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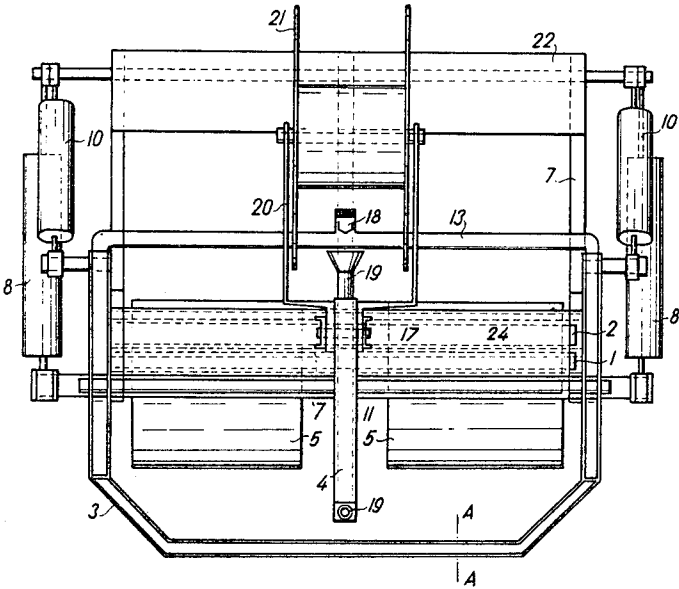
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[54] **MEMBRANE-FORMING PLOW**
5 Claims, 10 Drawing Figs.

[52] U.S. Cl..... **61/72.6,**
61/1, 61/11, 61/13, 61/63
[51] Int. Cl..... **F16I 1/00,**
A01b 17/00
[50] Field of Search..... **61/13, 11,**
72.6, 72.5, 72.2, 72.1, 63, 1

ABSTRACT: Underground ditches with impermeable walls are created in deep sands of arid areas by means of a plough, adapted to dig a ditch. The walls of said ditch are sprayed with a material which makes it impermeable and deposits into said ditch irrigating conduits capable of supplying water or solutions of nutritious substances required for growing plants.



