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(54) Finishing Tool

(57) A tool (1) for finishing moulded or preformed pieces in earth-like material, such as clay, kaolin or similar before they are cooked, comprising a first spatula (2) that is basically plate shaped and suitable for removing burrs from said moulded pieces and at least one other spatula (3, 4), which is basically plate shaped and suitable for removing burrs from said moulded pieces, wherein said other spatula (3, 4) presents a rigidity and/or hardness that is less than that of the first spatula (2).

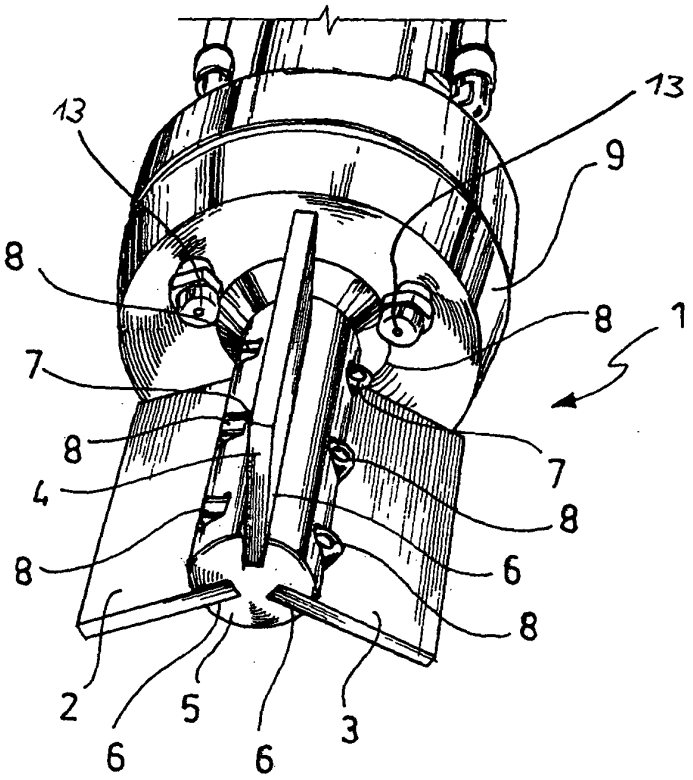

FIG. 2

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Description

[0001] The present invention relates to a finishing tool for moulded or preformed pieces in earth-like material, such as clay, kaolin or similar, before cooking.

[0002] In the production of articles in ceramic material, in particular sanitary products, such as toilets, bidets, sinks and similar, the base, earth-like material, which is typically a mixture containing, amongst other things, clay, kaolin, quartz and felspar finely pulverised and water, is preformed, for example by moulding or cutting. If necessary, because of the complexity of the form of the final product, several preformed pieces are glued together using a so-called "glue" that is essentially made up of the same earth-like material of the single pieces, with other chemical additives, which determine its consistency suitable for gluing the single pieces.

[0003] Burrs form both along the lines of the joints of the moulds used for forming the semi-finished products and along the edges glued together, which must be eliminated before the final piece is glazed and cooked.

[0004] Eliminating the burrs from the semi-finished product, which can still be deformed, is a particularly delicate operation and consequently still carried out by man. In fact, as a result of the decreased volume during the cooking, any excess removal of material and any crack that forms during the finishing of the semi-finished product would inevitably result in the final product breaking or, at least in a visible surface flaw.

[0005] A spatula made of metal or basically rigid synthetic material, for example PVC, is usually used to remove the burr, wherein the operator must gauge the force and the angle of incision depending on the thickness of the burr and the geometry of the semi-finished piece. This is disadvantageous since the quality of the final product and also the quantity of waste depend on the skill of the operator, and the operation of de-burring cannot be automated.

[0006] Therefore, it is the object of the present invention to offer a finishing tool having features that can remedy the inconveniences cited with reference to the prior art.

[0007] This object is achieved with a finishing tool according to claim 1, and with a tool machine according to claim 14.

