CLAIMS

1. A system for continuous preparation of an extruded food product, comprising:
- a raw material that is rich in protein and water,
- a sleeve inside which at least one screw is driven so as to apply a thermomechanical treatment to the raw material, and
- a die for extrusion of a protein and water-rich material, the die comprising:
- an outer casing, which is tubular, being centered on an axis, and which has a frusto-conical inner face, centered on the axis and divergent downstream, the outer casing being fixedly connected to the sleeve so that the material emerging from the sleeve is pushed by the at least one screw through the die, and
- an internal member, which is arranged coaxially inside the outer casing and mounted so as to rotate about the axis with respect to the outer casing, and which includes both:
- an upstream part, extending at least partially inside the outer casing and having a frusto-conical outer face, centered on the axis and diverging towards the downstream, and
- a downstream part, extending outside the outer casing and coupled to a motorization suitable for rotating the internal member about the axis,
wherein the outer casing and/or the upstream part of the internal member are thermally regulated,
wherein the frusto-conical inner face of the outer casing and the frusto-conical outer face of the internal member delimit therebetween a channel having an upstream end and a downstream end, which are opposite each other along the axis and between which the material flows in the channel, so that when the material is pushed through the die, the material advances through the channel from the upstream end to the downstream end through which the material exits outside of the outer casing,
wherein the sleeve includes, at the downstream end thereof, an end plate which internally delimits a through bore, centered on the axis and channeling the material pushed by the at least one screw out of the sleeve,
and wherein the system further includes a diffuser, which fixedly connects the end plate and the outer casing and which delimits a distribution chamber connecting the bore of the end plate and the upstream end of the channel, the distribution chamber being shaped so as to distribute the material emerging from the sleeve around the axis into the upstream end of the channel.

2. The system according to claim 1, wherein the die includes an adjustment device suitable for adjustably modifying a position of the internal member with respect to the outer casing along the axis.

3. The system according to one of claims 1 or 2, wherein the outer casing is provided with thermoregulation means suitable for acting on the temperature of the material flowing in the

channel by heat exchange with the frusto-conical inner face and for applying a temperature profile along the channel between the upstream and downstream ends of the channel.

4. The system according to any of the preceding claims, wherein the upstream part of the internal member is provided with thermoregulation means suitable for acting on the temperature of the material flowing in the channel by heat exchange with the frusto-conical outer face and for applying a temperature profile along the channel between the upstream and downstream ends of the channel.

5. The system according to any of the preceding claims, wherein the outer casing comprises at least two separate modules, which delimit respective parts of the frusto-conical inner face and which follow one another in juxtaposition along the axis.

6. The system according to claim 5, wherein the at least two modules of the outer casing are thermally regulated independently of each other.

7. The system according to one of claims 5 or 6, wherein the parts of the frusto-conical inner surface, delimited by the at least two modules, respectively, of the outer casing, are inclined with respect to the axis at respective angles which are different from each other.

8. The system according to any of the preceding claims, wherein the internal member comprises at least two separate modules, which delimit respective parts of the frusto-conical outer face and which follow one another in juxtaposition along the axis.

9. The system according to claim 8, wherein the at least two modules of the internal member are rotatable about the axis independently of each other.

10. The system according to one of claims 8 or 9, wherein the at least two modules of the internal member are thermally regulated independently of each other.

11. The system according to any of claims 8 to 10, wherein the parts of the frusto-conical outer face, delimited by the at least two modules, respectively, of the internal member, are inclined with respect to the axis at respective angles which are different from each other.

12. The system according to any of the preceding claims, wherein the frusto-conical inner face of the outer casing and the frusto-conical outer face of the internal member are parallel to each other from the upstream end to the downstream end of the channel.

13. The system according to any of claims 1 to 11, wherein the frusto-conical inner face of the outer casing and the frusto-conical outer face of the internal member have respective angulations with respect to the axis which are different from each other at least over an axial part of the channel.

14. The system according to any of the preceding claims, wherein the distribution chamber is provided with a frusto-conical surface, which is centered on the axis and diverges downstream so as to connect an upstream part of the distribution chamber to the frusto-conical inner face of the outer casing.

15. The system according to any of the preceding claims, wherein an upstream end of the upstream part of the internal member is at least partially arranged in the diffuser, delimiting, together with the diffuser, the distribution chamber.

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