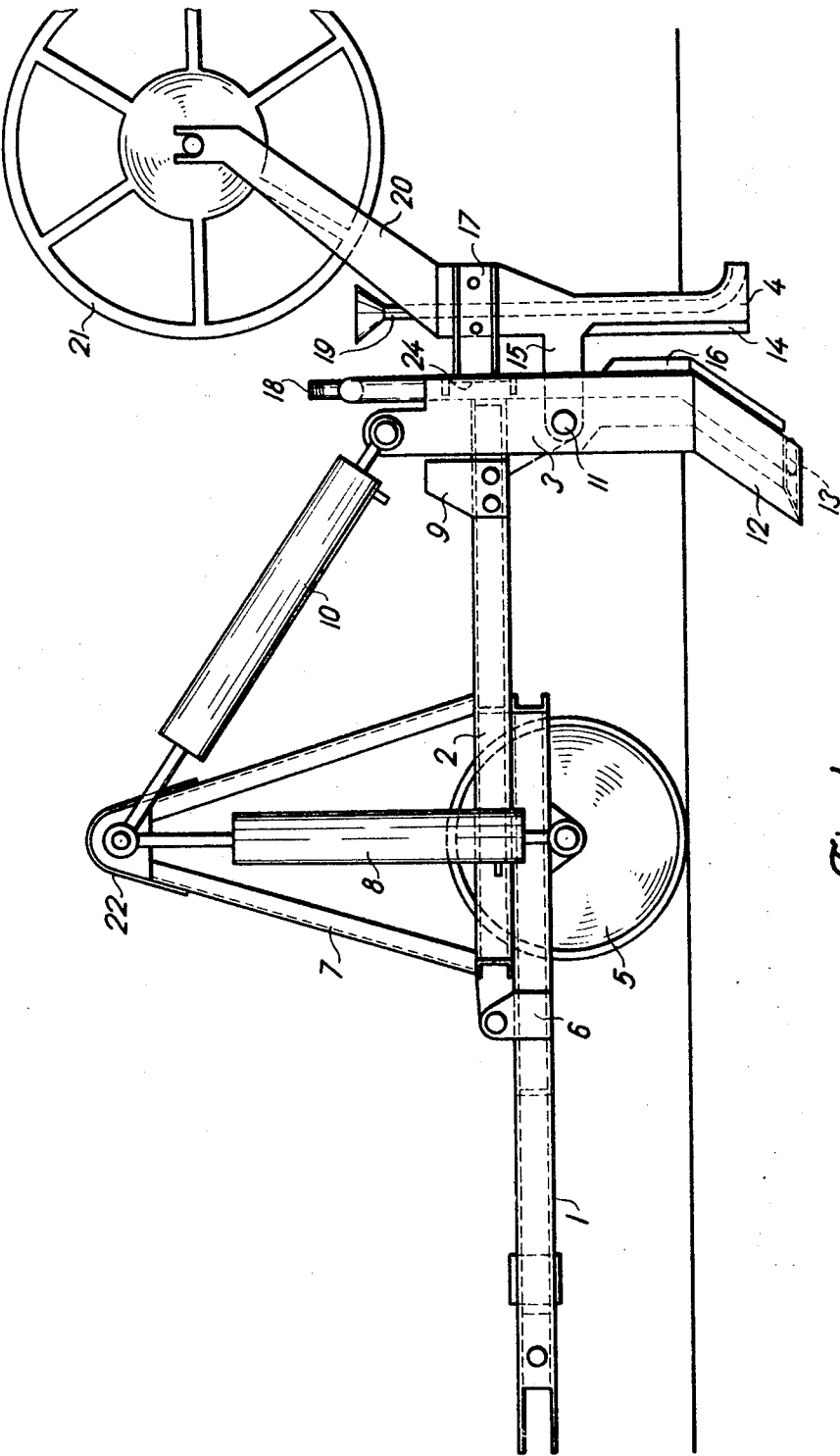


Fig. 1.

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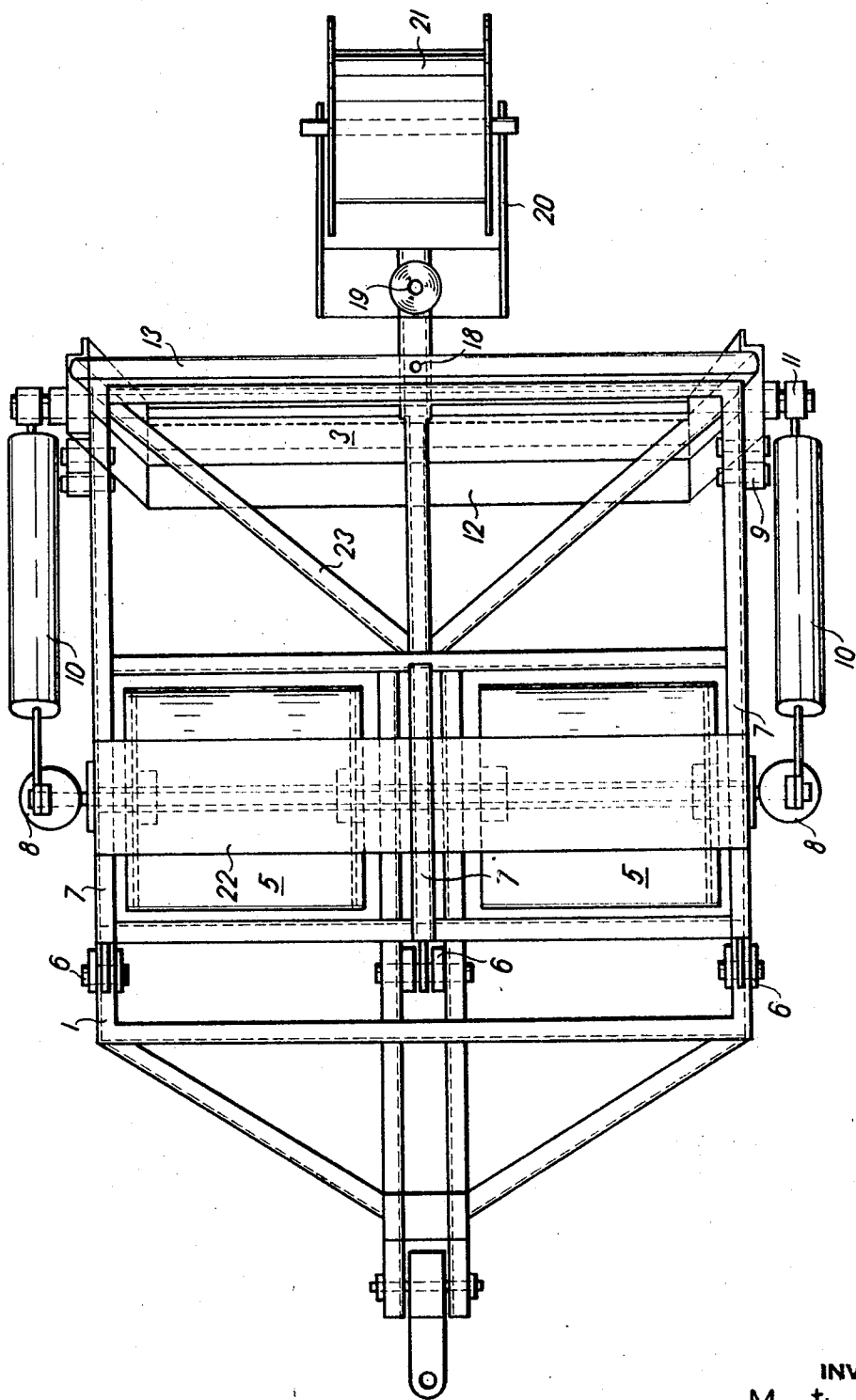


Fig. 2.

