

[54] **DISPLAY CABINET, TRACK AND CONTROLS**

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[51] Int. Cl. **B65g 17/00**

[58] Field of Search 198/158, 138, 208; 47/1.2; 211/1.5, 121; 312/266, 268; 74/243 PC

[56] **References Cited**

UNITED STATES PATENTS

1,578,983	3/1926	Gossett	74/243 PC
1,587,896	6/1926	Butterworth	198/208 UX
2,912,118	11/1959	Behrens et al.	211/121

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[57] **ABSTRACT**

A display cabinet is shown in which a drive mechanism comprising a pair of opposed endless link chains are coupled to a plurality of trays which move in a generally closed vertical path around a plurality of lights selected for their growth characteristics. A sin-

gle column is provided at the two opposed ends which, in combination with a plurality of brackets, outside panels, and inside panels, provide a track for the chain, a guide for the brackets which support the trays, and support for the lights which illuminate the plants. Reversely bent end portions on the column as well as the outside panels add rigidity to the unit, and support to the track for the chain which, in turn, is tightly confined within the track and yet is sufficiently limber to rotate without excessive binding friction. The brackets are formed of a single piece of wire to nestingly receive a pivot pin in a partially closed circular end of the bracket, the pivot pin being proportioned to receive a keyhole in the hanger arm which supports the trays. An irrigation control comprising a pin selectively positioned through one of the roller holes in the link chain cooperates with a switch which in turn is coupled to the irrigation system thereby permitting preselection of those trays which are to be irrigated, and those which are not to be irrigated. Means are also provided to tension the entire drive assembly to the end that play and binding effects in the chain can be minimized, and in addition tray height adjustment means are provided on the various sprocket mounts to permit accurate level alignment of the trays. Alternative tray constructions are shown, one of which permits containerization of potted plants to be transported through the entire chain of distribution in a single nesting rack which ultimately fits within the framework of a tray carried by the subject display cabinet.

7 Claims, 13 Drawing Figures

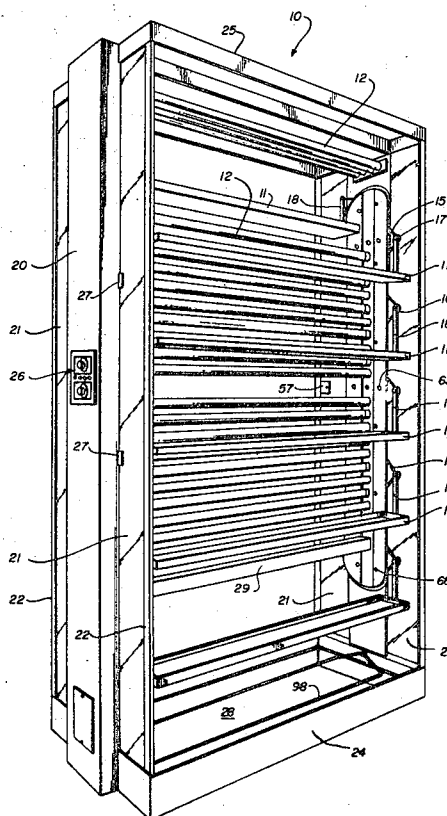
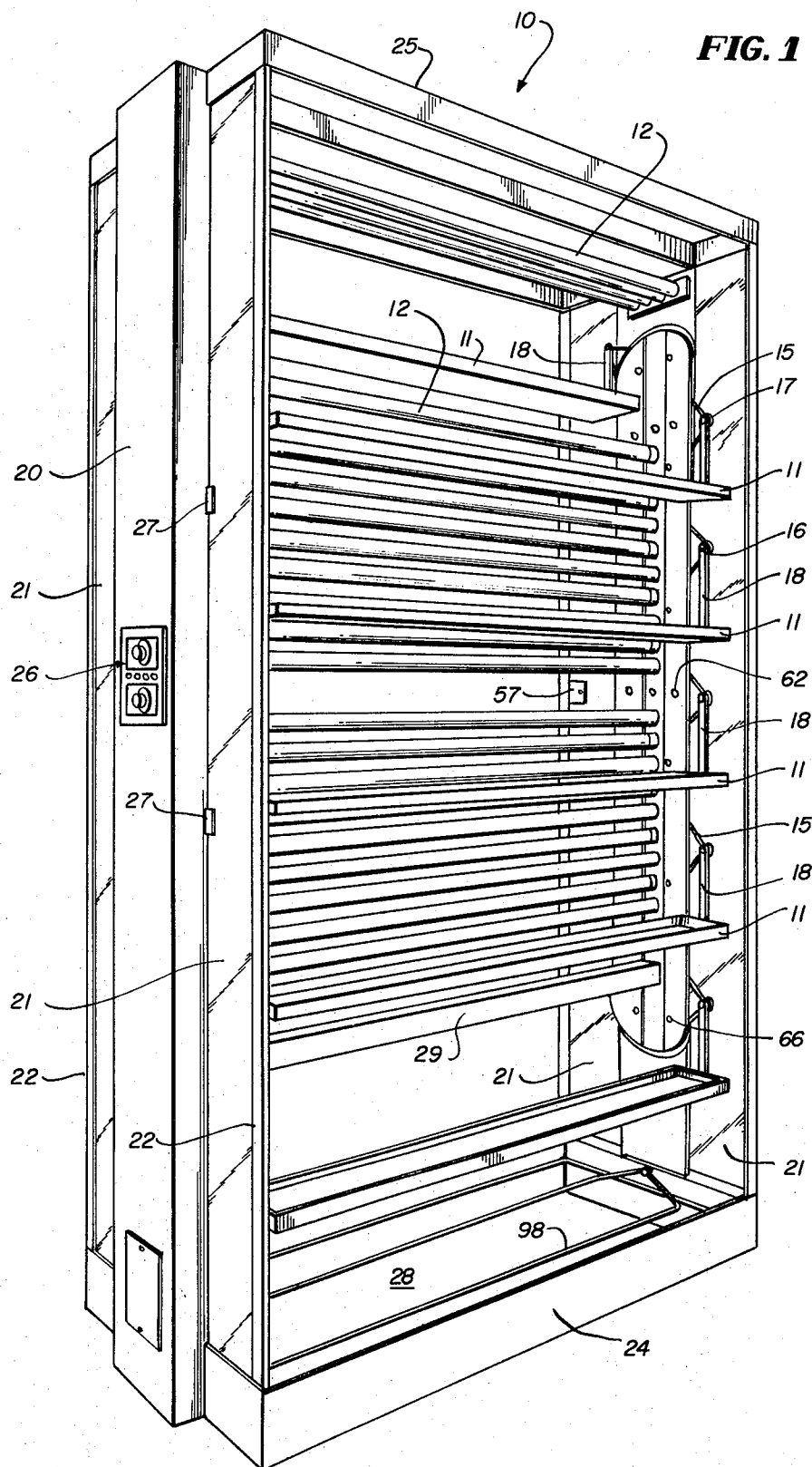