[0008] Some illustrative embodiments that are not limiting will be described below, with reference to the accompanying drawings for a better understanding of the invention and to appreciate the advantages, wherein:

[0009] figures 1 and 2 are prospective views of the tool according to the invention;

[0010] figure 3 shows a partial axial section of the tool;

[0011] figure 4 is a view sectioned according to the IV-IV line of the tool in figure 3;

[0012] figure 5 represents an example of a robot with the tool according to the invention.

[0013] With reference to the figures, a tool for finishing moulded or preformed pieces in earth-like material such as clay, kaolin or similar before cooking is globally indicated with reference numeral 1.

[0014] The tool 1 comprises a first spatula 2, which is basically plate shaped and suitable for removing burrs from said moulded pieces, and at least one, preferably two other spatulas 3, 4 that are also basically plate shaped and suitable for removing burrs from the moulded pieces. The other spatula 3, 4 presents a rigidity and/or hardness that is less than that of the first spatula 2, wherein the rigidity, in particular, the flexion rigidity of the spatulas can be regulated by suitably selecting the thickness of the spatula or its material.

[0015] According to the embodiment shown in the figures, the tool 1 comprises three spatulas 2, 3, 4, wherein each spatula presents a rigidity and/or hardness that is different from the rigidities and/or hardnesses of the other spatulas.

[0016] Advantageously, the spatulas are made of synthetic material, for example silicone, polyurethane or Plexiglas.

[0017] According to an embodiment of the invention, at least one of the spatulas 2, 3, 4 is made of abrasive material.

[0018] The spatulas 2, 3, 4 are removably fixed, and can therefore be replaced, to a common support part 5 with a cylindrical form that is fitted with three longitudinal grooves 6, which are preferably radial and arranged isogonally, defining angles of 120°. The grooves 6 are adapted to receive respective edges of the spatulas 2, 3, 4 and three threaded holes 7 are associated to each groove 6 to receive screws 8 for fastening the spatulas 2, 3, 4 inside the grooves 6, preferably by means of tightening.

[0019] Advantageously, the tool 1 also comprises regulating devices, preferably an electric or pneumatic regulating motor 9, suitable for orienting the support part 5 with the spatulas 2, 3, 4, so as to turn just one spatula selectively, from time to time, towards the surface of the moulded piece to be de-burred.

[0020] According to an embodiment, the regulating motor 9 is also suitable for inclining the support part 5, in a controlled manner, so as to regulate the angle of incision of the spatula 2, 3, 4 in relation to the surface to be de-burred. Alternatively, special inclination devices can be planned, for example another motor, or pneumatic or hydraulic actuators.

[0021] The tool described so far can be fitted with a handle (not shown in the drawings) to allow manual gripping for manual use of the tool.

[0022] Advantageously, the tool 1 is fitted with special connecting devices for connecting the tool 1 to an automatic or semi-automatic handling device, such as a programmable tool machine or a robot to accomplish the finishing operation in an automated manner, that is, without the intervention of a human operator.

[0023] According to an embodiment, the tool 1 comprises a portion 10 for coupling to a programmable handling device to make the tool 1 follow a set path.

[0024] Said handling device is preferably a robot 11,

for example an anthropomorphic robot, advantageously fitted with suitable devices for connecting and disconnecting the tool 1 so it can be replaced automatically with other tools.

[0025] Advantageously, the robot 11 comprises devices for operating said tool 1 and control devices suitable for selecting and operating one of the spatulas 2, 3, 4 of the tool 1 respectively according to the profile of the surface to be de-burred.

[0026] Advantageously, the control devices, for example a control unit (not shown in the drawings), which is suitable for carrying out a digital program memorised on a memory connected to the control unit, selects and operates a spatula for angular and irregular surfaces, which is less rigid and/or less hard than a spatula selected and operated for surfaces that are less angular or less irregular.

[0027] Advantageously, the coupling part 10 also comprises a shaped plate 12 for resting the tool 1 in a relative deposit.