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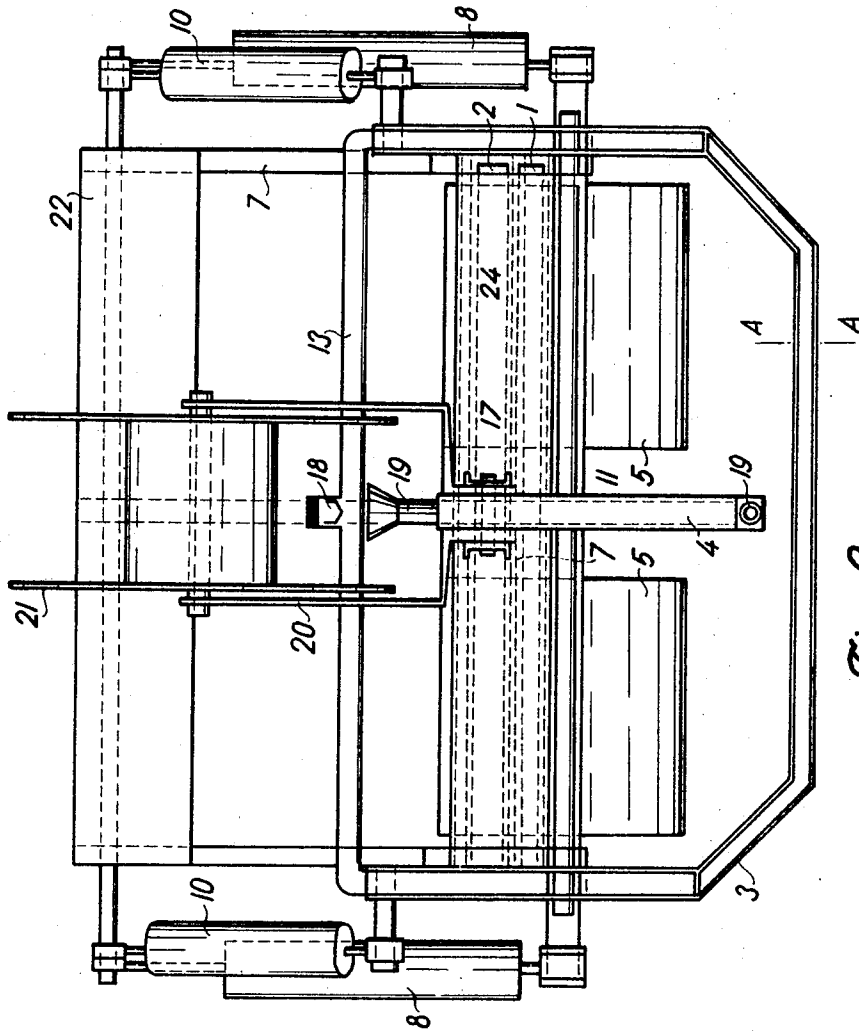


Fig. 2a.

