CLAIMS

1) A method for the production of a high-resistant tank consisting of an inner liner and an outer shell, the inner liner (2) being formed as a closed metal container having access doors showing an essentially cylindrical shape, the outer walls of the inner liner (2) being subjected to a mechanical treatment able of implementing an axial and longitudinal pretensioning hardening until a pre-determined level, wherein the method further comprises the following steps:

a) providing a mould (1) having such sizes that its inner wall defines internally an essentially cylindrical volume able of lodging the liner (2);

b) enclosing the liner (2) inside the mould (1);

c) fully enclosing the mould (1) so that the liner (2) will be closed inside it;

d) closing the access doors of the liner (2);

e) introducing into the liner (2) a fluid able of being pressurized;

f) submitting the outer walls (4) of the liner (2) to the mechanical treatment by pressurizing the fluid until the walls (4) of the liner (2), and particularly its whole cylindrical surface, are expanded and stretched until they meet the inner surface (3) of the mould (1);

g) de-pressurizing the inner volume of the liner (2) and removing the container from the inside of the mould (1);

h) carrying out an outer covering of the liner (2) by one or more layers of composite material, so to form the outer shell and finish the realization of the tank;

i) implementing on the tank an auto-frettage treatment.

2) The method according to claim 1, wherein a size of the radius (r + L) of the inner wall of the mould (1) is defined such that the linear and radial stretching (L) of the radius (r) of the wall (4) of the liner (2) is of such a size that the relevant material changes the elastic field by increasing the yield strength level to a pre-determined value.

3) The method according to claim 2, wherein the material forming the liner (2) is a steel showing high elongation before reaching the yield strength condition,.

4) The method according to claim 3, wherein the steel is an austenitic stainless steel, or a Duplex type.

5) The method according to claim 3 or claim 4, wherein the austenitic stainless steel is a steel showing characteristics conforming or similar to a steel according to AISI 304.

6) The method according to claim 5, wherein the steel is a more weldable steel (AISI 304L).

7) The method according to claim 1, wherein during the pressurization step of the inside of the liner (2), an adjustable counter-pressure is supplied, which is acting on the outer walls of the same liner (2).

8) The method according to claim 7, wherein the adjustable counter-pressure is controlled at a level so to maintain a pressure difference between the inside of the liner and its outer surface within pre-determined values.

9) The method according to claim 1, wherein the auto-frettage treatment is carried out on the complete tank in such a way that the resulting tensioning on the metal material of the liner (2) is lower than the yield point of the metal material .

10) The method according to claim 3 or claim 4, wherein the steel pretensioning treatment is carried out in two separate steps through two different moulds (20, 30), wherein in the first of these two separate steps, the liner (2) (when sausage shaped) is introduced into a first mould (20) and is subjected to a controlled deformation only in circumferential sense (20B), and wherein in the second step the liner (2) is introduced into a second mould (30) and is subjected to a controlled deformation which is basically axial (P, LT).

11) The method according to claim 1, wherein the pre-tensioning treatment is carried out after having subjected the liner (2) to an annealing/solubilization thermal treatment.

12) The method according to claim 1, wherein the wall of the liner (2) is shaped in such a way as to show remarkable undulations/corrugations (40B, 41B, 42B...).

13) The method according to claim 1, wherein after the pre-tensioning hardening treatment, the liner (2) is covered by a first layer of low module of elasticity, , and then the assembly, formed by the liner (2) and the layer, is subjected to an auto-frettage treatment.

14) The method according to claim 13 wherein the first layer is continuous fibreglass.

15) The method according to claim 11 or claim 12, wherein after the auto-frettage treatment, the assembly, formed by the liner (2) and the first layer, is further covered by a second layer of medium module of elasticity.

16) The method according to claim 15, wherein the second layer is carbon- fiber or KEVLAR.

17) The method according to claim 11, wherein after covering by the second layer, the tank is subjected to a second low entity auto-frettage treatment.

18) The method according to claim 1, wherein after the pre-tensioning hardening treatment, the liner (2) is covered with a first layer of material showing an high elasticity module, preferably carbon-fiber composite, and then the assembly made of the liner (2) and of the layer, is subjected to an auto-frettage treatment .

19) The method according to claim 10, wherein the plurality of corrugations are formed during the /pre-tensioning hardening treatment the plurality of corrugations being basically circular and parallel the ratio between the width "L" of any single undulation and its height or deepness "H" being comprised in an interval between 1 and 6 ($1 < L/H < 6$).

20) The method according to claim 10, wherein the ratio between the width "L" of any single corrugation and the bending radius (Re) between the flat and non-corrugate portion of the container wall and the contiguous inclined side (51) of the adjacent corrugation (52) is comprised in an interval between 3 and 15 ($3< L/Re < 15$).

21) The method according to claim 10, wherein the ratio between the width "L" of any single corrugation and the bending radius (Ri), of the lower curved vertex (Vi) between two contiguous sides (51, 53) of the same corrugation (52), is comprised in an interval between 3 and 15 ($3^ L/Ri < 15$).

22) The method according to claim 10, wherein the ratio between the radius "R" of the liner (2) and the height (H) of the respective corrugation is comprised in an interval between 20 and 100 (20^ R/H < 100).

23) The method according to claim 13 or claim 14, wherein the ratio between the radius "R" of the liner and the thickness "S" of the respective outer wall is approximately R/S = 100 if the approximate condition that L/H=g takes place, and R/S = 1250 if the approximate condition that L/H = 1 takes place.