Claims

1. A twisting device for electrical conductors, having at least one twisting head (1) that is drivable by motor power to rotate about an axis of rotation relative to a base, and a clamping device for the ends of the conductor (3) farthest from the twisting head (1), wherein the twisting head (1) is movable in the direction of its axis of rotation toward the clamping device, **characterised in that** the twisting head (1) is mounted on a first, automatically and motorised movable length compensation carriage (2), wherein the clamping device is mounted on a travel compensation carriage (4) that is movable towards the length compensation carriage (2) in a direction essentially parallel to the axis of rotation of the twisting head (1), and to which a force acting essentially parallel to the axis of rotation may be applied via a force generating element.

2. The twisting device according to claim 1, **characterised in that** a further twisting head (5) which is rotatable in the opposite direction with regard to the first twisting head (1) about an axis of rotation shared with the first twisting head (1) is mounted as the clamping device on the travel compensation carriage (4).

3. The twisting device according to claim 1 or 2, **characterised in that** the travel compensation carriage (4) is passively displaceable and is subjected to a force directed away from the first twisting head (1) by means of a preload element.

4. The twisting device according to claim 3, **characterised in that** the preload force of the preload element is adjustable at least before the start of activation of a drive unit of the length compensation carriage (2) and preferably remains constant throughout the twisting process.

5. The twisting device according to 3 or 4, **characterised in that** the preload element is a fluid cylinder, preferably a pneumatic cylinder (6), connected to a pressure source (41, 42, 43) via a controlled pressure control valve (44).

6. The twisting device according to claim 5, **characterised in that** a piston rod of the fluid cylinders (6) is equipped or coupled with a displacement sensor (7), which is connected to an evaluation unit for calculating and evaluating the travel profile of the travel compensation carriage (4).

7. The twisting device according to claims 1 to 6, **characterised in that** the travel compensation carriage (4) is equipped or coupled with a displacement sensor (7), which is connected to an evaluation unit for calculating and evaluating the travel profile of the travel compensation carriage (4).

8. The twisting device according to claim 1 or 2, **characterised in that** the travel compensation carriage (4) equipped with a force measuring sensor and a motorised drive unit as the force-generating element, wherein the travel compensation carriage (4) is subjected to a force depending on the signals of the force measuring sensor by the drive unit at least during the twisting process, said force directed away from the first twisting head (1) and if need be variable.

9. The twisting device according to claim 8, **characterised in that** the drive unit or a control device of the travel compensation carriage (4) for the drive unit is connected to an evaluation unit for determining and evaluating the travel profile of the travel compensation carriage (4).

10. The twisting device according to any one of claims 1 to 9, **characterised in that** a drive unit for the length compensation carriage (2) is activatable via a programmable controller to travel a travel profile prescribed for each conductor (3), conductor type and/or twist parameter, primarily towards the clamping device, and wherein the maximum possible displacement path of the travel compensation carriage (4) is kept shorter than the maximum possible displacement path (8) of the length compensation carriage (2) by preferably adjustable limit stops (8a, 8b).

11. The twisting device according to any one of claims 1 to 10, **characterised in that** at least the drive unit of the length compensation carriage (2) is connected to a

control unit, in which a travel profile is stored for each combination of conductors (3) and twist parameters for actuating the drive unit of the length compensation carriage (2).

12. The twisting device according to claim 6 or claim 11, **characterised in that** a routine is implemented in the control unit which queries the evaluation unit and/or the displacement sensor (7) and depending on the calculated travel profile of the travel compensation carriage (4) generates a quality assessment and/or adapts the travel profile of the length compensation carriage (2), if need be stores it in the control unit as the new travel profile for this combination of conductors (3) and twist parameters, and/or cancels the twisting process with an error message.

13. The twisting device according to claims 6-7 or claim 11, **characterised in that** a routine is implemented in the control unit which controls the length compensation carriage (2) in such manner that the values delivered by the force measuring sensor lie within a prescribed range, and depending on the calculated travel profile of the travel compensation carriage (4) generates a quality assessment and/or adapts the travel profile of the length compensation carriage (2), if need be stores it in the control unit as the new travel profile for this combination of conductors (3) and twist parameters, and/or cancels the twisting process with an error message.

14. A method for twisting electrical conductors (3), comprising the steps of:
- cutting the conductors (3) to size and transferring them to an actively displaceable twisting head (1) and an oppositely positioned displaceable clamping device,
- clamping and tensioning the conductors (3) between the twisting head (1) and the clamping device by moving at least the twisting head (1) away from the clamping device,
- activating the twisting head (1) so that it rotates about an axis of rotation parallel to the clamped conductors (3) while at the same time moving the twisting head (1) towards the clamping device according to prescribed travel profile,
characterised by the following steps:
- applying a force, if need be of different magnitude, directed away from the twisting head (1) to at least the clamping device, at least during the twisting process,

and

- determining and evaluating a travel and/or force profile for the movable clamping device.

15. The method according to claim 13, **characterised by**

- motorised displacement of the twisting head (1) away from the clamping device after the conductor (3) has been clamped in place and before the actual twisting process begins, until the clamping device has been moved by a predefined travel distance or a predefined force is exerted,
- measuring or at least indirect determination of a characteristic value for the length of the conductor (3) from the position subsequently taken up by the twisting head (1),
- repeating the above steps with a second or any further conductor (3) which is to be twisted together with the first conductor (3), wherein a correction value for cutting the second or any further conductor to length is determined from the measured values or characteristic values.

16. The method according to claim 15 or 16, **characterised in that**
the twisting head (1) completes a pre-programmed travel profile towards the clamping device for each conductor type and/or twist parameter while the clamping device is shifted towards the twisting head (1) by the force created by the shortening of the twisted conductor (3) against the effect of a force-generating element.

17. The method according to claim 14, **characterised in that** the conductors (3) to be twisted are clamped loosely before the start of the actual twisting process, after which the conductors are brought to the required tension after an initial loose twisting by moving the twisting head (1) until the clamping device has been displaced by about half the maximum travel path, wherein the clamping device is subjected to a force away from the twisting head (1).

18. The method according to claim 14 or 15, **characterised in that** the travel profile of the clamping device is evaluated during the twisting, wherein monitoring preferably covers exceeding a predetermined limit for the travel path and the associated rotation, so that a monitoring range can be represented which if required enables a detailed association of events in which the limit values are exceeded with the rotation.

19. The method according to claim 18, **characterised in that** the travel profile of the twisting head (1) is adapted according to the travel profile of the clamping device, preferably for a definable number of twisting processes with conductors (3) and twist parameters of the same kind.