FIG. 1



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FIG. 2

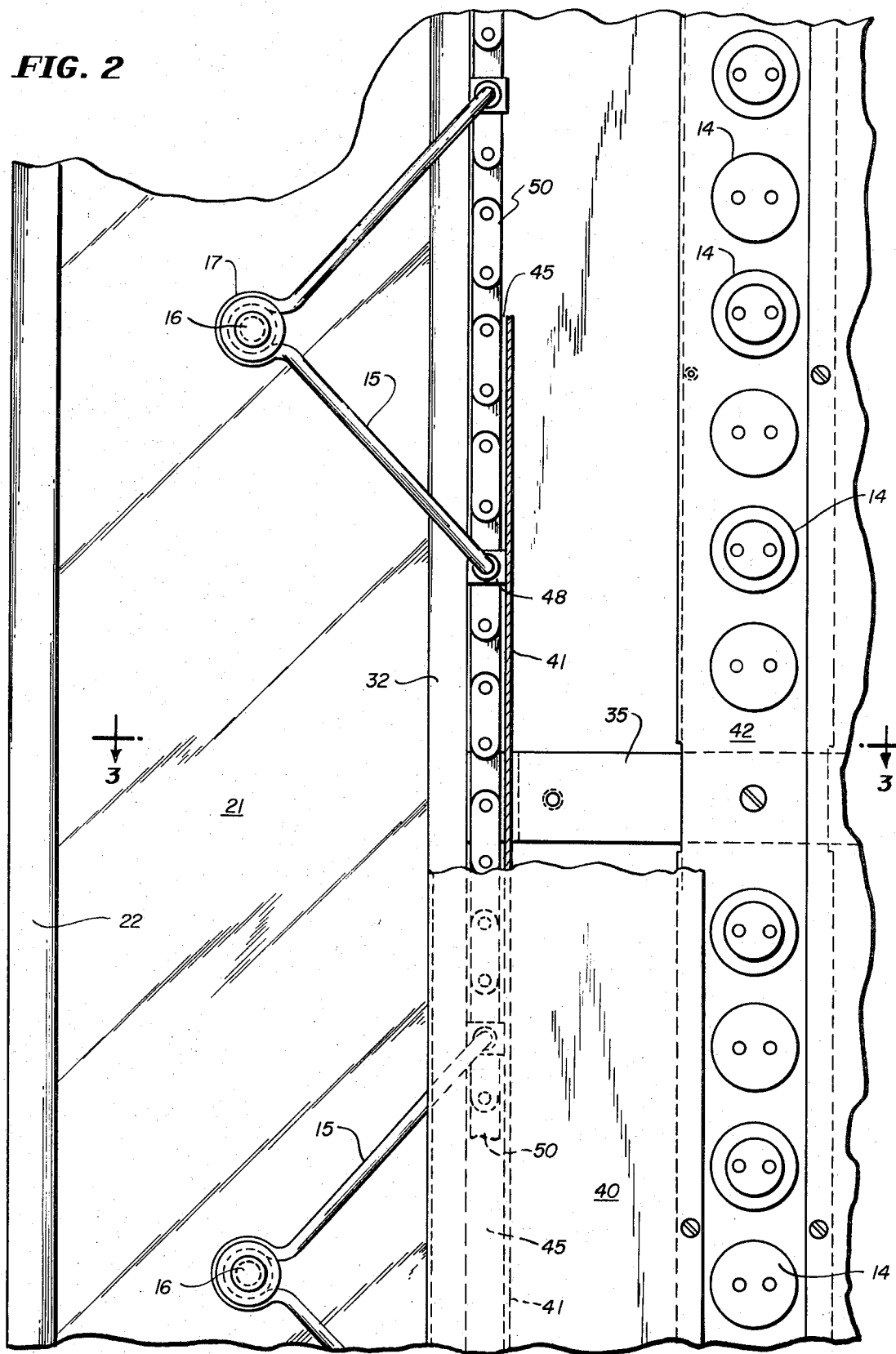


FIG. 3

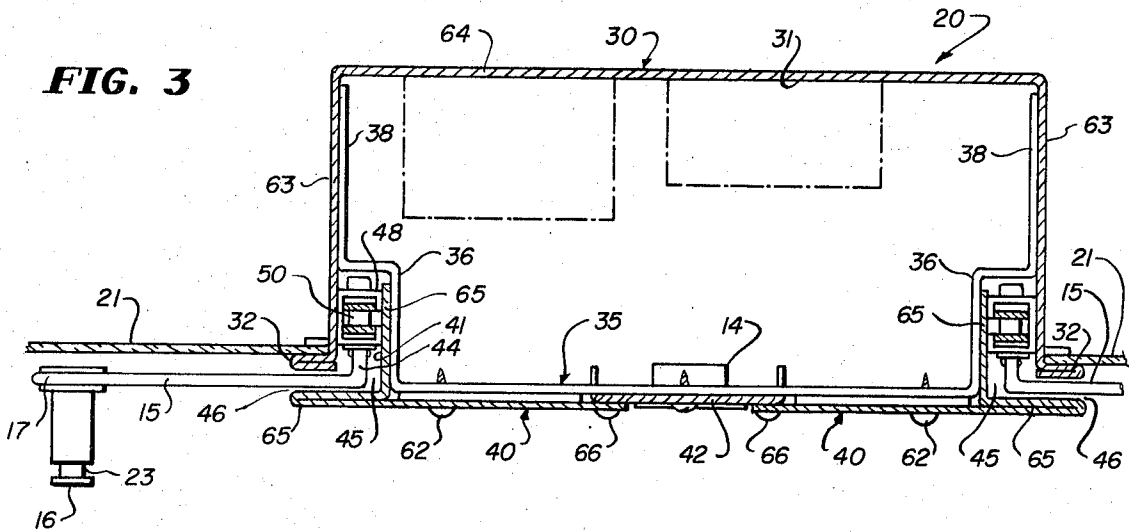


FIG. 4

