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ADJUSTABLE DRIP IRRIGATION SYSTEM

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Abstract *- A relevant equipment for providing an efficient and economical way to supply fresh water in conditions of its shortage is a regulated drip irrigation system designed for use in small farms and household plots.*

Keywords *- regulated drip irrigation, preheating of water, distribution pipeline, time relay with override mechanism, water flow meter, system conservation mode.*

Problem statement. Currently, as food production becomes a global challenge and the availability of fresh, clean water continues to decrease, it is crucial to develop multifunctional devices that provide efficient and economical irrigation solutions. Such a system should be capable of automatically regulating the water supply and monitoring water requirements. Additionally, an essential feature of this system is the ability to preheat water using a natural energy source, particularly sunlight. This is important for crops such as cucumbers and tomatoes, which show accelerated growth and fruiting when irrigated with warm water.

The main part. The controlled drip irrigation system we have developed is designed for watering crops in greenhouses and on small farm plots. Such adjustable drip irrigation systems are typically used when:

- It is necessary to preheat water using solar energy;
- A specific watering time needs to be set;
- The volume of water used must be monitored;
- The system should provide the ability to switch to conservation mode in winter.

The proposed system includes a water tank, a mechanism for controlling the filling of the tank, a distribution pipeline for water drainage for irrigation, and

a time relay with an override mechanism that allows the time mode of the system to be set based on weather conditions and soil moisture levels. Additionally, the system features a water flow meter for monitoring.

Furthermore, the controlled drip irrigation system includes a water preheater consisting of a polypropylene tube wrapped around the container. This tube is black for better heat absorption. The outer transparent casing creates conditions for additional water heating and prevents the water container from cooling due to environmental factors. The casing can have a cylindrical or faceted shape.

The developed system is illustrated in Fig. 1 and Fig. 2. The tank 1 is situated on the lower support frame of the transparent casing 2, which is attached to four posts. This design ensures structural rigidity and provides easy access to the water supply taps 3, drainage tap 9, and irrigation water tap 10.

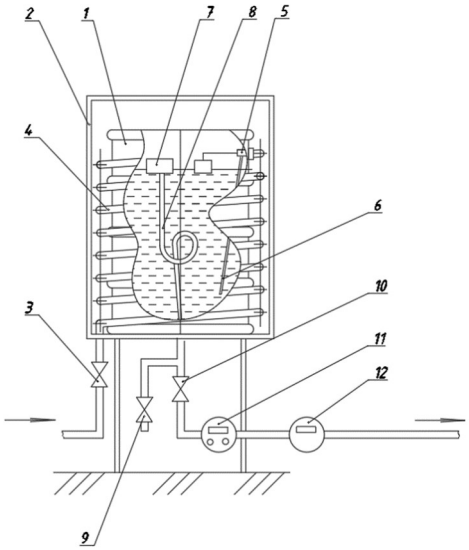

Fig.1. Diagram of the controlled drip irrigation system

The system works as follows. Water is supplied to the system through a supply valve 3, from which a polypropylene tube 4 extends. This tube wraps around the surface of the tank in a cylindrical helical line, ensuring that the water is heated by the sun's rays throughout the daylight hours. A conical water supply valve 5 with a float control mechanism is attached to the upper part of the side wall of the container, allowing the maintenance of a predetermined water level. The container is filled with water through a tube 6 at the lower part of the water column, ensuring more uniform heating of all layers.

Water is drawn through a corrugated tube 8, the upper end of which is fixed to a float 7, from the upper, most heated layer. Then, through the splitter, water is supplied to the drain valve 9 and the water supply valve 10, to which a pipeline with a time relay with a shut-off mechanism 11 and a water flow meter 12 is connected. To ensure control and selection of a rational irrigation mode, the system can be additionally supplemented with a hygrometer.

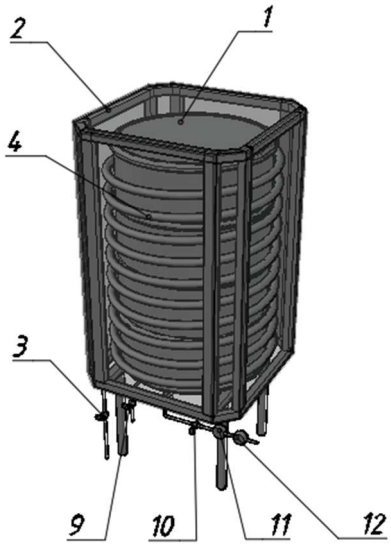

Fig. 2. General view of the controlled drip irrigation system

The system can be made from suitable materials, including:

- Posts made of metal, preferably lightweight and corrosion-resistant;
- Casing, tank, and fittings made of appropriate polymeric materials.

The color scheme of the product is dictated by its purpose, with the casing made transparent and the container in dark colors to absorb as much sunlight as possible.

Conclusions.

1. The developed drip irrigation system provides a simple, efficient, and economical method for irrigating household plots and small farms.
2. Since the system is mounted outside, it allows for the irrigation of plants in multiple greenhouses simultaneously.
3. The system is designed to switch to conservation mode in winter, facilitated by the inclusion of drainage valves in the design that ensure complete water drainage.

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