

METHOD AND SYSTEM FOR ACCELERATED ARTIFICIAL AGEING OF THERMOPLASTIC OR COMPOSITE MATERIALS

Patent No. *RO 131897 A2 / 29.04.2022, OSIM Bucharest*
 Authors: *Alin Constantin MURARIU, Lorand KUN*

Object of the invention:

The method is based on the accelerated degradation of samples using ultraviolet (UV) lamps and comparing their physical-mechanical characteristics before and after the artificial ageing process. The accelerated artificial ageing system use UV radiation to age thermoplastic or composite materials. The system presented in figure 1 and 2 is designed to achieve accelerated materials degradation under controlled conditions, to estimate their behavior over time in industrial working conditions.

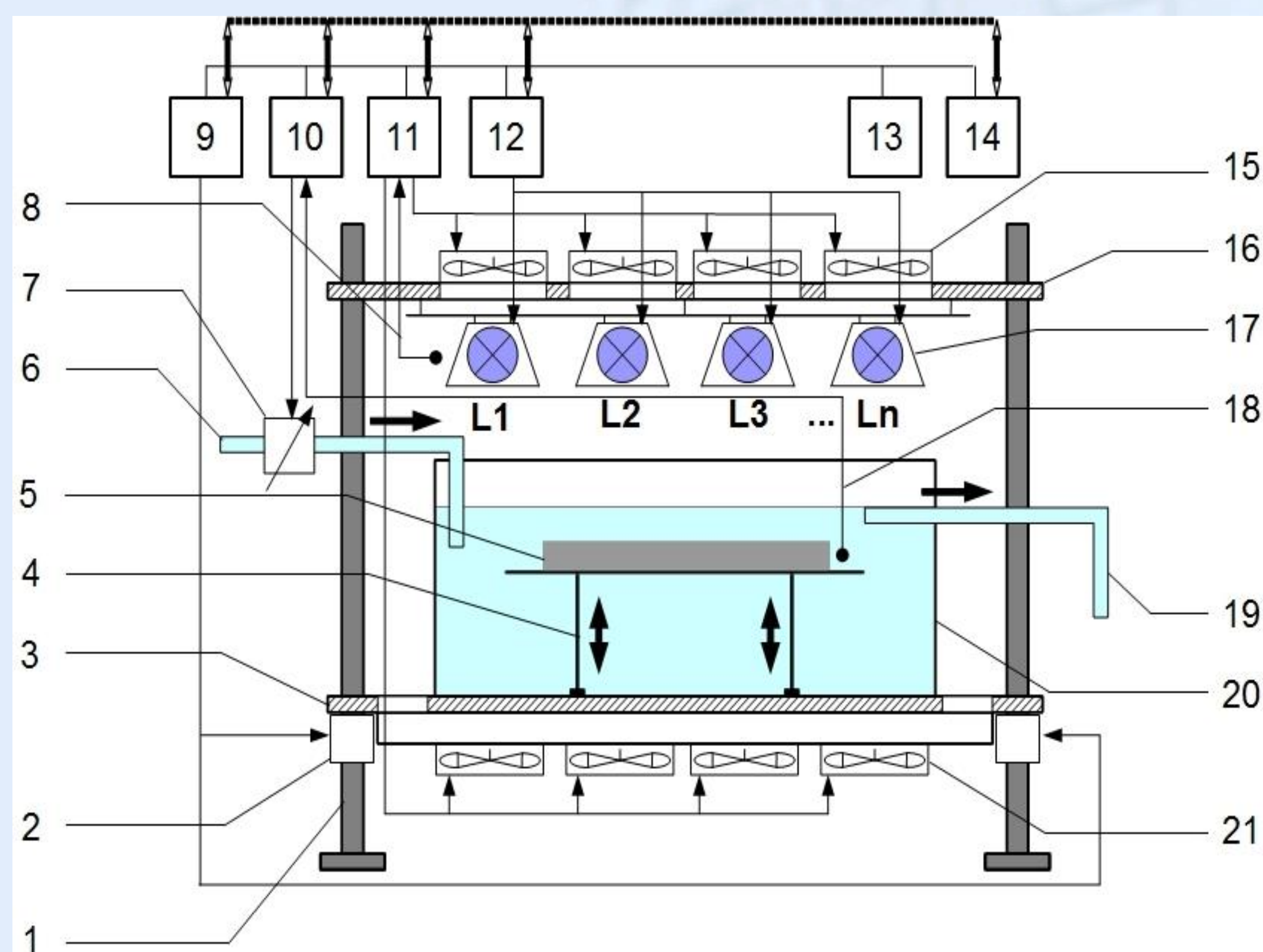


Figure 1 - Block diagram of the accelerated artificial ageing system

- | | |
|---|--|
| (1) - fixing columns; | (14) - programmable microcontroller (PCL); |
| (2) - step motors; | (15) - upper coolers; |
| (3) - lower mounting plate; | (16) - upper support plate; |
| (4) - immersed height-adjustable support; | (17) - ultraviolet lamps; |
| (5) - immersion samples; | (18) - thermocouple; |
| (6) - water inlet; | (19) - water overflow exhaust connection; |
| (7) - electrovalve; | (20) - constant level water tank; |
| (8) - thermocouple; | (21) - lower coolers |
| (9) - control block; | |
| (10) - control block for tank water supply; | |
| (11) - control block for forced air cooling system; | |
| (12) - control block for UV lamps; | |
| (13) - uninterruptible power supply; | |



Figure 2 - Monitoring and control system for UV artificial ageing of thermoplastics and composites

Technical problem solved by the invention:

