



PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Crop Growing Device

5 We, NATIONAL RESEARCH DEVELOPMENT CORPORATION, a British Corporation established by Statute of Kingsgate House, 66—74 Victoria Street, London, S.W.1, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to the growth of glass-house crops and provides a new system of apparatus for growing glasshouse crops of many kinds. The invention is especially suited to the growing of tomatoes and for descriptive convenience will be described primarily in connection with the raising of these fruits although it will be apparent that it has many other applications in horticulture.

20 In recent years the single truss technique for the growth of tomatoes has attracted attention as a result of its economic advantages over the more conventional method of growth. However, the labour costs of the method as at present practised are still substantial and economies are desirable. For example, in the present method the crop is grown in soil beds in the ground and great expense is incurred in sterilizing the soil (by steam injection) to a sufficient depth before the crop is planted.

30 Again, the crop requires considerable attention as growth proceeds and it is necessary for the operator to move along the rows of plants on frequent occasions with the consequent danger that local virus infection present may be spread throughout the whole of the crop.

35 In accordance with this invention the above-mentioned disadvantages have been largely avoided and additional benefits have been obtained by growing tomatoes and other crops in elongated containers for soil, peat or other growth medium arranged in one or more units of apparatus in each of which the containers form a stepwise system of tiers transversely spaced to allow plants to grow in each container unimpeded by the containers above with

respect to light and space, each container being watered automatically in accordance with the requirements of the growth medium and the plants as growth proceeds. Thus plants are grown by this method in apparatus in which the containers are carried by a supporting structure and arranged as described, each container having irrigation means for sub-irrigating growth medium when present therein and arranged for connection to a water supply in such a manner that irrigation of each container is achieved independently and automatically as growth proceeds. Arrangements are also preferably made to add nutrients to the water supply continually or from time to time as desired.

The irrigation means may conveniently take the form of pipes which serve also as the means of injecting steam into the containers for sterilising growth medium in situ prior to use. For this purpose the pipes are fabricated in suitable resistant material e.g. polypropylene and provided with appropriate couplings for connection to a steam supply.

70 The apparatus of this invention is preferably constructed in units in each of which the tiers rise from approximately ground level to an uppermost level which is preferably well within the reach of an operative tending the growing crop. For example, the tiers may be arranged symmetrically rising from approximately ground level on both sides of such a unit to an uppermost level. In large scale operation a number of such units may be arranged in line the containers in any one tier being served by a common irrigation pipe which extends along the production line and is provided with steam injection couplings at various positions along its length. In one suitable arrangement the individual containers which for convenience of manufacture are made in unit lengths may be connected together directly to form longer units.

The containers may be in the form of troughs of channel section or have generally

conveniently

tubular form containing openings through which the individual plants may grow, and the material of construction for either of these kinds of container is preferably asbestos cement or fibreglass. If desired, the containers may be integrally formed with the main supporting structure of the apparatus but they are preferably detachable for ease of cleaning. It will usually be necessary to provide means for supporting the growing plants such as wires strung between end members of the structure and extending between the tiers.

The crop growing apparatus described above has the advantage of being compact and permits of considerable space saving as compared with the prior method of single truss growth, and this is of considerable advantage where CO₂ enrichment of the glasshouse atmosphere or crop heating either through the soil or by raising the atmospheric temperature is to be used. The system is also readily designed to enable the operator to attend to the growing plants without movement in between the rows.

It will be appreciated that the method and device described above are designed for use in a greenhouse or in a building having artificial lighting and heating. The invention therefore permits the cultivation of many crops in areas having a climate in which such crops cannot normally be grown. The device is especially adapted for tomato growing and is designed to exploit to the full the advantages of the single truss method of growth and to achieve with these fruits a greater number of crops per year than is otherwise possible. The reduction in handling achieved by the invention reduces the possibility of infection arising in the crop and minimises its spread. Also, by producing more crops of shorter duration the effect of infection is economically less harmful.

The invention will now be further described with reference to the accompanying drawings of which Figure 1 is a diagrammatic perspective view of the device coupled to a watering system, Figure 2 is a detailed view in section showing the disposition of the watering pipe in a trough, and Figure 3 is a perspective partial view of an alternative form of trough.

The device comprises a framework 1 shown in idealized manner and supporting eleven parallel troughs 2 in tiers. The troughs form an ascending series of steps on one side up to the highest trough and a descending series on the other side. The troughs 2 are removable from the framework 1 for the purpose of cleaning or replacement.

Each trough 2 is of square cross section and in the bottom half of the trough a supply pipe 3 is mounted extending the entire length of the trough 2. The pipe 3 has perforations 4 on its lower surface, and in order to prevent blockage of the perforations 4 and to support the soil bed the pipe 3 is covered with a fibreglass strip 5 of the same width as the

trough 2. The pipe 3 extends through the right-hand wall of the trough as shown in Figure 2 and is connected at the projecting end to an auxiliary watering system.

Prior to connection to the watering system the pipes 3 may be connected to a steam supply to sterilise the soil beds above them in the troughs.

The framework 1 has end members 6 of inverted V-shape and between them are strung wires 7 running parallel to and in between the troughs 2. The wires 7 serve to support the growing plants and direct their growth upwards and clear of the trough at the next level.

The watering system comprises an uppermost tank 8 which feeds a series of secondary tanks 9 arranged vertically below it via a down pipe 10 and T-piece connections 11. The highest secondary tank 9 is connected through a rubber hose 12 to the supply pipe 3 of the highest trough 2. Proceeding downwards the next secondary tank 9 is connected through a T-piece 11 as shown in Figure 2 to the two troughs immediately below the highest through hoses 12 and 12'. Succeeding secondary tanks 9 feed the next troughs at the corresponding level and so on.