[0028] According to a further embodiment of the invention, the robot 11 or tool 1 can comprise sensory devices, for example optical scanners, suitable for detecting irregularities or angularities of the surface to be de-burred. These sensory devices are in data connection with the control unit, which selects the most suitable spatula for de-burring the surface, on the basis of the data provided by the sensory devices.

[0029] According to a further embodiment, the tool 1 comprises at least one, preferably three spray nozzles 13 that are connected to a circuit 14 for the controlled channelling of a means, for example air and/or water. The nozzles 13 can be stationary, facing one or more of the spatulas 2, 3, 4, or oriented, in a controlled manner, to spray air and/or water, in a controlled manner, onto the spatulas and or onto the piece to be de-burred.

[0030] Advantageously, two supply tubes 14 are provided, one for supplying air and the other for supplying water to the spray nozzles 13.

[0031] During operation of the tool 1, the spray nozzles 13 allow shavings to be eliminated from the piece to be de-burred and they allow the spatulas 2,3,4 to be dusted and de-scaled with a jet of water or a powerful flow of air during and/or after immersing the tool, in particular, the spatulas, in a washing liquid, for example water.

[0032] The tool according to the invention presents numerous advantages. Thanks to the presence of a plurality of spatulas with a different rigidity/hardness, it is possible to de-burr surfaces with different characteristics (for example smooth, flat surfaces, and angular surfaces with protrusions etc.) without requiring the sophisticated gauging of the force to be applied, but simply by using a spatula with a suitable hardness/rigidity.

[0033] This allows the finishing process for moulded pieces in earth-like material to be automated, at the same time reducing the quantity of waste.

[0034] According to the present invention, the tool also allows the moulded piece to be finished by the same robot that also carries out, for example, interlocking to the machine for moulding of the piece.

[0035] Obviously, a person skilled in the art could make further modifications and variations to the finishing tool according to the present invention to satisfy specific and contingent needs, all of which are also included in the scope of protection of the invention, as defined by the following claims.

Claims

1. Tool (1) for finishing moulded or preformed pieces in earth-like material, such as clay, kaolin or similar before they are cooked, comprising a first spatula (2), which is basically plate shaped and suitable for removing burrs from said moulded pieces, **characterised in that** it comprises at least one other spatula (3, 4) that is basically plate shaped and suitable for removing burrs from said moulded pieces, wherein said other spatula (3, 4) presents a rigidity and/or hardness that is less than that of the first spatula (2).

2. Tool (1) according to claim 2, comprising three spatulas (2, 3, 4) suitable for removing burrs from said moulded pieces, wherein each spatula (2; 3; 4) presents a rigidity and/or hardness that is different from the rigidity and/or hardness of the other spatulas (3; 4; 2).

3. Tool (1) according to claim 2, wherein the three spatulas (2; 3; 4) are arranged isogonally, defining an angle of 120°.

4. Tool (1) according to any one of the previous claims, comprising a support part (5) and devices for the removable connection (6, 7, 8) of the spatulas (2, 3, 4) to the support part (5).

5. Tool (1) according to claim 4, wherein said removable connection devices comprise threaded devices, for example screws (8) .

6. Tool (1) according to claim 4 or 5, wherein said support part (5) comprises one or more grooves (6) suitable for receiving a part of said spatulas (2, 3, 4).

7. Tool (1) according to any one of the previous claims, comprising regulating devices (9) suitable for orienting the spatulas (2,3,4) to turn one spatula (2;3;4) from time to time selectively towards the moulded or preformed piece.

8. Tool (1) according to any one of the previous claims, comprising inclination devices suitable for regulating the angle of incision of at least one of the spatulas (2; 3; 4).

9. Tool (1) according to any one of the previous claims, comprising a regulating motor (9) suitable for rotating the support part (5) to orient one of the spatulas (2,3,4) selectively towards the moulded piece and/or regulate the angle of incision of said spatula (2;3;4) in relation to the surface of the moulded piece.

10. Tool (1) according to claim 9, wherein said regulating motor (9) is an electric or pneumatic motor.

11. Tool (1) according to any one of the previous claims, wherein said spatulas (2, 3, 4) are made of synthetic material.