- the need to assess changes over time in the physical-mechanical characteristics of components made of thermoplastic or composite materials using qualitative determinations of resistance to artificial ageing;
- exposure to UV radiation and removal of infrared (IR) radiation generated by ultraviolet lamps by water cooling of samples, a process controlled by dedicated software implemented in an automated system.

Advantages:

- eliminates the effect of heat on samples, degradation being achieved exclusively by exposure to UV radiation and not by the cumulative effect of UV and IR radiations;
- provides high flexibility, as the method can be applied to different sizes of thermoplastic components, i.e. the system can be set to operate in different irradiation / temperature / time regimes, according to the requirements;
- the operating mode is simple and intuitive, the system being controlled by means of a PLC with dedicated software;
- it is a high-performance UV accelerated artificial ageing system.

METHOD AND SYSTEM FOR ACCELERATED ARTIFICIAL AGEING OF THERMOPLASTIC OR COMPOSITE MATERIALS

Patent No. *RO 131897 A2 / 29.04.2022, OSIM Bucharest*

Authors: *Alin Constantin MURARIU, Lorand KUN*

Object of the invention:

The method is based on the accelerated degradation of samples using ultraviolet (UV) lamps and comparing their physical-mechanical characteristics before and after the artificial ageing process. The accelerated artificial ageing system use UV radiation to age thermoplastic or composite materials. The system presented in figure 1 and 2 is designed to achieve accelerated materials degradation under controlled conditions, to estimate their behavior over time in industrial working conditions.

