevational view of the structure of FIG. 7.

FIG. 9 is an enlarged fragmentary end view of a bulk rack showing a tine frame in use.

FIG. 10 is a sectional view on the line 10—10 of FIG. 9.

FIG. 11 is a perspective view of a filled tobacco rack.

FIG. 12 is an enlarged sectional view on the line 12—12 of FIG. 11.

FIG. 13 is a perspective view of a strongback used with the bulk tobacco rack.

FIG. 14 is a perspective view of a tobacco curing barn.

FIG. 15 is an enlarged longitudinal sectional view of the barn of FIG. 14.

FIG. 16 is a sectional view on the line 16—16 of FIG. 15.

FIG. 17 is a side elevational view of a modified form of bulk tobacco rack and a fork lift handling mechanism.

FIG. 18 is a perspective view of the fork lift of FIG. 17.

FIG. 19 is a sectional view on the line 19—19 of FIG. 18.

FIG. 20 is a perspective view of a pallet used with the fork lift of FIG. 18.

FIG. 21 is a perspective view of a modified form of tobacco rack.

FIG. 22 is a fragmentary perspective view of a barn using the rack illustrated in FIG. 21.

FIG. 23 is an enlarged fragmentary sectional view of the barn of FIG. 22.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With continued reference to the drawings, a tobacco harvester 30 is provided having an elevated chassis 31 supported by ground-engaging wheels 32. The chassis 31 is located at an elevation high enough to be disposed above mature tobacco plants so that the harvester can pass through tobacco fields without damage to the plants. As illustrated in FIG. 1, an internal combustion engine 33 for propelling the harvester is carried by a steerable front wheel, although it is contemplated that such power plant could be mounted on the chassis 31 and connected by a chain or the like to drive either the rear wheels or the front wheels. An operator 34 is supported by the chassis 31 in a position accessible to a steering wheel 35 and the controls for driving the harvester through the tobacco field.

Suspended below the chassis 31 is at least one pair of defoliators 38 adjustably mounted on support posts 39 and such defoliators are normally inclined upwardly from front to rear, as illustrated in FIG. 1. Each of the defoliators includes a plurality of rotatable paddles constructed of rubber or the like which are adapted to engage opposite sides of the stalk of the tobacco plant and separate the lowermost leaves from the stalk by impact. A longitudinally disposed endless conveyor 40 is located below each of the defoliators in a position to receive the tobacco leaves which are removed from the stalks of the tobacco plants. Alternatively each of the defoliators could include a pair of front and rear end plates connected by a plurality of rods which move in an upward direction adjacent to the stalks and each of such rods may have one or more knives for cutting leaves from the stalks and transferring the separated leaves to the conveyor 40.

The conveyor 40 is rotated in any desired manner so that the upper run of the conveyor moves in a rearward direction. Adjacent to the rear end of the conveyor 40, an upwardly extending conveyor belt 41 removes tobacco leaves from the conveyor 40 and carries such leaves upwardly above the chassis 31 of the harvester. During the upward travel, the tobacco leaves are held in engagement with the conveyor 41 by a conveyor belt or strap 42 rotating at the same speed as the conveyor 41 and normally engaging the same. The lower end of the conveyor 42 is disposed slightly above the longitudinal conveyor 40 so that any leaves removed from the longitudinal conveyor are disposed between the upward conveyor 41 and the associated conveyor 42.

At the rear of the harvester 30, a platform 45 is provided and such platform is adapted to be raised and lowered by a carriage 46 mounted on inclined tracks 47 supported by the harvester, as illustrated in FIG. 3. It is contemplated that such platform could be monitored on a pair of parallel bars at each side of the harvester and a mechanism such as a cable or fluid cylinder could be provided for raising and lowering the platform in parallelogram action.

A cart 48 having a frame 49 supported by ground-engaging wheels 50 is carried by the platform 45 and is adapted to be raised and lowered therewith. The cart 48 can be of any desired size; however, in the structure illustrated, the frame 49 is approximately 10 feet long and 5 feet wide. Such cart is provided with a pair of sides 51 extending substantially the full length of the frame and being approximately 30 inches high. The sides 51 are connected by hinges 52 to the frame 49 and normally are maintained in an upright position in any desired manner, as by the use of braces 53 swingably mounted at one end by pivots 54 carried by lugs 55 fixed to the sides 51. The opposite ends of the braces are attached to the frame 49 by removable pins 56.