12. Tool (1) according to any one of the previous claims, wherein at least one of said spatulas (2, 3, 4) is made of abrasive material.

13. Tool (1) according to any one of the previous claims, comprising devices (13, 14) for automatic cleaning of the spatulas.

14. Tool (1) according to any one of the previous claims, comprising devices (13, 14) for removing separate burrs or shavings from the piece with the spatulas (2; 3; 4).

15. Tool (1) according to any one of the previous claims, comprising one or more spray nozzles (13) suitable for spraying air and/or water onto at least one of the spatulas (2, 3, 4) to clean it.

16. Tool (1) according to any one of the previous claims, comprising connecting devices (10) for connecting the tool (1) to an automatic or semi-automatic handling device (11) of the tool (1), such as a programmable tool machine or a robot.

17. Tool machine (11) for automatic or semi-automatic finishing of a moulded or preformed piece in earth-like material, such as clay, kaolin or similar before cooking, said tool machine (11) comprising a tool (1) according to claim 16, and devices for handling said tool and devices for operating said tool (1).

18. Tool machine (11) according to claim 17, comprising devices for connecting and disconnecting the tool (1) with said handling devices and said automatic operating devices suitable for replacing the tool (1) automatically with other tools.

19. Tool machine (11) according to claim 17 or 18, comprising devices for depositing the tool (1) when not in use.

20. Tool machine (11) according to claim 19, wherein said depositing devices comprise a shaped plate (12) for resting the tool (1) in a relative deposit.

21. Tool machine (11) according to any one of the claims from 17 to 20, wherein said tool machine is a robot.

22. Tool machine (11) according to any one of the claims from 17 to 21, comprising control devices suitable for selecting and operating one of the spatulas (2, 3, 4) of the tool (1) selectively according to the profile of the surface to be de-burred.

23. Tool machine (11) according to claim 22, wherein said control devices comprise a control unit suitable for carrying out a digital program memorised on a memory connected to the control unit.

24. Tool machine (11) according to claim 22 or 23, wherein said control devices select and operate a spatula for angular or irregular surfaces that is less rigid and/or less hard than a spatula, which is selected and operated for less angular surfaces.