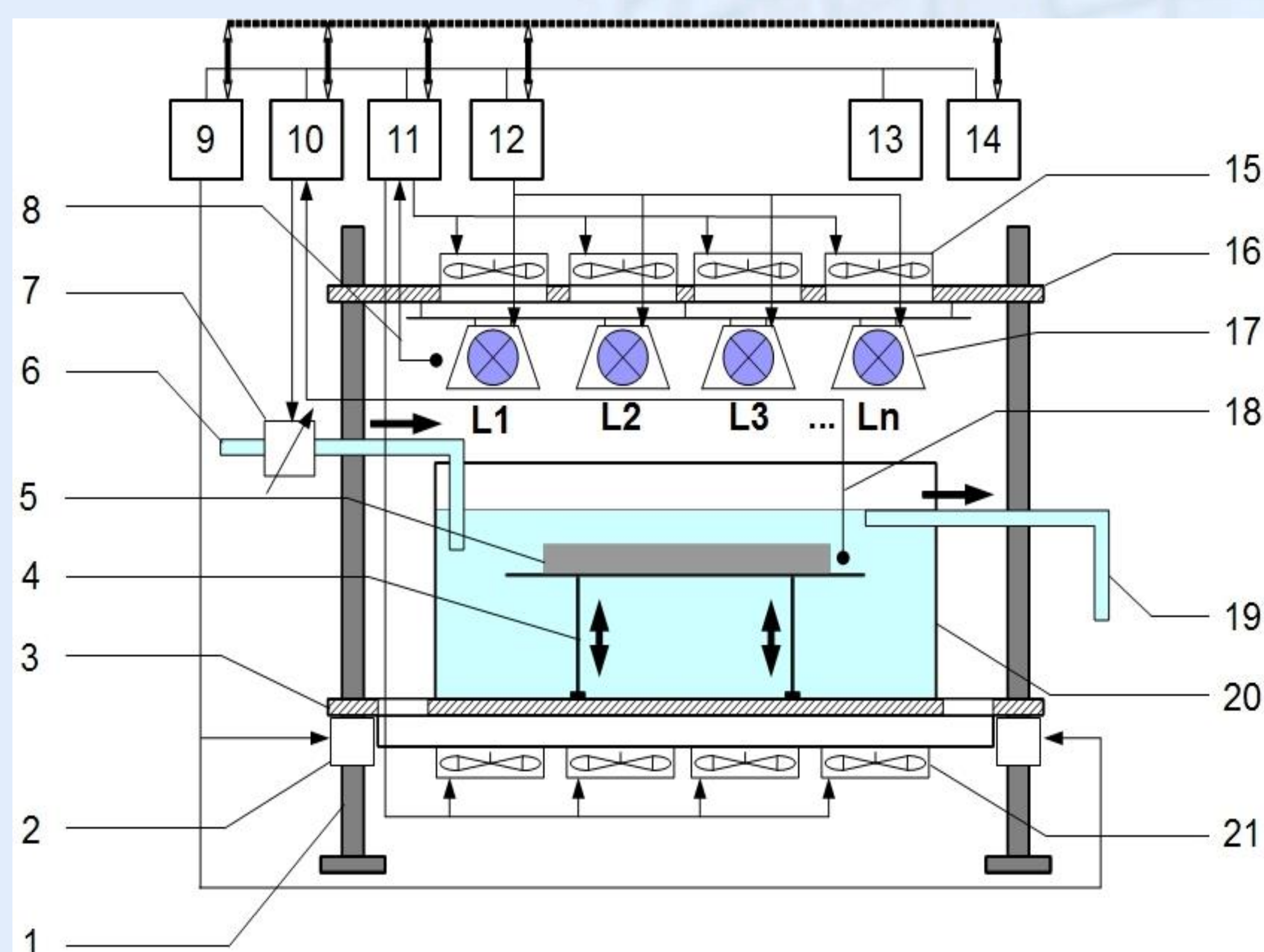


Figure 1 - Block diagram of the accelerated artificial ageing system

- | | |
|---|--|
| (1) - fixing columns; | (14) - programmable microcontroller (PCL); |
| (2) - step motors; | (15) - upper coolers; |
| (3) - lower mounting plate; | (16) - upper support plate; |
| (4) - immersed height-adjustable support; | (17) - ultraviolet lamps; |
| (5) - immersion samples; | (18) - thermocouple; |
| (6) - water inlet; | (19) - water overflow exhaust connection; |
| (7) - electrovalve; | (20) - constant level water tank; |
| (8) - thermocouple; | (21) - lower coolers |
| (9) - control block; | |
| (10) - control block for tank water supply; | |
| (11) - control block for forced air cooling system; | |
| (12) - control block for UV lamps; | |
| (13) - uninterruptible power supply; | |