The cart 48 receives a relatively large bulk tobacco rack 60 having a pair of generally parallel ends 61 connected by a side 62. Such side may be provided with a plurality of longitudinally extending angle members 63, or such side could have a plurality of grooves or recesses (not shown) extending substantially the entire length thereof for a purpose which will be described later. The rack 60 is at least 8 feet long and preferably is approximately 9 feet 6 inches long and 5 feet wide so that when such rack is placed on the cart 48 in a horizontal position with the side 62 lowermost, the ends cooperate with the sides 51 of the cart to define an open topped container.

The cart 48 with the rack 60 mounted thereon is located below the discharge end of the conveyor 41 so that tobacco leaves carried by such conveyor are randomly discharged into the open topped container in a disorganized manner. As illustrated in FIGS. 1 and 3, a guard rail 64 is mounted on the rear of the platform 45 so that a workmen 65 can stand on the platform 45 and such workman has a pitch fork 66 or other tool for distributing the tobacco leaves throughout the rack 60. Tobacco leaves are discharged into the rack until the leaves are mounded above the top of the rack and the harvester reaches the end of the row of tobacco plants.

When the rack is filled, the platform **45** is lowered to the ground and a tractor or other propelling vehicle hitches onto a tongue **67** of the cart and removes the cart with the filled rack from the platform. A cart having an empty rack is placed on the platform after which the platform is raised and the harvester again is driven by the operator **34** into the tobacco field.

Each end **61** of the rack is approximately **23** inches wide and is provided with a plurality of guides **70** extending from the open side of the rack toward the side **62.** The guides **70** are welded or otherwise permanently attached to the exterior surface of the ends **61** and an opening **71** is provided in the end member and each associated guide for a purpose to be described later. Each of the ends **61** also has an outwardly extending flange **72** welded or otherwise attached thereto and such flange normally extends from side to side of each end. When the rack is being filled, the side **62** rests on the cart; however, after the rack is full, it is adapted to be rotated 90° so that one edge is uppermost. In order to rotate the rack, an opening **73** is provided adjacent to the upper edge of the ends **61** and if desired a reinforcing boss **74** can be provided about each of the openings **73.** Intermediate the ends **61,** the side **62** is provided with a pair of sockets **75** located adjacent to the upper and lower edges of the side **62.**

After the rack has been filled with tobacco leaves, the cart with the filled rack is pulled by a tractor or other propelling vehicle to an area adjacent to a tobacco barn **76.** Any excess tobacco leaves are removed from the rack and are placed in an overflow rack or other container until the tobacco carried by the rack is disposed slightly above the open side of the rack. A plurality of pin frame **77** are attached to the rack to compress the tobacco leaves and to hold such leaves in position on the rack. Each of the pin frames includes a pair of elongated spaced generally parallel side members **78** connected at opposite ends to end members **79.** Intermediate the end members **79,** the side members **78** are connected by a plurality of braces **80** by means of which the pin frames are handled and pressure is applied thereto.

With particular reference to FIGS. **6–8,** each of the side members **78** of the pin frame **77** is provided with a plurality of elongated pins or tines **81** which extend outwardly approximately 22-½ inches. The upper ends of the tines are fixed to the side members **78** in any desired manner, as by forming outstruck straps or bands **82** in the downwardly extending flange of the side members and locating the upper ends of the tines within the straps after which the straps are collapsed to hold the pins in addition. It is noted that the pins can be mounted in any other desired manner, as by welding, clips, sockets or the like. Each of the end members **79** is provided with an elongated tongue **83** welded or otherwise attached at one end to the end member and extending outwardly therefrom in the direction of the tines **81.** Such tongues are adapted to be received within the guides **70** carried by the racks and in order to facilitate insertion into the guides, the free end of each tongue has an outwardly inclined portion **84.** Each tongue has an opening **85** adapted to be moved into registration with the openings **71** in the guides **70.**

