CLAIMS

1. A die for extruding a material rich in proteins and water,

which die defines a die axis and has two opposite sides according to the die axis, namely an upstream side through which the material enters the die and a downstream side through which the material leaves the die,

which die delimits successively according to the direction of the die axis:

- a channel which extends in a manner centered on the die axis from an upstream end, opening onto the upstream side of the die, to a downstream end,

- two branches, which extend on either side of the die axis, diverging from each other, from respective upstream ends, axially abutting the downstream end of the channel, to respective downstream ends, each of the branches extending substantially in a straight line from the upstream end of the branch to the downstream end of the branch, and

- two ducts, which extend on either side of and in a manner substantially parallel to the die axis from respective upstream ends, abutting respectively the downstream ends of the branches, to respective downstream ends, opening onto the downstream side of the die, each of the ducts having a cross-section, in a plane perpendicular to the die axis, which is constant between the upstream end and the downstream end of the duct,

in such a manner that, when the material is pushed through the die from the upstream side, the material flows into the channel and is then distributed in the branches before reaching the ducts in which, under effect of the material being pushed through the die from the upstream side, the material progresses to the downstream side where the material leaves the ducts in the form of two respective product streams,

and which die is equipped with temperature control means able (i) to control a wall temperature of the ducts, (ii) to control a wall temperature of the branches and (iii) to control a wall temperature of the channel.

2. The die according to claim 1, wherein each of the branches has, from the upstream end of the branch to the downstream end of the branch, a succession of sections in respective planes perpendicular to the die axis, which sections define respective centers, an union of which forms a branch axis that is substantially straight and forms with the die axis an angle of less than 30°, preferably less than 20°, even more preferably less than 15°.

3. The die according to one of claims 1 or 2, wherein the branches are delimited by:

- respective substantially flat first surfaces of the die, which are both perpendicular to the same geometric plane containing the die axis and which are located on either side of the die axis, each being turned away from the die axis, these two substantially flat first surfaces extend from the respective upstream ends to the respective downstream ends of the branches, diverging from one another, notably, in a symmetrical manner relative to the die axis, and

- respective substantially flat second surfaces of the die, which are both perpendicular to the geometrical plane and are located on either side of the die axis, each being turned toward the die axis, these two substantially flat second surfaces extend from the respective upstream ends to the respective downstream ends of the branches, diverging from one another, notably in a symmetrical manner relative to the die axis.

4. The die according to claim 3, wherein the substantially flat first surface and the substantially flat second surface of each of the branches are substantially parallel to each other and are inclined relative to the die axis at substantially the same angle which is less than 30°, preferably less than 20°, even more preferably less than 15°.

5. The die according to any one of claims 3 or 4, wherein the section of each of the ducts in a plane perpendicular to the die axis has a substantially rectangular outline having longitudinal edges that extend in a manner substantially perpendicular to the geometric plane, a width of the substantially rectangular outline being between 4 and 25 mm, preferably between 6 and 20 mm.

6. The die according to any one of the preceding claims, wherein the cumulative section of the branches in a plane both perpendicular to the die axis and located at the respective downstream ends of the branches is equal to or less than:

- a cumulative section of the branches in any plane both perpendicular to the die axis and located upstream of the respective downstream ends of the branches, and

- a section of the channel in any plane both perpendicular to the die axis and located between the upstream end and the downstream end of the channel.

7. The die according to any one of the preceding claims, wherein the die includes modules juxtaposed successively to one another according to the die axis from the upstream side to the downstream side of the die, namely:

- an upstream module, which delimits both the channel and the branches and incorporates a first portion of the temperature control means, able to control the wall temperature of the branches and the wall temperature of the channel, and

- one or more downstream modules, which delimit the ducts and incorporate a second portion of the temperature control means, able to control the wall temperature of the ducts.

8. A system for continuously preparing an extruded food product, comprising:

- a raw material which is rich in proteins and water,

- a barrel inside which at least one screw is driven in such a manner as to apply a thermomechanical treatment to the raw material, and

- a die, which is in accordance with any of the preceding claims and which is attached to the barrel in such a manner that the material leaving the barrel is pushed by the at least one screw through the die from the upstream side of the die.

9. The system according to claim 8, wherein the barrel includes, at a downstream end of the barrel, an end plate delimiting a through bore which is centered on the die axis and which abuts the upstream end of the channel in such a manner that the bore directs the material pushed by the at least one screw toward the channel.

10. The system according to any one of claims 8 or 9, wherein the system further includes a conveying tool that is arranged on the downstream side of the die and is able to convey the two product streams individually.