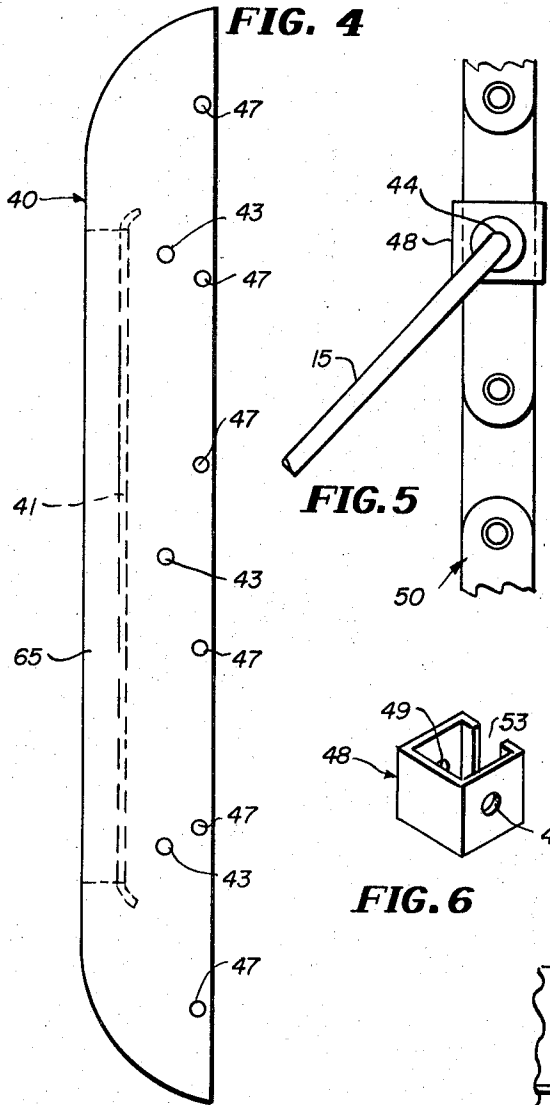


FIG. 5

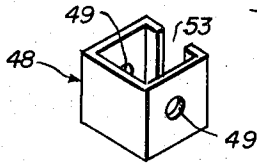


FIG. 6

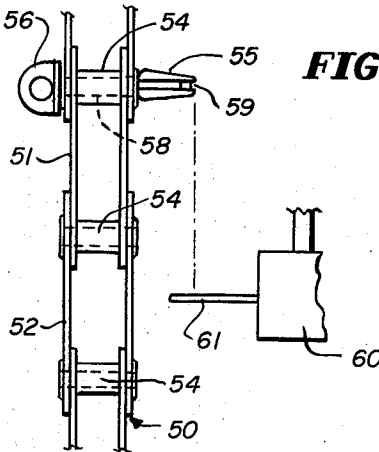


FIG. 7

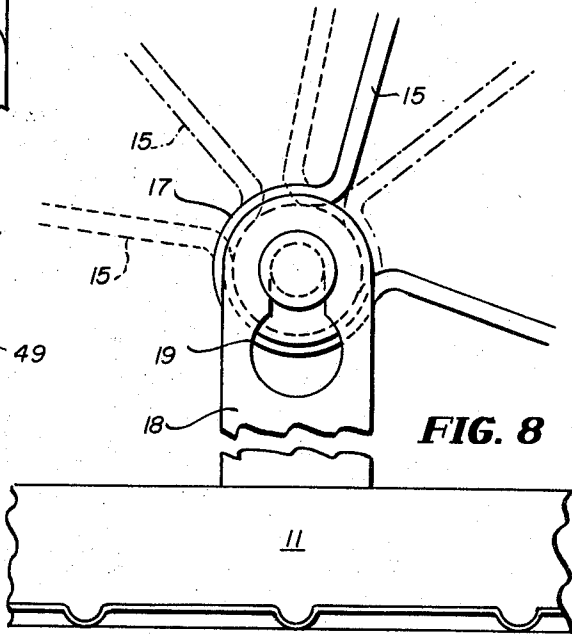


FIG. 8

FIG. 9