In order to lock the pin frames **77** to the rack **60,** a leaf spring **86** is connected at one end by a pivot **87** to the tongue **83.** An offset catch **88** is provided intermediate the ends of the leaf spring **86** and such catch normally extends through the opening **85** of the tongue **83** and through the opening **71** when the openings **85** and **71** are in registration. The catch **88** locks the pin frame **77** to the rack. The free end **89** of the leaf spring is inclined outwardly from the tongue **83,** as indicated best in FIG. **10,** to facilitate removal of the catch **88** from the openings **71** of the rack. If desired the leaf spring **86** can be rotated slightly so that it is out of registration with the opening **85,** as illustrated in broken lines in FIG. **9,** so that the leaf spring remains in unlocked position. This is particularly useful when the pin frames **77** are being removed from the rack **60.** To limit swinging movement of the leaf spring **86,** as well as to relieve tension on the pivot **87,** a bridge or yoke **90** is welded or otherwise attached at opposite ends to the tongue **83** and such bridge has a raised central portion overlying the leaf spring **86.**

When the cart with the filled rack is pulled to the barn **76,** a plurality of pin frames **77** are mounted on the rack by inserting opposite tongues **83** into the guides **70** and applying a downward force to the pin frames to compress the tobacco leaves on the rack and cause the tines **81** to penetrate the tobacco leaves until the catch **88** of the leaf spring snaps into the openings **71** of the rack. After the pin frames are in position, a generally U-shaped strongback **91** (FIGS. **11–13**) having notches **92** is mounted on the rack with the ends of the strongback being received within the sockets **75** of the rack and connected thereto in any desired manner, as by pins **93.** The notches **92** are spaced apart a distance sufficient to receive the side members **78** of the pin frames to support the central portion of the pin frame and to prevent sagging thereof due to the weight of the tobacco leaves.

As illustrated in FIG. **12,** the penetrating ends of the tines **81** are located adjacent to the angle members **63** of the rack so that such angle members support the free ends of the tines and prevent the tines from bending due to the weight of the tobacco leaves. After the pin frames and the strongback have been attached to the rack **60,** the filled rack of tobacco leaves is ready to be rotated substantially 90° and placed in the barn for curing.

The arrangement of a plurality of pin frames locked to a rack and supporting a large mass of tobacco leaves constitutes a substantially uninterrupted column of tobacco leaves approximately 9 feet 6 inches long, 5 feet high and 23 inches wide.

The barn **76** includes a base **100** constructed in any desired manner, as by a pair of spaced generally parallel side members **101** connected at opposite ends by end members **102.** Preferably the side members **101** and end members **102** are channel shaped in cross-section and the end members are connected by an I-beam **103** located generally along the longitudinal axis of the base **100.** Above the base **100,** the barn **76** includes side walls **104,** a rear wall **105,** and a roof **106.** The front of the barn normally is closed by a pair of swinging doors **107** mounted on hinges **108.** Spaced inwardly from the rear wall **105** is a partition **109** defining a heater compartment **110** within which a heater **111** is mounted. The heater preferably is either gas or oil fired; however, if desired such heater could use electrical resistance heating elements or other heating medium. A floor **112** is mounted on the upper portion of the base **100** and separates a pair of plenum chambers

113 within the base 100 from a treating chamber 114 within the barn.

The heater is operated either manually or automatically to produce controlled conditions of heat and humidity within the barn. Such heater has a fan (not shown) which blows air downwardly into the plenum chamber 113 to raise the pressure within the plenum chambers. In order to permit the heated air to circulate through the treating chamber 114, the floor 112 is provided with a pattern of elongated slots 115 which define openings of from 3 to 10 percent of the total floor area. Preferably the openings are limited to from 4 to 7 percent of the total floor area since this produces a more desirable air flow which is substantially constant throughout the barn due to the pressure differential between the plenum chambers 113 below the floor 112 and the treating chamber 114 above the floor.

The barn 76 may be of any desired size, although a barn approximately 30 feet long, 10 feet wide and 10 feet high has been found satisfactory. To assist in circulating air through the plenum chambers 113 and the treating chamber 114, the partition 109 has an opening 116 located adjacent to the roof 106. A fan 117 is located within the heater compartment 110 and is adapted to draw air from the treating 114 and the plenum chambers 113 into the heater compartment 110 where such air is heated and returned to the plenum chambers 113.