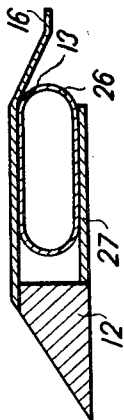
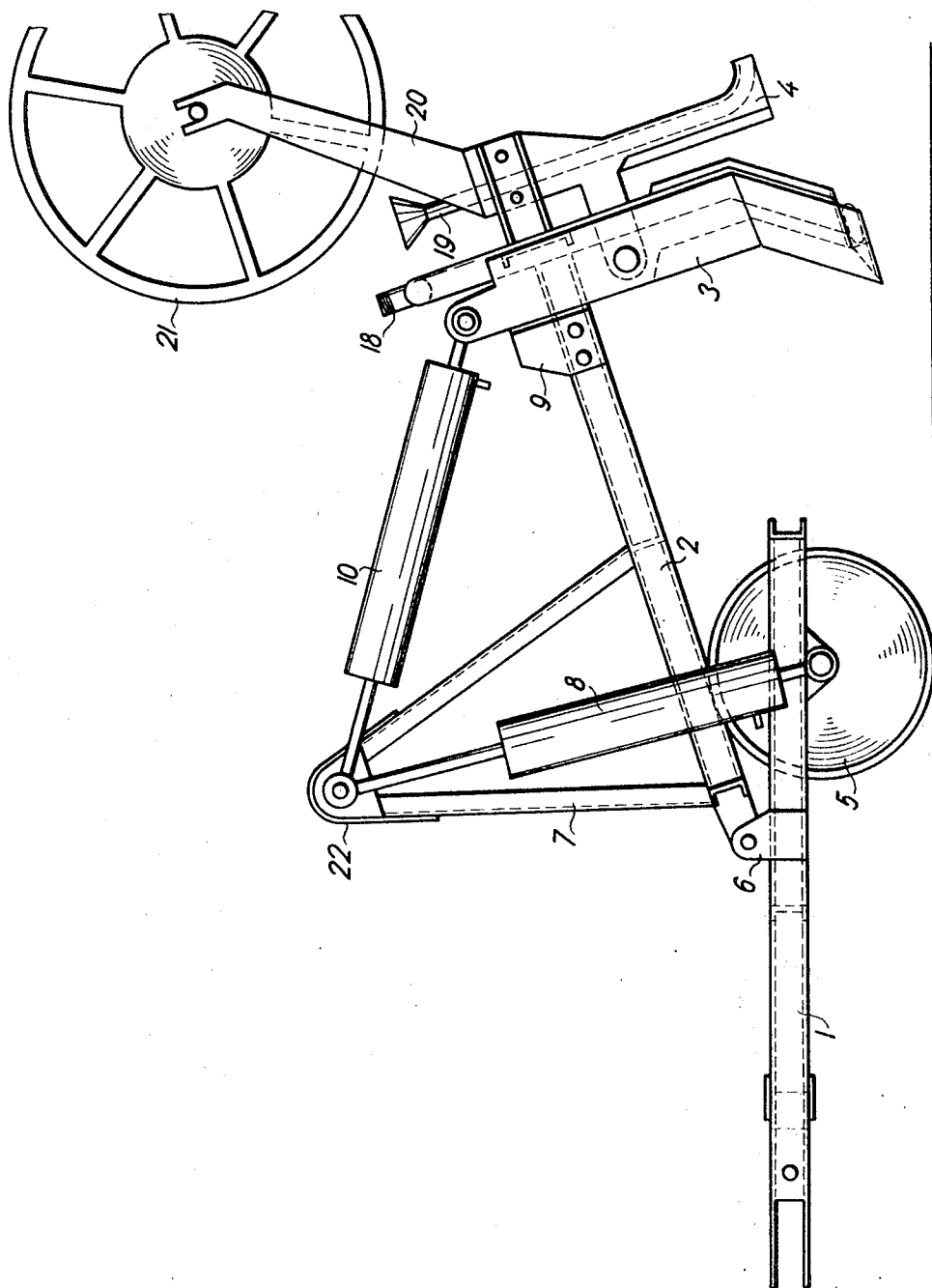


Fig. 2b.