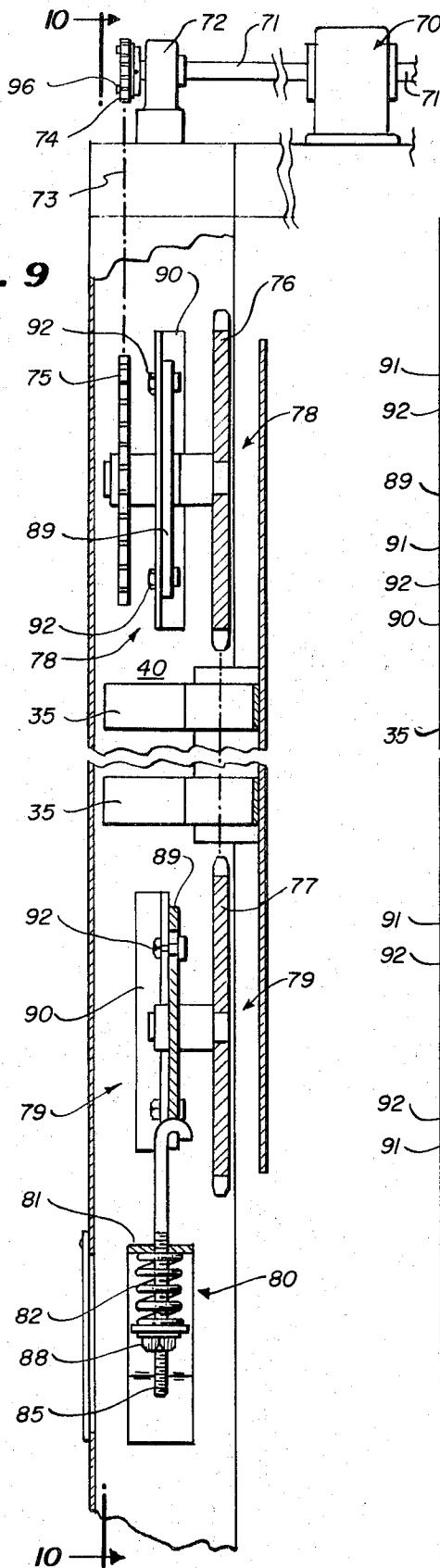


FIG. 10

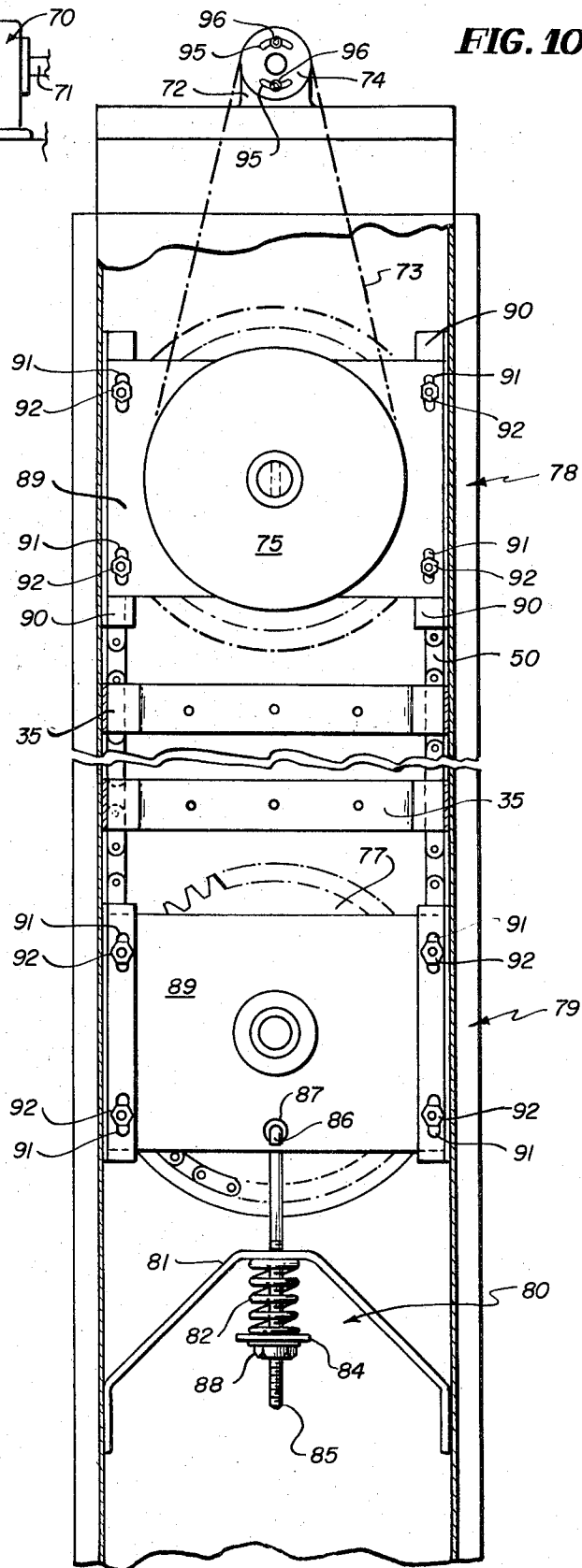


FIG. 11

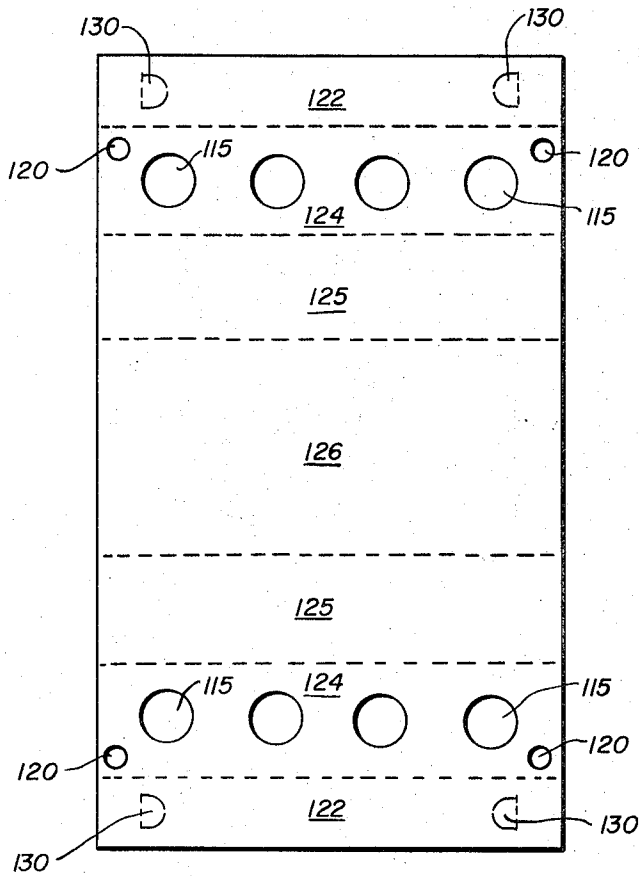
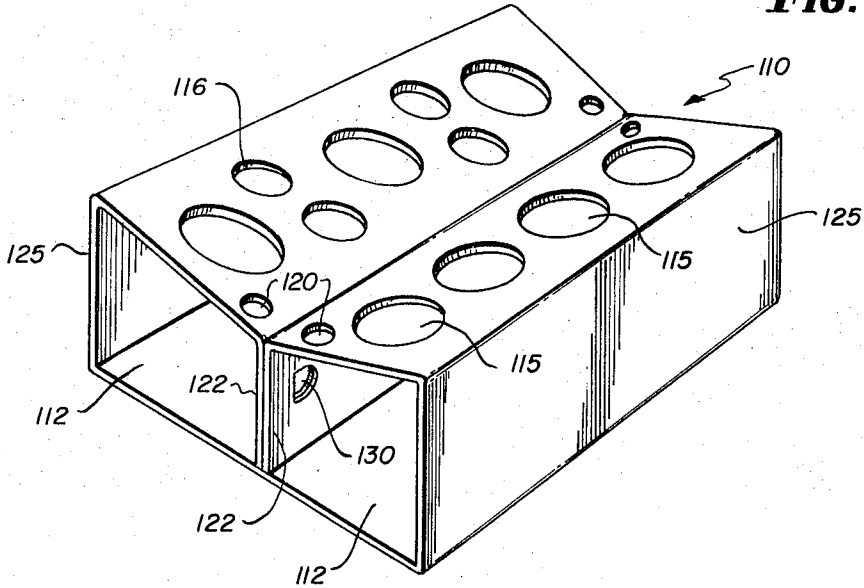