In order to move the racks into the curing barn, an overhead hoist 120 is provided having a rail 121 located along the longitudinal axis of the barn in the upper portion of the treating chamber 114 and extending outwardly of the barn a substantial distance, as illustrated in FIGS. 14–16. A hoist carriage 122 is movably supported by wheels 123 and such carriage may have an electrically operated winch 124 or such carriage may have a manually operated chain fall or block and tackle. The winch 124 has a cable 125, the free end of which is connected to a bridle 126 including a beam 127 having hooks 128 swingably connected at each end. The hooks 128 are spaced apart a distance sufficient to engage the openings 73 in the ends of the rack 60 so that the winch 124 can be operated to lift a rack from the cart 48.

After the rack has been lifted from the cart, the carriage 122 is moved along the rail 121 so that the rack is moved into the barn. In order to support the rack 60 a pair of side rails 129 are connected to opposite sides of the interior of the barn and such rails are spaced a predetermined distance above the floor 112. The hoist carriage 122 moves the rack of tobacco leaves into the barn until the rack engages the partition 109 or abuts a previously positioned rack after which the winch 124 lowers the rack until the flanges 72 at opposite ends of the rack engage the side rails 129 which support the rack.

After the bridle 126 is disconnected from the rack, the carriage 122 is moved outwardly of the barn and to an area adjacent to the opposite end of the rail 121 which constitutes a storage area for empty racks. In order to support the outer end of the rail 121, an upright post 130 has its lower end embedded in the earth and its upper end engaging and supporting the outer end of such rail. The post 130 may be a substantial distance from the front of the barn, such as a distance of 40 feet or more and it may be necessary to support the rail at one or more places intermediate its length. In order to do this, one or more bridges 131 are provided each of which includes a central span 132 supported at opposite ends by upright posts 133. The central portion of the span 132 is welded or otherwise attached to the upper portion of the rail 121 to support such rail in substantially level position.

In the operation of this modification, an empty rack 60 is placed on its side on a cart 48 after which the cart is mounted on the platform 45 of the harvester with the rack located below the discharge end of the conveyors 41 and 42. As the harvester 30 moves through a field of tobacco plants, the defoliators 38 remove the lowermost tobacco leaves from the stalks of the tobacco plants and discharge such leaves onto the longitudinal conveyor 40 which transfers the leaves to the conveyors 41 and 42. The lift conveyors 41 and 42 raise the tobacco leaves to a higher elevation and discharge such leaves in a random, haphazard, disorganized manner into the rack 60 where a workman distributes the leaves throughout the rack. When the rack has been filled and the harvester has reached the end of a row of tobacco plants, the platform 45 is lowered and the cart with the filled rack is removed therefrom. A cart with an empty rack is placed on the platform and the platform is raised after which the operator 34 again drives the harvester 30 into the field.

The cart with the filled rack is pulled by a tractor or other propelling vehicle to an area adjacent to the barn 76 where a plurality of pin frames 77 are latched onto the rack with the tines 81 piercing the tobacco leaves to hold such leaves in position. Thereafter the hoist carriage 122 is moved to a position above the rack and the hooks 128 are engaged in the openings 73 of the rack. When the winch 124 is operated, the rack is rotated to an upright position and the carriage 122 moves along the rail 121 and carries the rack into the barn 76 where the rack is lowered until the flanges 72 engage the side rails 129. After the bridle 126 is disconnected from the rack, the carriage 122 is moved to the opposite end of the rail to the rack storage area where an empty rack is picked up by the bridle and winch and the empty rack is placed on the cart 48.

With reference to FIGS. 17–23, a modified form of tobacco rack and apparatus for handling the same are disclosed. In this structure a rack 140 is provided having a side 141 with end walls 142 at opposite ends thereof. As in the previous modification, the end walls 142 are provided with guides 70 which receive pin frames 77 for holding the tobacco leaves in position. The rack 140 is provided with a top wall 143 having a plurality of elongated slots 144 arranged in a predetermined pattern with such slots providing openings which constitute approximately 4 to 7 percent of the total surface area of the top wall 143.

Adjacent to the bottom edge of the rack when the rack has been moved to an upright position for curing the tobacco, a pair of rollers or wheels 145 are rotatably mounted on stub axles 146 carried by each of the end walls 142. Preferably the rollers 145 extend below the edges of the end walls so that the rollers support the rack is spaced relationship with the ground. With particular reference to FIG. 23, each of the rollers has a substantially flat tread 147 with a V-shaped groove 148 located centrally thereof.

