FE of the protrusion can be rotated with respect to the rest of the protrusion F1 about the rotational axis D_{N+1} or can be arranged rotatably about the rotational axis D_{N+1}, and the free end FE has input elements EE for the manual input of data.

The proposed arrangement and design of the input elements EE on the free end FE of the protrusion in particular enables good ergonomic operation, particularly during teach-programming, of a robot having such a robot arm. The input of information via the input elements EE is advantageously carried out manually, i.e. by means of touching or manual operation of the input elements EE.

Advantageously, the input elements EE are arranged on the free end FE at least partially concentrically with respect to the rotational axis D_{N+1}. That is to say that two, three, … or all the input elements EE are arranged concentrically with respect to the rotational axis D_{N+1}, advantageously with an identical radius to the rotational axis D_{N+1}. If the protrusion F1 is gripped by a hand and if the input elements EE are operated with the thumb of the hand, then the input elements EE are consistently well accessible or operable by the thumb, even with different alignments of the hand.

Advantageously, an input element EE_0 of the input elements EE is arranged axially with respect to the rotational axis D_{N+1}. Advantageously, this central input element EE_0 serves to input or control current primary parameters, for example to input a start time and a finish time for teach-programming.

Advantageously, the parameters input or controlled by means of the input elements EE and EEZW respectively can be variably assigned or selected automatically or manually depending on the particular task.

Advantageously, the protrusion F1 and/or the protrusion F2 is designed such that it can be gripped by a hand of an operator, wherein a thumb of the hand comes to rest on the free end FE for operating the input elements EE or on the input elements EEZW. Advantageously, the protrusion F1 or the protrusion F2 has a cylindrical shape or an ergonomic grip shape for this purpose.

Advantageously, the free end FE of the protrusion F1 is ergonomically formed to operate the input elements EE with the thumb of the hand. For this purpose, in an embodiment, the input elements EE are arranged on a surface which is inclined at an angle of 5° to 60° with respect to a surface perpendicular to the rotational axis D_{N+1}.

CLAIMS

1. A robot arm having a number N of arm components A_n, which can be connected to a robot body via a number N of actuator-drivable joint connections GV_n where n = 1, 2, …, N; wherein

   - a distal arm component A_N of the robot arm is connected at its proximal end to the arm component A_{N-1} via the joint connection GV_N,

   - a proximal arm component A_1 can be connected at its proximal end to the robot body via the joint connection GV_1,

   - the joint connection GV_N permits a rotation of the arm component A_N about a rotational axis D_N,

   - the arm component A_N of the robot arm extends along an axis L1 and the axis L1 encloses an angle of 50° to 130° with the rotational axis D_N,

   - the distal end of the arm component A_N can be connected to an actuator E via an actuator-drivable joint connection GV_{N+1}, wherein the joint connection GV_{N+1} permits a rotation of the actuator E about a rotational axis D_{N+1}, wherein

     - the rotational axes D_N and D_{N+1} enclose an angle W1 in the range from 50° to 130°,
     - the rotational axis D_{N+1} and the axis L1 enclose an angle W2 in the range from 50° to 130°,
     - the arm component A_N has a grip-like protrusion F1 rigidly connected thereto which protrusion extends concentrically with respect to the rotational axis D_{N+1}, a free end FE of the protrusion F1 can be rotated with respect to the rest of the protrusion F1 about the rotational axis D_{N+1} or can be arranged rotatably about the rotational axis D_{N+1}, and the free end FE has input elements EE for the manual input of data, and
     - a protrusion F2 is formed on an intermediate part ZW arranged between the joint connection GV_{N+1} and the actuator E, which protrusion extends perpendicular to the rotational axis D_{N+1}, can be gripped by a hand and is rigidly connected thereto.

2. The robot arm according to claim 1, in which one or more input elements EE_{ZW} are arranged on the intermediate part ZW within reach of a thumb of the hand.

3. The robot arm according to claim 1, in which the input elements EE are arranged on a surface which is inclined at an angle of 5° to 60° with respect to a surface perpendicular to the rotational axis D_{N+1}.

4. The robot arm according to one of claims 1 to 3, in which the free end FE can be detachably securely connected to the rest of the protrusion F1 in different alignments about the rotational axis D_{N+1}.

5. The robot arm according to one of claims 1 to 4, in which the free end FE is securely connected rotatably about the rotational axis D_{N+1} to the rest of the protrusion F1.

6. The robot arm according to one of claims 1 to 5, in which a mechanical and/or electrical and/or a magnetic latching device, which allows a rotation of the free end FE about the rotational axis D_{N+1} with a specified resolution, is provided between the free end FE and the rest of the protrusion F1.

7. A robot having a robot arm according to one of claims 1 to 6.

8. The robot according to claim 7, having

    - sensors for detecting a mechanical state Z(t) of the robot arm,

    - a unit for detecting inputs EG(t) via the input elements,

    - a unit for evaluating the states Z(t) and the inputs EG(t) to determine evaluation results AW(t), and

    - a storage unit for storing the evaluation results AW(t).

9. The robot according to claim 8, in which the evaluation results AW(t) are control instructions for controlling the robot arm robot.