FIG. 12

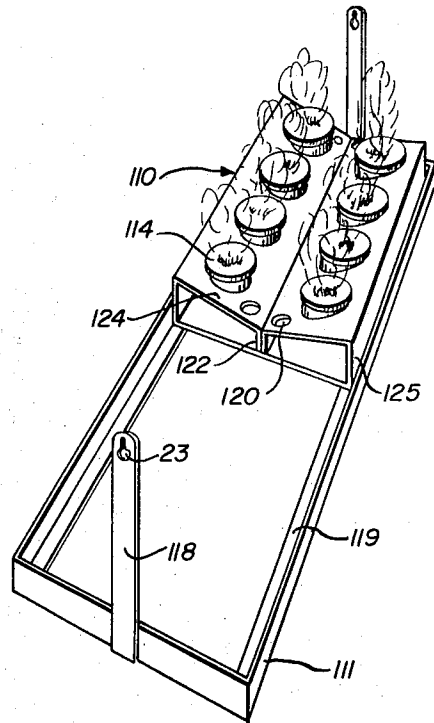


FIG. 13

DISPLAY CABINET, TRACK AND CONTROLS**BACKGROUND OF INVENTION****1. Field of Invention**

The field of invention in its principal utility finds itself classified in part in Class 47-17 and more particularly display cabinets which also permit the growth of horticultural products and plant life while irrigating and lighting the same pursuant to a preselected plan. In addition, however, the display cabinet can be used to merchandise perishable foodstuffs such as lettuce, strawberries, and the like, where timed irrigation will prolong the shelf life of the perishables.

2. The Prior Art

The prior art is best exemplified in U.S. Pat. No. 3,529,379 disclosing a commercial predecessor of the device illustrative of the present invention. Another relevant example of the prior art is U.S. Pat. No. 3,254,448. These examples of the prior art have operated satisfactorily in controlled conditions with constant supervision in accelerating the growth of plant life. While this is fine for school and laboratory purposes, it has since been determined commercially that the subject display cabinet when sold with potted plants which are properly irrigated and illuminated serves as an excellent display chamber, and cuts the traditional potted plant loss experienced by many stores to a mere fraction of the historical budgeted loss. Furthermore, flexibility in marketing is provided because potted plants at various stages of development can be placed within the subject display chamber without interrupting their continued growth, bloom, nourishment, and development.

Because the subject display cabinet is intended to operate for days, if not weeks and months, with minimum supervision and maintenance, it is more important that the principal moving part, the endless chains, be adequately confined and controlled. Furthermore, the economics of construction are such that even extrusions become expensive, whereas a configuration which can be built up from simply punched and bent sheet metal is more competitive, reduces the material cost, reduces the labor cost, and yet enhances the durability and trouble-free operation of the devices. Thus the prior art, while teaching the broad concept of movable trays and fixed growing lights as well as an irrigation system, did not teach the structural means directed to achieving such combination in an environment of marginal sophisticated care, maintenance, and repair.

SUMMARY

A display cabinet is shown which utilizes a pair of opposed endless chains to mount a plurality of trays in which the motion of the chains is confined by opposed parallel tracks which are defined in the construction of a single column of U-shape, a plurality of U-shaped brackets mounted to the column, and a pair of outside panels flanking an inside panel which are secured to the brackets and closing the open end of the U-shaped column to define a track for the endless chain, a housing for the electrical system, and sprockets for the parallel lights. In addition, those elements defining the track have extensions which define a bracket guide, both formed from standard sheet metal. A control is provided for an irrigation system which is tied into the track by means of the holes through the roller chain and comprises a removable pin which can be preselect-

tively positioned within a particular link of the chain so that in timed relationship to the passing of its tray by the irrigation means, irrigation can be selectively activated, deactivated, or rendered not in use in such instances where foliage such as cactus, or even artificial plants are displayed on one tray, whereas plants requiring considerable irrigation are disposed on adjacent trays. The sprocket drive mechanisms for the main chain as well as the sprocket drive from the motor drive are all slidably mounted on slide plates which in turn cooperate with guides on the column and a yieldable tension means at the lower portion of the display cabinet whereby all of the chain members in the unit may be preselectively tensioned to maintain operable tensioning of the chain under actual load conditions. Related thereto is the provision of means for adjusting the sprockets with relationship to opposed sprockets and the opposed chain to the end that the supported trays can be leveled when an out-of-level condition occurs between the opposed drive mechanism. The hanger brackets, which are also keyed into the endless drive chain and sprockets, are provided with means for self-energizingly engaging a pivot pin at the apex of the two legs which pivot pin, in turn, engages a keyhole at the upper end of the hanger arms thereby permitting quick interchangeability of trays where, for example, a frame-like tray is provided to receive containerized potted plants which are retained in nests which are preformed at the growing center such as a greenhouse, and continue to house and hold the potted plants even when displayed, illuminated, and irrigated by the subject display cabinet.

DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the present invention as well as a better understanding of the same will become apparent as the following description proceeds, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a display cabinet illustrative of the present invention.

FIG. 2 is a partially sectioned view taken from inside the display cabinet of FIG. 1 looking to the lefthand end portion thereof, the same being partially broken and partially sectioned to illustrate the spacial relationship of operable members.

FIG. 3 is a transverse sectional view looking downward from section line 3—3 of FIG. 2 illustrating the end column, chain track, and bracket track and related elements.

FIG. 4 is a front elevation in reduced scale illustrating an outside panel.

FIG. 5 is a partially broken enlarged view illustrating the connection between the bracket and chain by means of a plastic bracket mount.

FIG. 6 is a perspective view of the plastic bracket mount shown in FIG. 5.

FIG. 7 is an enlarged partially broken diagrammatic view illustrating the relationship between the irrigation actuating pin, link chain, and irrigation switch mechanism.

FIG. 8 is an enlarged partially broken view illustrating the relationship between the tray, tray hanger, bracket, and pivot pin provided at the apex of the bracket.

FIG. 9 is a longitudinal sectional view taken through one of the end columns generally along section line

9—9 of FIG. 1 but broken in the mid portion and base portion to illustrate primarily the drive mechanism.

FIG. 10 is a transverse sectional view of the drive mechanism shown in FIG. 9 taken along section line 10—10 of FIG. 9.

FIG. 11 is a perspective view of a transport container intended for usage in a modified tray construction.

FIG. 12 is a flat layout view of the material from which the container is folded.

FIG. 13 is a perspective view of an alternative embodiment tray used in combination with the container.

DESCRIPTION OF PREFERRED EMBODIMENT

A display cabinet 10 illustrative of the present invention is shown in FIG. 1 where it will be seen that the same is generally rectangular in configuration. A plurality of trays 11 are provided which move in a generally vertical closed path in flanking relationship to a plurality of lights 12 of the character designed for emitting light most appropriate to the maintenance of the growth cycle of a plant. The lights 12 are oriented primarily in a vertical plane, and secured to the ends of the cabinet in sockets 14 (shown in greater detail in FIG. 2). A plurality of tray brackets 15 are secured to a pivot pin 16 which in turn are coupled to the hanger arms 18 which support the trays 11.

The physical structuring of the display cabinet 10 as well as the drive means including means for guiding the chain as well as the bracket are primarily a function of the structure and configuration of the end column 20. The end column 20, as shown, has a plurality of shroud fasteners 27 which, in turn, secure a pair of transparent shrouds in flanking relationship to the end column 20, the shrouds being further secured in the shroud trim 22. A base 24 and top 25 join the two end columns 20 and their flanking transparent shrouds. Controls 26 are conveniently provided interiorly of the end column 20 and may be preselected to determine the period of time per day that the lights 12 are on, a period of time during which the irrigation bar 29 may be activated to irrigate the trays as they pass, and further to shut down the entire unit overnight, if this is desired.

The particular details of the end column 20 will be best appreciated by reference to FIG. 3 where it will be seen that the end column 20 has as its principal member the U-shaped base column 30 having a pair of opposed side walls 63 and a base 31. At the terminal ends of the side walls 63, reversely folded ends 32 become evident. The reversely folded ends 32 provide structural stability for the column 30, provide a means for thick metal reinforcement where the column 30 is secured to the base 24, and also provide one of the side walls for the bracket guide 46. In addition, the transparent shrouds 21 are secured by means of the shroud fasteners 27 to the reversely folded ends 32.

To enclose the box-like structural aspect of the base column 30, a plurality of column brackets 35 are provided which have a bracket base 39 positioned generally across the open U-shaped portion of the column 30, the base 39 terminating in a combination track offset 36, and side mount 38. The side mounts 38 are opposed members, and are secured by means of welding, bolting, or other convenient fastening to the side walls 63 of the column 30. As illustrated in FIG. 2, the column bracket 35 is positioned at a mid portion, and is further illustrated in FIGS. 9 and 10, at upper and lower portions across the column 30.

To close off the open end portion defined by the column 30, and provide for proper guidance for the chain drive and tray brackets 15, a pair of outside panels 40 are provided of the general configuration shown in FIG. 4. The outside panel has a reversely folded bracket guide flange 65 which extends vertically from the plane of the outside panel 40 and becomes the base of the track guide or track base 41 (see FIG. 3). As will be further observed, a plurality of bracket holes 43 are provided on the outside panel 40 which permits securing the same to the column bracket 35 by means of fasteners 62 as illustrated in FIG. 3. In addition, inside panel holes 47 are provided in the outside panel 40 to secure the central inside panel 42 to the base 39 of the column bracket 35 by means of its side panel fasteners 66.

As set forth in the objects of the invention, it is important to provide a track channel 45 for the endless chain 50, the same being shown in FIG. 3. There it will be seen, as set forth above, that the lower portion of the side walls 63 of the column 30 provide the outer portion of the track guide 45, and the inner portion is provided by the track base 41 which in turn is formed out of the bracket guide flange 65. The opposed side walls of the track guide 45 are defined by the track offset 36 between the side mounts 38 and base 39 of the column bracket 35. The opposite side of the track guide 45 is the portion of the bracket guide flange 65 which is in direct opposition to the reversely folded ends 32 of the side wall 63 of the column 30, thereby defining an arrow-shaped guide space which includes the bracket guide 46 as well as the track channel 45. In each instance, those elements where side play may be involved are reversely folded or double reinforced such as the reversely folded flange 65, and the reversely folded end 32. In addition, the inner portion includes the track base 41 in opposition to the track offset 36 of the column bracket 35. Because the chain 50 is under tension and adjustably held there by the tension spring adjustment 80 (to be described hereinafter) reinforcement is not required by double thickness of metal at the lower end portion of the side walls 63 of the column 30. The desirability of a bracket guide 46 with the rigid reversely folded elements as described above will become apparent as a description of the tray bracket 15 proceeds. Noting first FIGS. 5 and 8, it will be seen that the bracket (also see FIG. 1) is a V-shaped member terminating in a bracket head 17 which is a shaped portion covering more than 180° of a circle, and preferably 270° of a circle. The bracket head 17 then yieldably engages the pivot pin 16, as better illustrated in the lower lefthand corner of FIG. 3. Also it will be noted that the pivot pin 16 is provided with a hanger key 23 which is an undercut at the end of the pivot pin 16. The hanger arms 18, as shown in FIG. 8, which support the tray 11, are provided with a keyhole 19 in the upper end portion thereof, the narrow neck of which is proportioned to nestingly and pivotally engage the hanger key 23 of the pivot pin 16. Thus as the legs of the tray bracket 15 are squeezed inwardly and outwardly as the same goes over the upper portion of the chain track (see FIG. 1) the flexing action will self-energizingly squeeze the bracket head 17, and therefore reinforce the grip on the pivot pin 16 from which the hanger arm 18 and tray 11 depend and are held in such depending relationship by gravity throughout the upper portion of the travel of the tray 11 around and to come down the other side of