In this modification the overhead hoist 120 and the side rails 129 of the previous embodiment are eliminated and the barn 76 is provided with a pair of in-

verted V-shaped rails **149** supported by the side members **101** of the base of the barn. Since the top wall **143** is provided with a plurality of slots to control the flow of air through the barn, the floor **112** of the previous modification can be eliminated so that in effect the columns of tobacco leaves are being supported within the plenum chamber of the barn.

In order to prevent the passage of air along the sides of the racks **140** when such racks are in the barn **76,** each of such racks is provided with an outwardly extending flange **150** adjacent to the top wall **143.** A flexible resilient imperforate baffle **151** is connected to each of the flanges **150** and extends outwardly therefrom into engagement with the inner surface of the side walls of the barn. When the barn **76** is filled with the racks **140,** the top walls **143** provide a restriction to the flow of air so that a differential pressure occurs on opposite sides of the top walls **43** to equalize the distribution of the flow of air through the columns of tobacco leaves and through the top wall **143** after which the air is recirculated through the heater compartment **110.**

As illustrated in FIG. **22,** an auxiliary rail **152** can be connected in alignment with the V-shaped rails **149** of the barn and extend outwardly therefrom with the outer free ends being supported by posts **153** in such a manner that the auxiliary rails **152** and the V-shaped rails **149** are substantially coextensive. It is noted that if desired the auxiliary rails **152** could be inclined downwardly from the V-shaped rails **149** so that the outer free ends of such auxiliary rails can rest directly on the ground or on an apron in front of the barn **76.**

In order to transport the racks **140** to and from the tobacco fields, as well as to move the racks from a horizontal to a generally vertical position and to load such racks into the barn **76,** and remove the racks from such barn, a tractor or other propelling vehicle **155** is provided with a lift arm mechanism **156** for raising and lowering a fork lift assembly **157.** The fork lift assembly includes a pair of spaced generally parallel L-shaped main forks **158** each of which has a generally vertical leg **159** and a generally horizontal leg **160.** The legs **160** are connected by a brace **161** for stability. Each of the generally vertical legs **159** has a pair of spaced lugs **162** to which the lift arm mechanism **156** is swingably mounted. Each of the forks **158** is substantially U-shaped in cross-section, and the generally horizontal leg **160** thereof is adapted to receive an auxiliary L-shaped fork **163** having a generally vertical leg **164** and a generally horizontal leg **165.** The horizontal leg **160** of the main fork **158** and the horizontal leg **165** of the auxiliary fork **163** are swingably connected together by a pivot **166** adjacent to the toe end of the main fork **158.**

Adjacent to the upper end of the vertical legs **164** of the auxiliary forks **163,** an L-shaped lever or bell crank **167** is swingably mounted on a pivot **168** with the lower leg **169** of such lever extending outwardly of the vertical leg **164** of the auxiliary fork. A resilient member such as a leaf spring **170** normally urges the lower leg **169** of the lever outwardly. Outward movement of the lower leg of the lever **167** results in an upward movement of the upper leg **171** thereof and in order to restrict swinging movement of such lever, a cap **172** is welded or otherwise attached to the upper ends of the auxiliary forks **163.**

The lower ends of the vertical legs **164** of the auxiliary fork are provided with notches **173** of a size to receive one edge of a pallet **174.** Such pallet includes a floor **175** which is approximately **10** feet long by **5** feet wide and such floor has two or more depending skids **176** to permit the horizontal arms of the fork lift assembly to move under the floor **175.** The pivoted end of each of the horizontal legs of the auxiliary fork **163** has an upstanding lug **177** to retain the pallet **174** on the fork lift assembly.

The pallet **174** is large enough to support one of the racks **140** and in order to prevent sliding movement between the rack and the pallet when the auxiliary fork **163** is moved relative to the main fork **158,** a pair of upstanding lugs **178** are located along at least one side of the pallet in a position to engage the edge of the side **141** of the rack. As illustrated in broken lines in FIG. **19,** movement of the fork lift assembly under the pallet **174** having a rack **140** thereon causes the top wall **143** of the rack to engage the outwardly extending lower leg **169** of the lever **167** and swing such leg inwardly so that the upper leg **171** of such lever overlies the upper edge of the top wall **143.**