The tanks 8 and 9 are provided with ball-cock arrangements (not shown) so that watering proceeds automatically as water is drawn from the troughs by the plants by capillary action. The water level in the tanks 9 and troughs 2 is indicated by the broken lines in figure 2. Nutrient materials may be added to the tanks as desired.

If desired, tomato seed may be sown in the troughs and the seedlings thinned out, or seedlings produced elsewhere may be pricked off into the troughs. When the first flower buds are visible the growing point and the auxiliary shoots are removed but no other attention is required until the ripe crop is picked ten to thirteen weeks after germination. Containment of root growth within the troughs tends to improve the quality of the fruit and three crops of excellent quality tomatoes may be obtained annually with this device. Other crops for which the device may be used include French beans, strawberries and some ornamentals.

The apparatus illustrated has eleven troughs. For tomato growing these preferably have a 7-inch square cross-section and are placed with their centre lines 7 inches apart. If the lowest troughs are raised about 2 inches from ground level it is possible to mount two troughs side by side at the uppermost level and thereby increase the number of troughs to twelve whilst still within the reach of an operative of average height.

In a commercial apparatus the troughs may be formed in 5 foot units of guttering section either open-ended and bonded or bolted together end-to-end to form a continuous con-

tainer or as sealed end units with O-ring joint connections to the common irrigation pipe.

Each container is preferably fitted with a water level indicator.

- 5 The units may be supported on a steel or concrete framework.

Figure 3 shows a tubular container 20 for growth medium having holes 21 of 2 to 3 inches diameter spaced at 7 inch centres from which the plants grow. The tube 20 has an end closure 22 at each end fitted with a water level indicating tube 23 inserted in a bung 24. An irrigation pipe 25 extends through the tube 20.

15 WHAT WE CLAIM IS:—

1. Apparatus for growing tomatoes or other glasshouse crops comprising a plurality of elongated containers for growth medium carried by a supporting structure and arranged in a stepwise formation of tiers transversely spaced to allow unimpeded growth of the crop in each container, the containers being provided with irrigation means for sub-irrigating growth medium when present therein and arranged for connection to a water supply in such a manner that irrigation of each container is achieved independently and automatically as growth proceeds.

2. Apparatus according to claim 1, in which the irrigation means comprises sub-irrigation pipes which serve also as steam injection means for sterilising growth medium in situ prior to use.

3. Apparatus according to claim 1 or 2, in which the containers are detachable individually.

4. Apparatus according to claim 1, 2 or 3, comprising a unit having a symmetrical system of tiers rising from approximately ground level on both sides of the unit to an uppermost level, each container being within the reach of an operator of ordinary height to enable the whole crop to be tended by the operator standing at ground level.

- 45 5. Apparatus according to any of claims 1 to 4 in which the containers are troughs of channel section.

6. Apparatus according to any of claims 1 to 4 in which the containers are of generally

tubular shape having openings through which individual plants are grown. 50

7. Apparatus according to any of the preceding claims in which the containers are fabricated in asbestos cement or fibreglass.

8. Apparatus according to any of the preceding claims, comprising means for supporting the growing plants. 55

9. Apparatus according to claim 8, in which the supporting means comprises wires strung from the supporting structure from end to end. 60

10. Apparatus according to any of the preceding claims for growing tomatoes in which the transverse dimension of the containers is 7 inches and the tiers are transversely spaced at 7 inch centres. 65

11. Apparatus according to any of the preceding claims comprising 11 or 12 containers symmetrically arranged and arising from approximately ground level on both sides of the supporting structure to an uppermost level. 70

12. Apparatus according to claim 1 substantially as described with reference to figures 1 and 2 of the accompanying drawings.

13. Apparatus according to claim 6, substantially as described with reference to figure 3 of the accompanying drawings. 75

14. A method of growing tomatoes or other glasshouse crops in which the crop is raised in elongated containers for soil, peat, or other growth medium arranged in one or more units of apparatus in each of which the containers form a stepwise system of tiers transversely spaced to allow plants to grow in each container unimpeded by the containers above with respect to light and space, each container being watered automatically in accordance with the requirements of the growth medium and the plants as growth proceeds. 80

15. Method according to claim 14 in which the units have the form defined in claim 4. 90

16. Tomatoes or other glasshouse crops whenever grown by a method according to claim 14 or 15.

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individually



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Each container is preferably fitted with a water level indicator.

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20 2. Apparatus according to claim 1, in which the irrigation means comprises sub-irrigation pipes which serve also as steam injection means for sterilising growth medium in situ prior to use.

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40 4. Apparatus according to claim 1, 2 or 3, comprising a unit having a symmetrical system of tiers rising from approximately ground level on both sides of the unit to an uppermost level, each container being within the reach of an operator of ordinary height to enable the whole crop to be tended by the operator standing at ground level.

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12. Apparatus according to claim 1 substantially as described with reference to figures 1 and 2 of the accompanying drawings.

13. Apparatus according to claim 6, substantially as described with reference to figure 3 of the accompanying drawings. 75

14. A method of growing tomatoes or other glasshouse crops in which the crop is raised in elongated containers for soil, peat, or other growth medium arranged in one or more units of apparatus in each of which the containers form a stepwise system of tiers transversely spaced to allow plants to grow in each container unimpeded by the containers above with respect to light and space, each container being watered automatically in accordance with the requirements of the growth medium and the plants as growth proceeds. 80

15. Method according to claim 14 in which the units have the form defined in claim 4. 85

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