the display bracket 10. At the opposite of each one of the legs of the tray bracket 15, provision is made for a bracket leg 44 (see FIG. 3) which is offset at approximately 90° from the plane of the tray bracket 15. The bracket leg 44, as shown in FIG. 5, is inserted into one of the holes along the link chain 50 which is the hollow interior of the chain roller 54, as shown in FIG. 7. A bracket plastic mount 48 (see FIG. 6) is provided for opening by means of spreading the sprocket tooth slot 53 and positioning over the link chain 50 as shown in FIG. 5, with the bracket leg 44 being inserted through the bracket leg holes 49 on the opposed side walls of the bracket plastic mount 48. Thereafter, as shown in FIG. 3, the bracket leg 44 is secured by various means to the chain 50, in the instance shown a pair of offset ears support a washer immediately adjacent the elbow where the bracket leg 44 enjoins the body of the bracket, and the opposite end after passing through the opposed bracket leg hole 49 is secured by means of a tinnerman nut or other fastening means thereby firmly securing the bracket within the track channel 45 as well as the bracket guide channel 46.

When the link chain 50 is tensioned by means of the tension spring assembly 80 to be described hereinafter, the accuracy of the link chain 50 for purposes of positioning the trays 11, and otherwise controlling the operation of the display cabinet 10, is quite reliable. It is for this reason that the link chain 50, as shown in FIG. 7, may be provided with an irrigation pin 55 which may also be inserted at preselected locations through the hole in the chain roller 54. As shown, the inner link plates 51 and outer link plates 52 always provide a double thickness of links at each of the rollers 54. The irrigation pin, as shown, is molded of plastic and has a head 56 provided with an aperture therein for removal, and a body 58 which passes through the hole in the roller 54 and terminates in a snap end 59. To remove the pin, a wire can be inserted through the aperture in the head 56 of the irrigation pin 55, and the opposed snap ends 59 squeezed together by the fingers, and the irrigation pin 55 removed and installed in another location. As shown in FIG. 1, an access door 57 is provided in the front portion of one of the outside panels 40 to permit the operator to open the access door 57, and position the pin in preselected relationship to the positioning of the particular trays 11, so that the snap end 59 of the irrigation pin 55 will engage the irrigation switch 60 by striking its switch paddle 61 and thereafter activating or deactivating the irrigation bar 29 in timed relationship to the passage of various of the trays 11. For example, if in one display tower cactus and artificial flowers may be one tray 11, and African violets on another tray, it will be desirable to irrigate the African violets and yet deactivate the irrigation when the artificial flowers or cactus pass the irrigation bar 29. This purpose is served by the irrigation pin 55 in combination with the irrigation switch 60.

As pointed out above in connection with the utilization of the irrigation switch 60 on its activating irrigation pin 55, it is important that the link chain 50 be properly tensioned. The means for providing this proper tension, and adjustability to properly orient the trays 11, are shown in FIGS. 9 and 10. There it will be seen that the entire display cabinet drive mechanism is operated as a function of the drive motor 70 to which opposed drive shafts 71 are attached. The drive shafts connect at a bearing 72 above the opposed end col-

umns 20 of the display cabinet 10 which may also serve as a speed reducer where desired. At the terminal opposed ends of the drive shaft 71 provision is made for a sprocket 74 to drive the upper motor chain 73 which, in turn, is engaged in sprocket drive relationship by the lower motor sprocket 75. The link chain 50 is ultimately wreathed about the upper chain sprocket 76 and lower chain sprocket 77 to be guided through the track channel 45 as described above. In order that the link chain 50 as well as the upper motor chain 73 all be tensioned uniformly, it will be observed that the respective sprockets and chains are coupled in series to a tension spring assembly 80 provided at the lower portion of the column 20. Each of the respective upper sprockets 76 and lower sprockets 77 are secured to a pair of tension assemblies, an upper tension assembly 78 and a lower tension assembly 79. The tension assemblies each have a slide plate 89 with guides 90 for mounting thereon by means of the slots 91 and bolts 92 as shown. It will be further observed that the guides 90 are mounted to the side walls 63 of the end columns 30.

Observing now the lower portion of FIGS. 9 and 10, it will be seen that the tension spring assembly 80 includes a tension spring bracket 81 which is also mounted to the side walls 63 of the U-shaped column member 30, and secured to the tension spring bracket 81, is a partially threaded shaft 85 having a hook 86 which engages a tension hole 87 provided in the lower portion of the lower slide plate 89 which supports the lower sprocket 77. The spring 82 is then adjusted by means of rotating the nut 88 against the spring support washer 84 to progressively increase or decrease the tension on the various chain members, and then secured more permanently if desired by tightening the bolts 92, but in most operations it will be found that the bolts 92 serve merely to guide the slide plates 89 along the guides 90.