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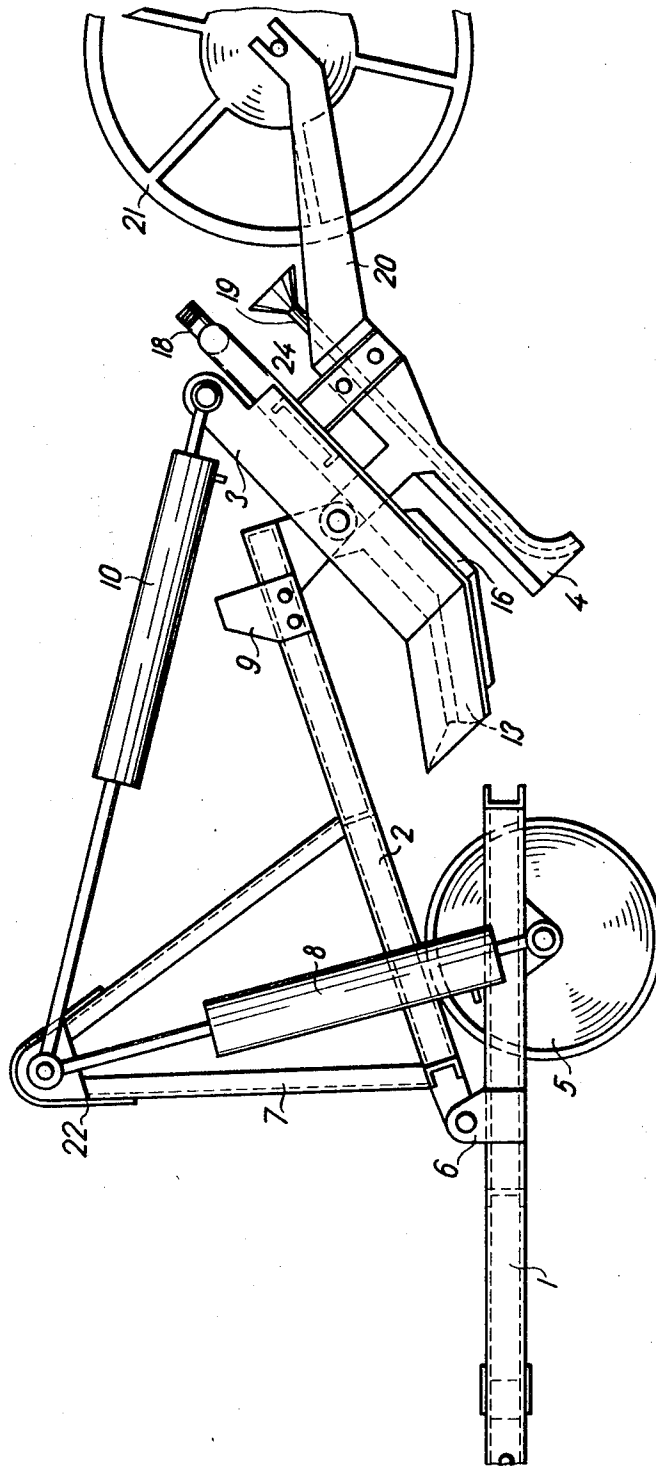
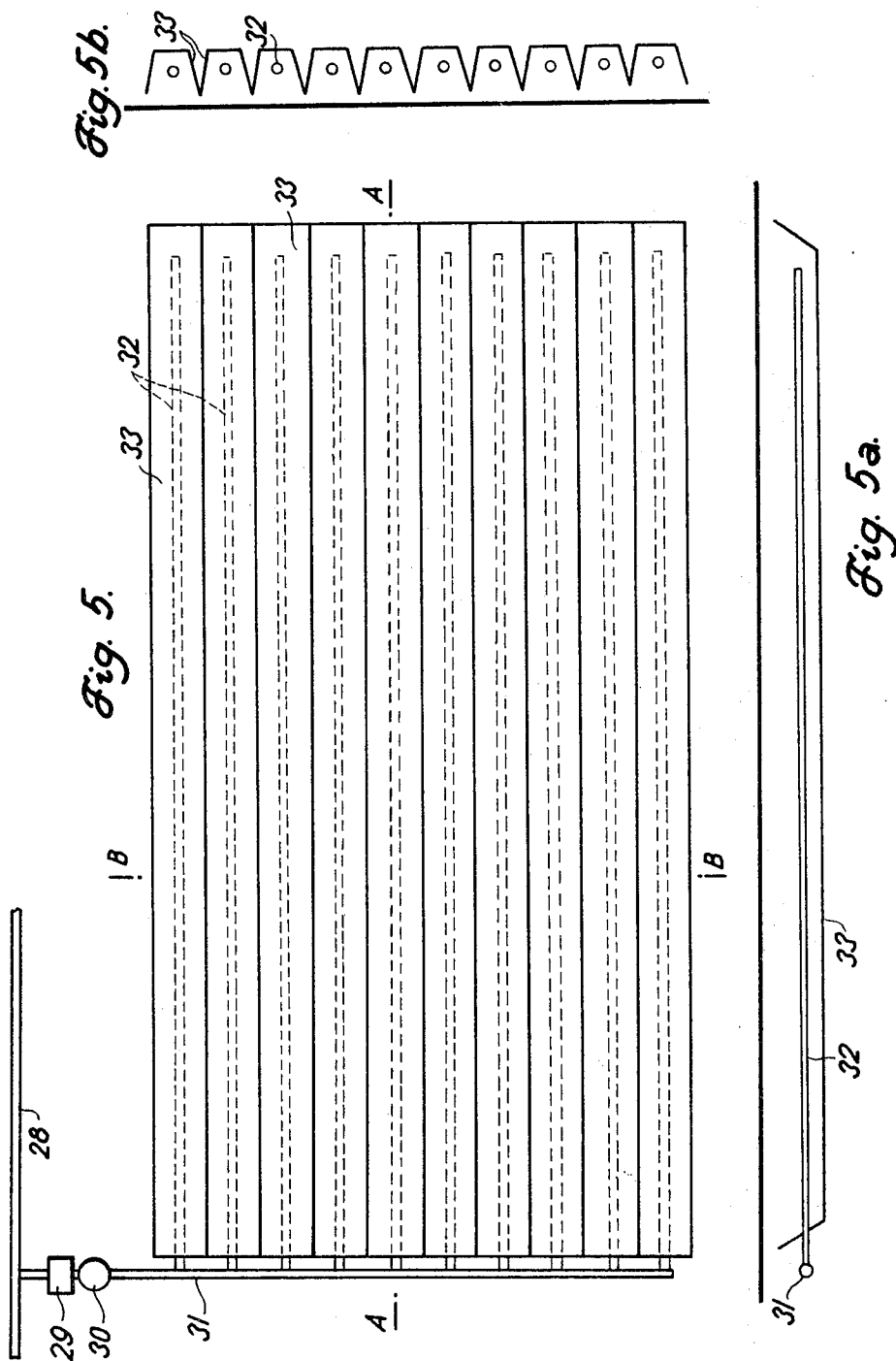


Fig. 4.