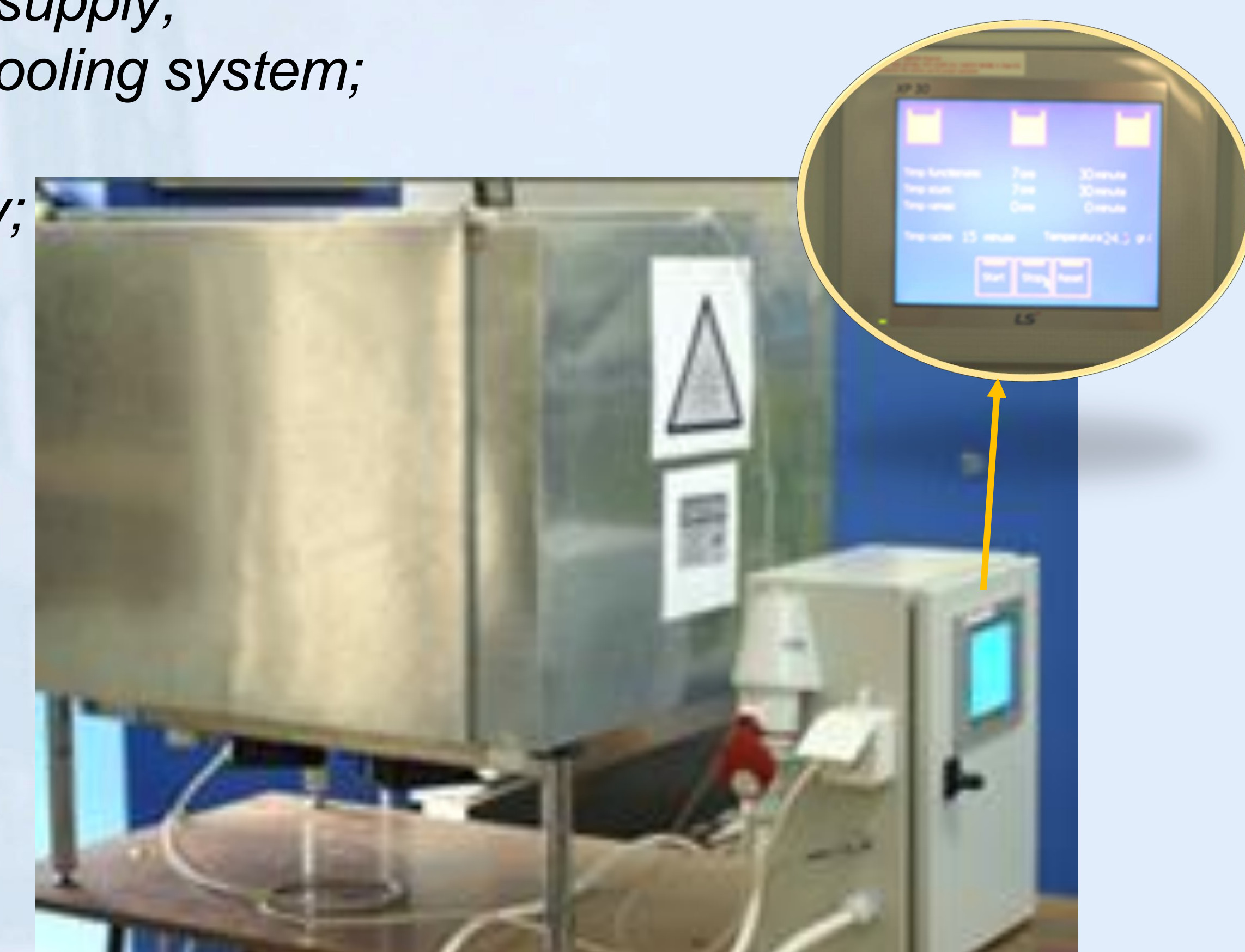


Figure 2 - Monitoring and control system for UV artificial ageing of thermoplastics and composites

Technical problem solved by the invention:

- the need to assess changes over time in the physical-mechanical characteristics of components made of thermoplastic or composite materials using qualitative determinations of resistance to artificial ageing;
- exposure to UV radiation and removal of infrared (IR) radiation generated by ultraviolet lamps by water cooling of samples, a process controlled by dedicated software implemented in an automated system.

Advantages:

- eliminates the effect of heat on samples, degradation being achieved exclusively by exposure to UV radiation and not by the cumulative effect of UV and IR radiations;
- provides high flexibility, as the method can be applied to different sizes of thermoplastic components, i.e. the system can be set to operate in different irradiation / temperature / time regimes, according to the requirements;
- the operating mode is simple and intuitive, the system being controlled by means of a PLC with dedicated software;
- it is a high-performance UV accelerated artificial ageing system.