CLAIMS

1. A ~~M~~method for producing a device ~~(10)~~ comprising a membrane ~~(14)~~ of piezoelectric nature above at least one cavity ~~(11)~~, the method comprising:
   a) providing a carrier substrate ~~(1)~~ having a first face ~~(12)~~ extending over a plane (x, y) and provided with a cavity ~~(11)~~ opening out onto the first face ~~(12)~~, the cavity ~~(11)~~ having a lateral dimension in the plane (x, y) that is larger than 30 µm,
   b) providing a donor substrate ~~(2)~~ provided with a buried weakened plane ~~(20)~~ formed by implanting light species through a front face ~~(21)~~ of the donor substrate ~~(2)~~, the weakened plane ~~(20)~~ delimiting a surface layer ~~(22)~~,
   c) depositing, on the front face ~~(21)~~ of the donor substrate ~~(2)~~, a stiffening layer ~~(13)~~ made of piezoelectric material having a thickness ~~(e)~~ greater than 500 nm,
   d) joining the carrier ~~(1)~~ and donor ~~(2)~~ substrates at a bonding interface ~~(30)~~ arranged between the first face ~~(12)~~ of the carrier substrate ~~(1)~~ and the stiffening layer ~~(13)~~,
   e) splitting, after step d), the donor substrate ~~(2)~~ at the buried weakened plane ~~(20)~~ so as to transfer a membrane ~~(14)~~ comprising the surface layer ~~(22)~~ and the stiffening layer ~~(13)~~ to the carrier substrate ~~(1)~~, the membrane ~~(14)~~ being located above the cavity ~~(11)~~.

2. The ~~M~~method according to the preceding claim, in which the donor substrate ~~(2)~~ is made of silicon or of silicon carbide.

3. The ~~M~~method according to Claim 1, in which the carrier substrate ~~(1)~~ is made of silicon.

4. The ~~M~~method according to Claim 1, in which the donor substrate ~~(2)~~ is made of silicon and the stiffening layer ~~(13)~~ is deposited at a temperature lower than 450°C.

5. The ~~M~~method according to Claim 1, in which the donor substrate is made of silicon carbide and the stiffening layer ~~(13)~~ is deposited at a temperature lower than 850°C.

6. The ~~M~~method according to one of the preceding claims, in which the implanted light species are hydrogen ions and/or helium ions.

7. The ~~M~~method according to one of the preceding claims, in which a first electrically conductive layer ~~(31)~~ is interposed between the stiffening layer ~~(13)~~ and the carrier substrate ~~(1)~~, the first layer ~~(31)~~ being directly in contact with the stiffening layer ~~(13)~~ and configured to form a lower electrode ~~(31)~~ of the device ~~(10)~~.

8. The ~~M~~method according to one of the preceding claims, in which a bonding layer ~~(32)~~ is interposed between the stiffening layer ~~(13)~~ and the carrier substrate ~~(1)~~, said bonding layer ~~(32)~~ being directly in contact with the carrier substrate ~~(1)~~.

9. The ~~M~~method according to ~~the preceding~~ claim 8, in which the bonding layer ~~(32)~~ is made of silicon oxide.

10. The ~~M~~method according to one of the preceding claims, in which a second electrically conductive layer ~~(33)~~ is formed on the stiffening layer ~~(13)~~, the second layer ~~(33)~~ being configured to form an upper electrode ~~(33)~~ of the device ~~(10)~~.

11. The ~~M~~method according to one of the preceding claims, comprising at least one mechanical grinding operation and/or at least one chemical-mechanical polishing operation and/or at least one chemical etching operation on the surface layer ~~(22)~~ after splitting step e).

12. The ~~M~~method according to one of the preceding claims, in which joining step d) comprises bonding by molecular adhesion between, on the one hand, the donor substrate ~~(2)~~ provided with the stiffening layer ~~(3)~~ and, on the other hand, the first face ~~(12)~~ of the carrier substrate ~~(1)~~.

13. The ~~M~~method according to one of the preceding claims, in which a step of deposition on the free surface of the surface layer ~~(22)~~ is performed after step e) so as to increase the thickness of the surface layer ~~(22)~~.

14. A ~~D~~donor substrate ~~(2)~~ configured to transfer a membrane ~~(14)~~ of piezoelectric nature to a carrier substrate provided with at least one cavity having a lateral dimension larger than 30 µm, the donor substrate ~~(2)~~ comprising:

a weakened plane ~~(20)~~ arranged in the donor substrate ~~(2)~~ and delimiting a surface layer ~~(22)~~, and

a stiffening layer ~~(13)~~ made of piezoelectric material having a thickness ~~(e)~~ greater than 500 nm arranged on the surface layer ~~(22)~~.