CLAIMS

The invention claimed is:

1. Device (2, 20, 22, 27) for the removal of ions from a polar liquid ~~(F)~~, in which the device comprises electrodes, at least one compartment (14, 14', 14") which comprises at least one inlet (4) for an entering polar liquid flow (F) and at least one outlet (5) for an outgoing deionized liquid flow (D, F'), in which said compartment (14, 14', 14") an electrochemically regenerable ion-exchange material (17, 17', 17") fills a zone through which zone a liquid flow is able to pass, wherein the device (2, 20, 22, 27) ~~being characterized~~ in that it comprises at least one sensor (1, 1'; 1") of at least one dimensional change of the ion-exchange material (17, 17', 17") filling said zone.

2. Device (2, 20, 22, 27) according to ~~the preceding~~ claim 1, wherein the sens~~or (1") comprises a photo-sensor (23, 24, 25).~~

3 Device (2, 20, 22, 27) according to ~~any one of the preceding claims~~ claim 1, wherein the sensor (1, 1') comprises a sensor of mechanical stress (16, 19).

4. Device (2, 20, 22, 27) according to ~~any one of the preceding claims~~ claim 1, wherein the sensor (1") comprises a photo-sensor which comprises a mechanical element (18") and a photo-detector (23, 24, 25) of the displacement of said mechanical element which comprises a transmitter and a transceiver (23, 24), and wherein ~~the~~ said compartment (14") ~~around the mechanical element (18")~~ has at least one transparent wall (28) so that the optical signal from ~~the~~ said transmitter (23) to ~~the receiver~~ said transceiver (24) can cross said compartment (14") adjacent to the mechanical element (18").

5. Device (2, 20, 22, 27) according to ~~any one of the preceding claims~~ claim 1, comprising another sensor which is able to measure the hydraulic pressure of the liquid flow which can circulate into the zone.

6. Device (2, 20, 22, 27) according to ~~any one of the preceding claims~~ claim 1, comprising an apparatus (10, 11, 100) connected to the sensor~~, and, preferably, this apparatus (10, 11, 100) is able to analyze the dimensional change of the ion-exchange material and to control the electric current that can be conducted through said compartment or through said device.~~

7. Device (2, 20, 22, 27) according to claim 6, adapted to analyze the dimensional change of the ion-exchange material (17, 17', 17") and to control the electric current that can be conducted through said compartment (14, 14', 14") or through said device (2, 20, 22, 27).

~~7~~8. Method for the removal of ions from a polar liquid (F) wherein at least a part of said polar liquid (F) passes as a stream through an electrochemically regenerable ion-exchange material (17, 17', 17") located in a compartment (14, 14', 14") where an electric field is applied so that the ions to be removed migrate,

the method comprising a step of controlling the electric current conducted through said compartment (14, 14', 14"),

the method ~~being characterized in that it includes~~ further comprising a step of measuring at least one dimensional change of the ion-exchange material (17, 17', 17") and in that the step of controlling the electric current takes into account this dimensional change of the ion-exchange material (17, 17', 17").

~~8~~9. Method according to ~~the preceding~~ claim 8, wherein the step of measuring the dimensional change of the ion-exchange material (17, 17', 17") is carried out by means of a sensor (1 ; 1' ; 1").

~~9~~10. Method according to ~~the preceding~~ claim 9, wherein said sensor (1") comprises a photo-sensor (23, 24, 25).

~~10~~11. Method according to ~~any one of claims 7 to 9~~ claim 8, wherein said sensor comprises a sensor of mechanical stress (1, 1', 18").

~~11~~12. Method according to ~~any one of the claims 7 to 10~~ claim 8, further comprising a step of measuring the hydraulic pressure of the stream flow which passes through the ion-exchange material (17, 17', 17").

~~12~~13. Method according to ~~the preceding~~ claim 12, wherein the step of controlling the electric current takes into account the dimensional change of the ion-exchange material (17, 17', 17") without the influence of the hydraulic pressure of the stream flow.