In order to tilt the rack **140** from a substantially horizontal position (shown in full lines in FIG. **17**) to a substantially vertical position (shown in dotted lines), a telescoping fluid cylinder **180** is swingably connected by a pivot **181** to a lug **182** carried by the brace **161.** A piston rod **183** is carried by the fluid cylinder **180** and the free end of such piston rod is connected to a bifurcated head **184** to which one end of a connecting link **185** is swingably mounted by a pivot **186.** The opposite end of the connecting link **185** is connected to a clevis **187** swingably mounted on a shaft **188** the opposite ends of which are welded or otherwise attached to the generally vertical legs **164** of the auxiliary forks **163.** The fluid cylinder **180** normally is provided with fluid under pressure from the hydraulic system of the tractor **155.**

When fluid under pressure is introduced into the lower part of the cylinder **180,** the piston rod **183** is extended to cause the auxiliary fork **163** to swing about the pivots **166** and swing the rack **140** from a horizontal position to a substantially vertical position. In this position a slight forward movement of the tractor **155** moves the pallet lugs **178** from the side wall **141** of the rack, after which the fork lift assembly **157** is raised to release the upper leg **171** of the lever **167** from the top wall **143** of the rack. Since the lower end of the pallet **174** is resting on the lugs **177** of the auxiliary forks and the upper end is retained by the notches **173,** the pallet **174** remains on the auxiliary forks.

The racks **140** normally are stored in a vertical position and to place an empty rack on the pallet **174,** or to remove a rack from the barn after the tobacco leaves have been cured, the auxiliary forks **163** are swung to a substantially vertical position or to a position slightly past vertical and the fork lift assembly **157** is raised slightly. The tractor **155** then is moved toward the rack until the upper leg **171** of the lever **167** has passed the top wall **143** of the rack. In this position the fork lift assembly **157** is lowered until the top wall of the rack engages the lower leg **169** of the lever **167** and swings the upper leg **171** into a position adjacent to the edge of the top wall **143.** Thereafter a slight rearward movement of the tractor causes the pallet lugs **178** to be disposed beneath the side wall **141** of the rack and the rack is

locked to the pallet. Rearward movement of the piston rod **183** returns the auxiliarly forks to a nested position within the main forks **158.**

In the operation of this modification, a rack **140** carried by a pallet **174** is placed on the platform **45** of the harvester with the rack in a position to receive tobacco leaves from the conveyors **41** and **42.** After the rack has been filled with tobacco leaves, the filled rack is removed from the platform by the tractor having the fork lift assembly **157** and another pallet with an empty rack thereon is placed on the platform **45** so that the harvester can continue its operation while the filled rack is carried by the tractor to the barn. A plurality of pin frames **77** are attached to the rack to hold the tobacco leaves in position, after which the fork lift assembly **157** is operated to tilt the rack **140** from a substantially horizontal position to a substantially vertical position in which the wheels **145** of the rack engage the V-shaped rails **149** of the barn. Thereafter the rack is rolled along the rails until the rack abuts the partition **109** or engages the side **141** of a previous rack.

After the barn has been filled, the heater **111** is energized to treat the columns of tobacco leaves.

I claim:

1. The method of harvesting and treating tobacco leavs comprising the steps of mechanically removing leaves from a predetermined portion of the stalk of tobacco plants while the plants are in a field, conveying said leaves upwardly and rearwardly from said plants, discharging said leaves randomly into an elongated bulk tobacco rack having a side wall substantially wider than the length of mature tobacco leaves and disposed in a generally horizontal plane when the rack is in a first position, distributing said leaves substantially evenly throughout said rack with the flat surfaces of the leaves generally parallel with said side wall and the stems of said leaves being disposed in a plurality of different directions, attaching a plurality of pin frames to said rack with each of said pin frames having at least one row of spaced tines penetrating said tobacco leaves, rotating said rack substantially 90° to a second position so that the side wall of said rack and the flat surfaces of the leaves are located along generally vertical planes and the tines of said pin frames support the tobacco leaves in an uninterrupted column, moving said rack into a curing barn having means for moving air under controlled conditions of temperature, humidity and pressure through the column of leaves in the rack to treat and leaves.

2. The method of claim **1** including the step of automatically locking said pin frames on said rack.

3. The method of claim **1** including the additional step of supporting said pin frames intermediate their ends after said pin frames are attached to said rack.

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