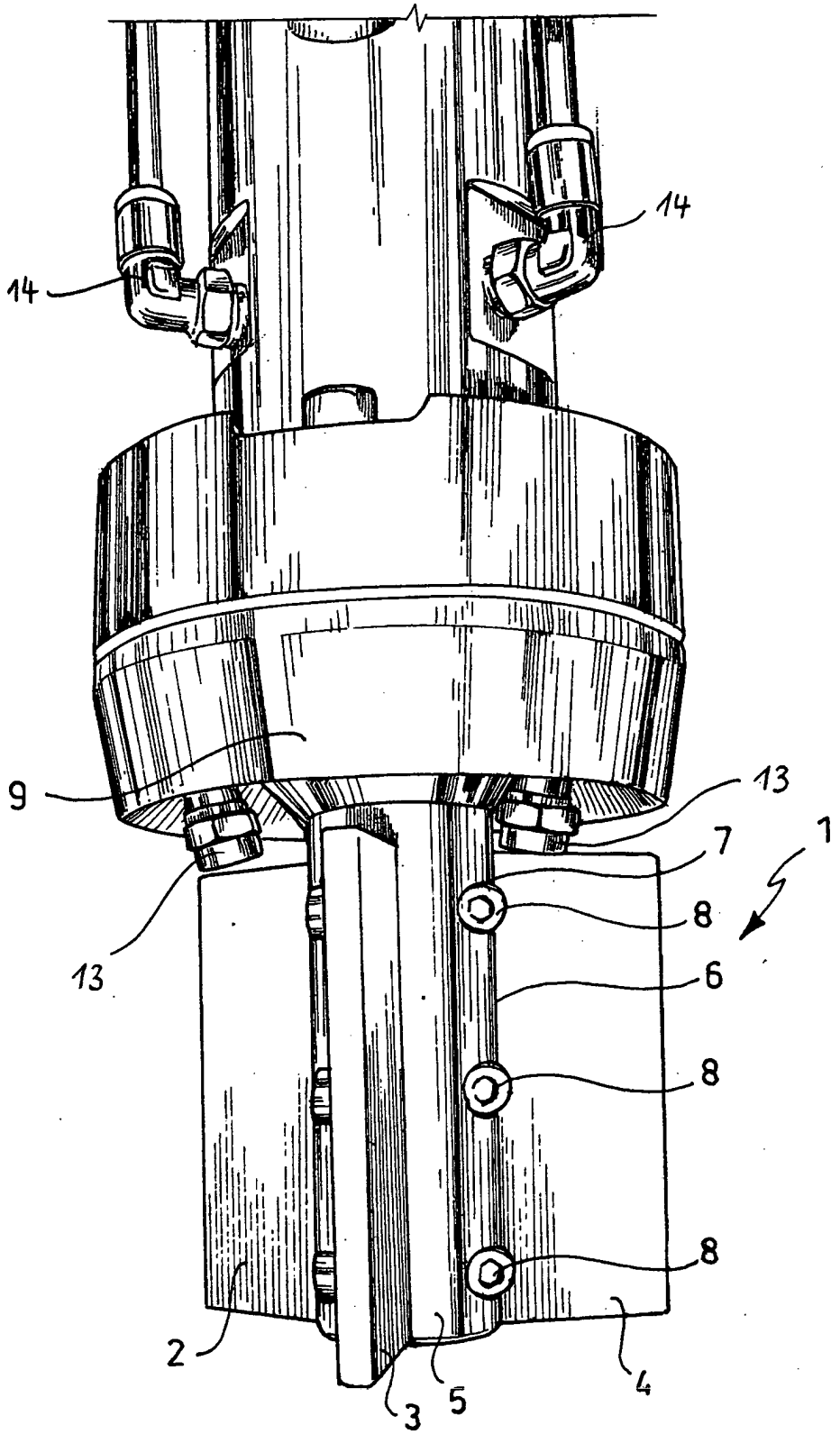


FIG.1

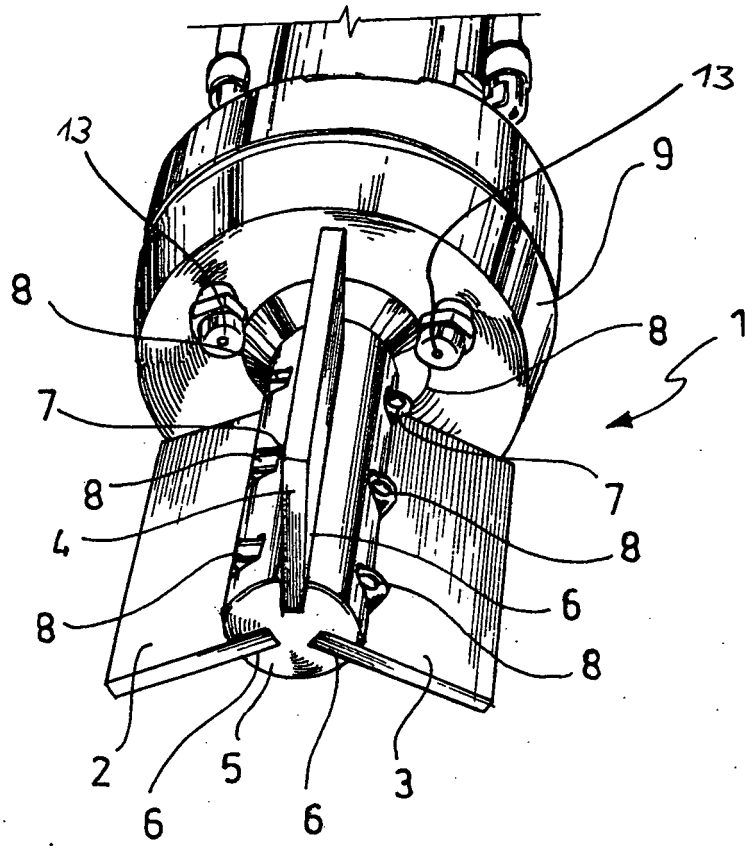