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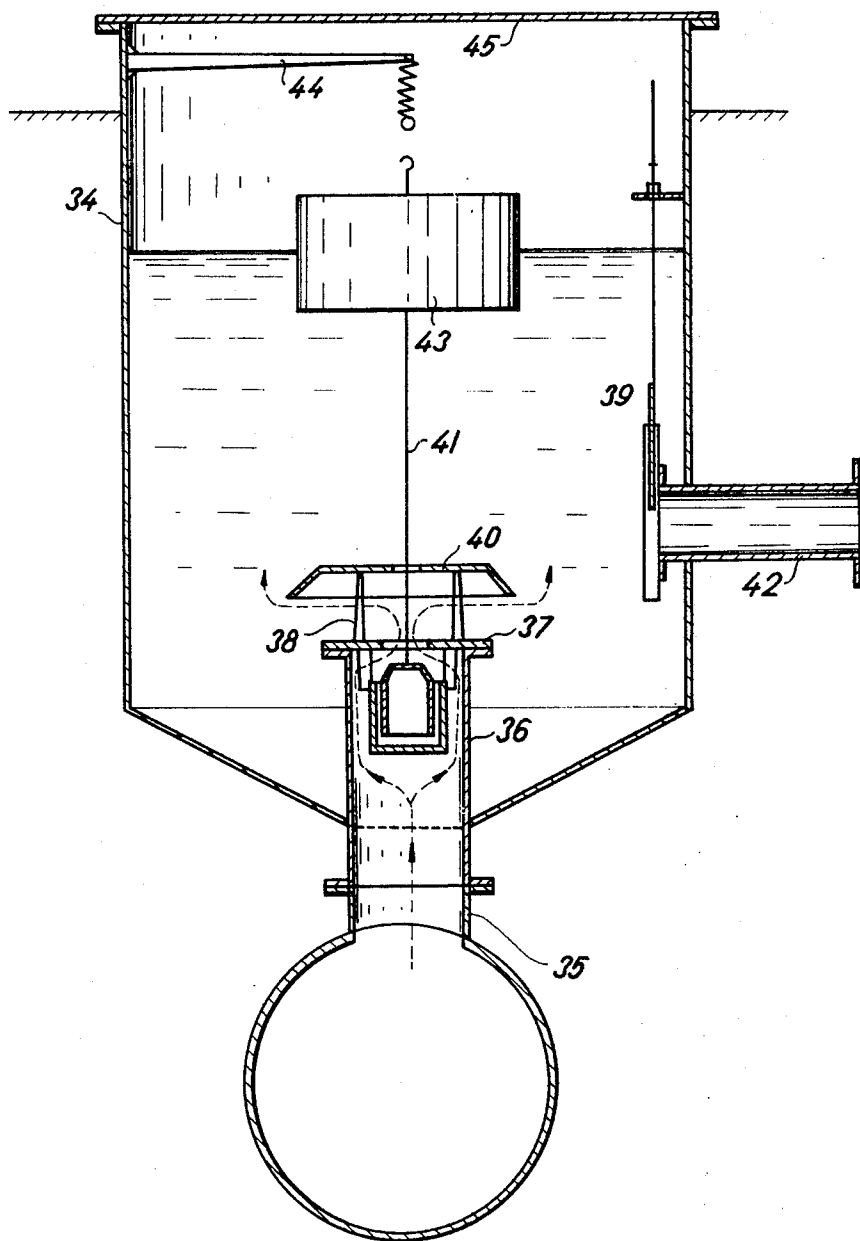


Fig. 6.

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MEMBRANE-FORMING PLOW

BACKGROUND OF INVENTION

This invention relates to an arrangement for melioration and reclaiming of deep sands in dry areas, based on the principle of large area hydropony comprising a meliorating plough for creating underground ditches with impermeable walls, with simultaneous depositing of a perforated irrigating conduit in said ditches, through which conduits a nutritious solution is supplied into said underground ditches, the amount of which supplied solution could be adjusted to a constant value.

The main reason for barrenness of deep sands is their high permeability and thus also their inability to maintain in the surface layer moisture and diluted nutritious substances, which is the fundamental requirement for growing plants.