To further assist in "tuning" the unit, above and beyond providing for appropriate tension on the various chains by means of the tension spring assembly 80, the upper motor sprockets 74 are mounted on sprocket plates 94. An orientation slot 95, shown in crescent configuration in FIG. 10, is provided in combination with an adjustment bolt 96 to the end that the alignment of the respective sprocket plates and trays 11 at the opposite ends of the display cabinet 10 may be properly adjusted to a level relationship with the end columns of the display cabinet. It has been observed in practice that adjustment by means of set screw is often frustrated in usage, particularly rough usage. On the other hand, a positive connection between the shaft and sprockets by means of the crescent shape radial orientation slots 95 may be achieved.

Further illustrating the advantages of the subject display cabinet is the type of containerization which may be employed from the greenhouse directly to the ultimate display thereby reducing the amount of handling required for potted plants in the distribution of the same through the subject display cabinet 10. Turning now to FIG. 11, it will be seen that the container 110 has a pair of opposed tubular compartments 112 in which a plurality of pot rings 115 are provided. At one portion of the illustrative container 110 four large pot rings are shown, whereas at the other side three large pot rings 115 are shown in combination with four small pot rings 116. To illustrate the end usage, reference may be had to FIG. 13 where it will be seen that a con-

tainer 110 with eight potted plants 114 is inserted at one end of the tray 111. Further to be observed is the fact that the frame members 119 which define the parameter of the tray 111 are L-shaped angle irons, with lower legs sufficiently wide to support the edges of the container 110. In the particular embodiment shown, it is contemplated that the tray 111 will be approximately 48 inches long, and eight inches wide. Therefore two 24-inch containers 110 will fill the tray 111. As further noted, finger holes 120 are provided at the opposed central portions of the container 110 so that it can be readily lifted into the tray 111, and removed from the tray 111 in accordance with the display techniques most suited for the proprietor of the display cabinet 10.

The specific details of the container 110 are shown in FIG. 12 which is a blank for hand forming the same. There it will be observed that the container blank, at its outer ends, has a pair of opposed center walls 122 adjacent the top 124 which contain the prepunched pot rings 115. Next to the top provision is made for the sides 125 which, in turn, flank the bottom 126. It will be noted that the height of the center walls 122 is coordinated with the height of the sides 125 and width of the top members to provide a drainage angle toward the junction of the center walls 122 of about 135° with the vertical. In this manner irrigation overflow is directed to the center of the trays 111.

Various lines of weakness are provided at the intersection between the bottom, sides, tops, and center walls.

In operation, the container 110 is shipped flat to the greenhouseman. He then folds the container 110 along the various lines of weakness and, after the two center walls 122 are brought in face-to-face relationship, the locking tabs 130 are then actuated to provide an interlock between the two opposed center walls 122 thereby completing the configuration of the container 110 as illustrated in FIGS. 11 and 13.

Additional features for safety are provided such as the safety shut off switch 98, in the form of a wire bracket shown in the tub 28 at the base of the display cabinet as illustrated in FIG. 1. At any time a pot may drop out of position, a carton be dropped into the tub, or the like, the tilting of the pivoted safety shut off 98 will deactivate the motor 70 for the entire display cabinet 10. In addition, because the irrigation pump is an impeller type pump and will burn out if run dry, a moisture sensing switch is provided in the tub which turns on a warning light and shuts off the operation of the motor 70 in the event the water in the irrigation system becomes perilously low.

Variations are contemplated to provide further operating tolerances. For example, the tray bracket 15 may be bent centrally at its remote end to position the pivot pin away from the shrouds 21. Also the extremities of the track base 41 of the flange 65 are curved centrally to provide relief for the chain 50 as it engages the upper and lower sprockets 76, 77.

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternatives, embodiments, usages and equivalents of a display cabinet, track, and controls as fall within the spirit and scope of the invention, specification and the appended claims.

What is claimed is:

1. A display cabinet and track assembly comprising, a pair of opposed end columns, each column having a U-shaped column member with side walls and a base, said side walls terminating in an outwardly turned end forming one wall of a bracket guide, brackets of U-shaped configuration formed for mounting to the column side walls to cover the open portion opposed from the base and an offset portion at the intersection of the side mount and base, outside panels for mounting to the bracket bases and having a track base secured thereto and in perpendicular relationship to said panels and offset from the outer edge to define a bracket guide flange, a drive member in the form of a chain, said track base, offset end, and column guide wall defining a track channel, brackets secured to the chain for holding a plurality of trays, said bracket guide flange and said outwardly turned column edges defining a bracket guide, whereby the column serves to support the end of the display cabinet and in combination with the outside panels provides a track guide for the chain and bracket guide for the brackets.

2. In the display cabinet and track assembly of claim 1, opposed sprockets for driving said chain, means for mounting said sprockets on a slidable member, and yieldable tension means secured to each column for adjustably preselecting the tension to be placed upon a remote sliding means for mounting said sprockets,

whereby said sprockets and their associated chains may be selectively tensioned for field usage.

3. A display cabinet and track assembly of the character defined in claim 1 above wherein, the column ends are reversely folded to define the offset portions thereof, and the bracket guard flange and track base are reversely folded portions of the outside panels, whereby additional double thickness members are provided opposed portions of the bracket guide, and at the inner portion of the track guide.

4. In the display cabinet and track assembly of claim 1, an inside panel mounted to said U-shaped bracket and beneath the internal marginal edges of said outside panels,

and a plurality of light sockets positioned in said center panels for physically and electrically connecting a plurality of growth lights intermediate the path of the plurality of trays held by the brackets.

5. In the display cabinet and track assembly of claim 1 wherein,

said brackets are a single bent formed wire member having offset legs which penetrate holes in said link chain, and

a pivot pin secured in the arcuate portion defined by the bent intersection of two legs of said bracket, and wherein arcuate form is in excess of 180°, and means on said pivot pin for securing a hanger to the plurality of trays.

6. In the display cabinet of claim 5 above, a hanger fixed to said tray at each end thereof,

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a keyhole slot in the end of each hanger,
and a keyhole slot receiving undercuts on each pivot
pin,
whereby said trays and said hangers may be removably
secured without additional parts to said pins.

7. In the display cabinet of claim 1,

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said outside panels being curved centrally at their
end portions to provide relief for the brackets as
the same pass around sprockets at the upper and
lower portion of the column.

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