FIG. 2

FIG. 3

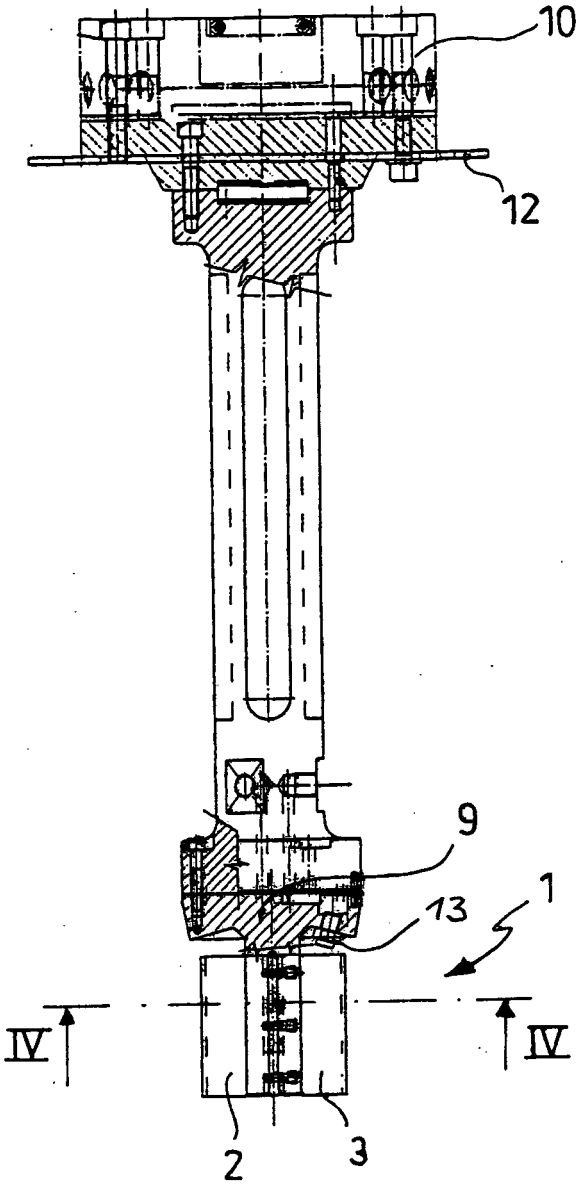
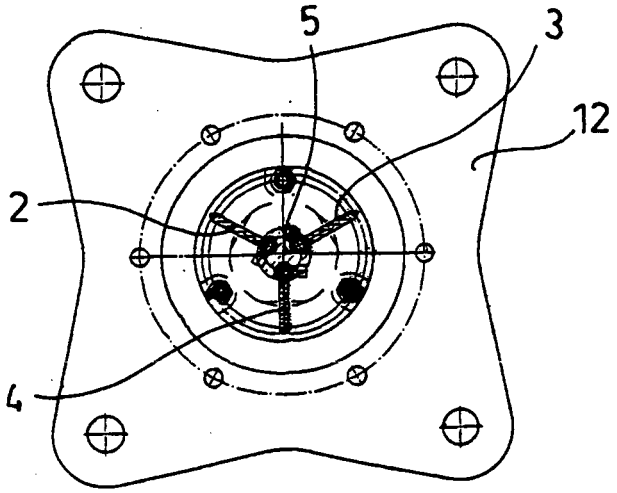