The reclaiming of such sandy soil with an efficient use of irrigating water requires the creating of an impermeable layer below the sand surface to prevent losses of water due to infiltration into the lower layers and thus also the washing out of supplied nutritious substances from the active subsurface layer into the lower layers. After creation of an impermeable layer below the sand surface conditions for an efficient use of artificially supplied moisture and nutritious solutions to the surface layers are accomplished, so that they may serve for growing plants. The nutritious solutions are supplied to the upper sand layers by means of perforated irrigation pipes, connected to a network of underground distributing conduits, provided with an arrangement for enriching the irrigating water with nutritious substances, whereby the amount of the supplied nutritious solutions can be regulated to achieve automatically a constant supply according to predetermined conditions. The whole reclaiming system is based on the principle of large area hydropony at natural conditions.

SUMMARY OF INVENTION

The fundamental means for creating underground ditches with impermeable walls and for depositing of irrigation pipes for the supply of nutritious solution is a meliorating plough.

DESCRIPTION OF DRAWINGS

An embodiment of the plough according to this invention is shown on the accompanying drawings, showing in
FIG. 1 an elevation of the plough,
FIG. 2 a top view,
FIG. 2a a rear view,
FIG. 2b a cross-sectional view of the injection conduit,
FIG. 3 an elevation of the plough in the transport position,
FIG. 4 an elevation of the plough in its position after having dug a ditch,
FIG. 5 a top view,
FIG. 5a a side view and
FIG. 5b a cross section of a treated area and
FIG. 6 a sectional elevation of a storage tank in a pit for the storage of the irrigating solution.

DESCRIPTION OF PREFERRED EMBODIMENT

The meliorating plough is pulled by a tractor or by any other suitable trailer pulling device. The underground ditches with impermeable walls are obtained by using asphalt or some other suitable material, which is supplied to an injection device of the meliorating plough from a vessel which is arranged on a trailer or which is fixed on the frame of the plough or by means of an asphalt sprayer.

The plough comprises a front frame part 1 supported on wheels 5. A rear frame part 2 is pivotally linked to the front frame part 1 by means of the member 6. Struts 7, connected at the top by head piece 22, are fixed to the rear frame part 2. At both sides of the front frame 1 a hydraulic cylinder 8 is pivotally mounted on the axle of the wheels 5, the cylinders 8 being adapted to raise the rear frame part 2 together with the appliances supported by said rear frame part 2. The rear frame part 2 contains an injection plough 3 pivotally supported by a

bolt 11 in a sleeve of a bracket fixed on the rear frame part 2. The turning of the injection blade 3 is achieved by a hydraulic cylinder 10, linking the injection plough blade 3 with the upper part of the struts 7. In order to prevent, in the course of operation of the machine, any rear deviation of the blade 3, stops 9 are provided on the rear frame part 2 against which the upper part of the injection plough blade 3 rests in the operation of the machine. The upper part of the injection blade 3, which in operation is positioned above the soil surface is strengthened by a brace 24 to which brackets 17 are fixed; such brackets support the irrigation plough blade 4 which protects a guiding tube 19 for the irrigation pipes. Said guiding tube 19 is provided with a funnel shaped extension on the top, preventing dragging of the irrigation pipes entering at different tangential angles in the course of their winding off from the storage drum 21 which is supported by two members 20 fixed to the irrigation plough blade 4. The irrigation plough blade 4 is additionally linked by means of the bracket 15 to the axle 11 of the wheels 5 in order to increase its stability.

The injection plough blade 3 is of trapezoidal shape. It is provided with an edge 12 in order to reduce its resistance in the course of operation in the soil. The injection suspension, for instance asphalt, is supplied to the soil through the injection conduit 13 connected to a supply hose from an asphalt sprayer by way of the connecting sleeve 18. A cross-sectional view of the injection blade 3 along the plane A-A in FIG. 2a is shown in FIG. 2b. The injection conduit 13 of a flat cross section is provided with outlet ports 26 and is protected along its whole length from contamination and damage by the soil at the bottom by a protective plate 27 and at the top by a slide plate 16. FIG. 3 shows an elevation of the meliorating plough in the transport position, which is achieved by raising the rear frame part 2 of the plough with all appliances above the surface of the ground. When starting ploughing the sandy ground, the rear frame part 2 is completely lowered so that the injection and irrigation blades enter the soil surface. In the course of ploughing, a spray pump supplying asphalt to the injection blade starts operation simultaneously with the movement of the plough. The depositing of the irrigation pipes is effected by anchoring the pipes at the starting point of the injection ditch in the ground in order to achieve a rotation of the storage drum 21. After a certain length of the pipe is deposited, the rotation of the drum is secured in the course of unwinding of the pipe.

When raising the plough out of engagement with the ground the hydraulic cylinder 8 is actuated simultaneously with the hydraulic cylinder 10 in order to achieve a continuous raising of the plough and a termination of the injected ditch in a short distance. This position of the machine is shown in elevation in FIG. 4.

When replacing the drum 21 with the stored irrigation pipe, the rear frame part 2 of the plough is lowered to the ground, the empty drum is replaced by a full one, and the machine is brought by the hydraulic cylinders to the transport position as shown in FIG. 3 and a new operation may start.

The hydraulic devices are controlled from the tractor, which is provided with a hydraulic pump and with control means in the operator's cabin.

The proper melioration system for large style hydropony comprises a number of underground asphalt injected ditches 33 of trapezoidal cross section, in which perforated irrigation pipes 32 are deposited, which are connected to an underground distribution pipe system 31. The nutritious solution is supplied to the asphalt injected underground ditches 33 from a pressure supply conduit 28 over the distribution conduit 31 and the irrigation pipes 32. A throughflow fertilizer device 29 is installed in a connecting pipe between the supply conduit 28 and the distribution conduit 31, where the irrigating water is enriched by nutritious substances and this nutritious solutions pass into a regulating pit 30 enabling a constant withdrawal of the nutritious solution to the fertilized soil.

The regulating pit for constant withdrawal of irrigating water or of the nutritious solution is shown schematically in

FIG. 6. It comprises a tank 34 connected by way of the inlet tube 36 to the branch tube 35 of the supply conduit. The inlet tube 36 is provided with a flange 37 with a circular opening which can be closed by a circular plug, connected by means of a pull rod 41 to a float 43. A buffer plate 40 damping the water stream is fixed on the flange 37 by means of brackets 38. The tank 34 is provided with a cover 45 preventing damages of the interior outfit. In case of prolonged interruption of irrigation, the float is fixed to the bracket 44, closing thus permanently the water supply to the tank. In the course of operation the float maintains, a relatively small fluctuation, a constant operating level of the water in the tank. In case a maximum level is achieved, the supply to the tank is interrupted. If water is drained through the outlet tube 42 connected to the distribution conduit, the water level in the tank is lowered, the float is equally lowered and opens the water supply. The outlet tube 42 is provided at its entrance with a slide gate 39 for more accurate adjustment of the water supply from the tank at predetermined operating water level in the tank.

The described melioration arrangement for fertilizing deep sands in dry areas on the principle of large area hydropony enables at relatively low cost to reclaim large areas of sandy soil, which have not been hitherto used for agriculture, particularly of deserts and semi-deserts of arid region. In addition to the low costs of the outfit and its operation this reclaiming method makes it possible to reduce the need of irrigation water and nutritious substances while achieving high yields. Due to subsequent accumulation of organic material in the surface layer of the sand in the course of several years, sufficient humus is accumulated, making it possible to include thus fertilized large sand areas permanently into regions with intensive agricultural exploitation. It is obvious that in addition to asphalt, other suitable materials can be used for injection, for instance, bituminous loam and similar materials.

I claim:

1. A meliorating arrangement for reclaiming regions containing deep sands in arid areas on the principle of large area hydropony, comprising a meliorating plough having a front supporting frame part provided with supporting wheels, a rear

frame part, said rear frame part pivotally linked to said front frame part, said rear frame part provided with a hydraulically controlled injection plough having a horizontally elongated plow blade extending transversely of the direction of travel of the plow, said blade being substantially trapezoidal in cross section adapted to form an opening in the sandy soil, means disposed along the rear of the plough blade for spraying a water impermeable substance into the thus created opening to form an impervious membrane thereon, an irrigation plough blade disposed behind rear part of said injection plough blade, said irrigation plough blade being provided with means for depositing a pliable irrigation pipe above said impervious membrane.

2. An arrangement as set forth in claim 1 said means for spraying substances to the walls of the opening comprising an exchangeable injection conduit with an outlet slot of adjustable width, making it possible to adjust the amount of supplied suspension and thus also the thickness of the impervious walls of the opening, a sliding plate with lowered rear part adapted to protect the outlet slot against contamination by the soil, said lower rear part reducing the height of falling of the sand or soil into the injected suspension after such sand or soil has been dug from the upper surfaces by the injection plough blade.

3. An arrangement as set forth in claim 1, said rear frame part supporting said injection plough blade and said irrigation plough blade being provided with means for adjusting the relative position of said rear frame part with respect to said front frame part.

4. An arrangement as set forth in claim 1, both said injection plough blade and said irrigation plough blade being supported pivotally by said rear frame part, and comprising means for simultaneously adjusting the position of both said plough blades with respect to the front frame part.

5. An arrangement as set forth in claim 1, comprising a storage drum for the irrigation pipe arranged on the rear frame part, said irrigation plough blade being provided with a guiding tube for the irrigation pipe which is wound off from said drum and deposited in the prepared opening.

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