FIG. 4



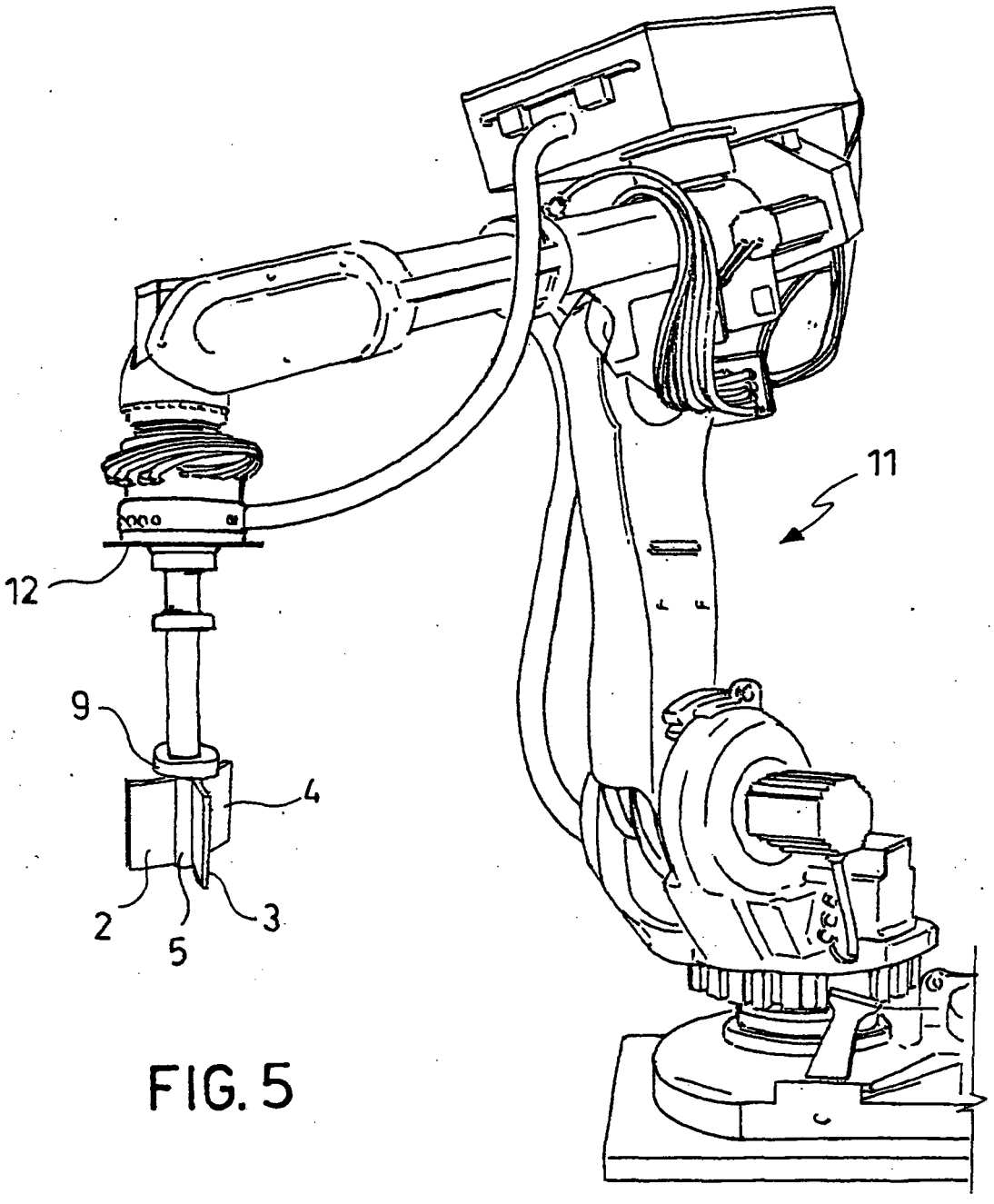


FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5565

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 355 639 A (FERARD MICHEL ET AL) 18 October 1994 (1994-10-18) * abstract *	1	B28B11/18 B24B9/20
A	US 2 587 271 A (ALLEN HOWARD G ET AL) 26 February 1952 (1952-02-26) * column 12, line 51 - line 74; figure 18 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B28B
B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 December 2004	Roberts, P

CATEGORY OF CITED DOCUMENTS

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