

TUBE PROFILE CUTTING MACHINE AND METHOD FOR CUTTING A CONTOUR

[0001] The invention relates to a tube profile cutting machine including a cutting device, a clamping device by which a pipe is clampable centered about a horizontal longitudinal axis and rotatable about the horizontal longitudinal axis, a chassis by which the tube and/or the cutting device are movable parallel to the longitudinal axis and relative to one another, a vertical drive by which the cutting device is movable along a vertical axis, a rotary drive by which the cutting device is rotatable about the vertical axis, a cutting head arranged at the cutting device, a pivot drive by which the cutting head is pivotable about a horizontal pivot axis, and a feed drive by which the cutting head is feedable in a beam direction, wherein the cutting head is movable relative to the tube by the chassis, the vertical drive, the rotary drive, the pivot drive and the feed drive so that a cutting beam exiting from the cutting head in the beam direction cuts a contour at the tube,

[0002] The invention also relates to a method for cutting a profile, wherein at a tube profile cutting machine including a cutting device, a clamping device by which a pipe is clampable centered about a horizontal longitudinal axis and rotatable about the horizontal longitudinal axis, a chassis by which the tube and/or the cutting device are movable parallel to the longitudinal axis and relative to one another, a vertical drive by which the cutting device is movable along a vertical axis, a rotary drive by which the cutting device is rotatable about the vertical axis, a cutting head arranged at the cutting device, a pivot drive by which the cutting head is pivotable about a horizontal pivot axis, a feed drive by which the cutting head is feedable in a beam direction.

[0003] Tube profile cutting machines and methods performed by the tube profile cutting machines of the general type described supra are generally known from the product program of the applicant. Machines and methods of this type are used for automated contouring of tube spouts and containers for welding.

[0004] The typically cylindrical (tubular) containers are generally closed by cambered floors on one side or on both sides. Cambered floors are flattened relative to a semi spherical shape that is theoretically ideal for pressure loading. DIN 28011

„Kloepperboden“ and DIN 28013 „Korbbogenboden“ standardize various embodiments of such cambered floors.

[0005] Contours for tube connectors at cambered floors cannot be produced with the known tube profile cutting machines.

OBJECT OF THE INVENTION

[0006] Thus, it is an object of the invention to cut a contour at a cambered floor for a container.

SOLUTION

[0007] Improving upon a known tube cutting machine it is proposed according to the invention to provide a pivoting device by which the clamping device is pivotable by 90° so that a cambered floor for a pressure container with a vertically extending axis of symmetry is clampable by the clamping device in a centered manner and rotatable about the symmetry axis.

[0001] The cutting device of the known tube profile cutting machine is configured for cutting contours about a vertical axis and limited to such contours due to a limited pivot range. The tube profile cutting machine according to the invention facilitates clamping cambered floors in a manner which facilitates using the known cutting device of the known tube profile cutting machine for cutting contours in cambered floors of this type.

[0002] Advantageously the pivot device of the tube profile cutting machine according to the invention includes a pivot joint with a horizontally extending pivot axis. A tube profile cutting machine of this type according to the invention facilitates reproducible pivoting of a clamping device that may weigh up to several tons depending on the application. Alternatively the clamping device can be removed from the standard arrangement for clamping tubes that are lying flat using a crane. Then the clamping device is pivoted by 90° and inserted again.

[0003] Based on the known method it is proposed according to the invention that the clamping device is pivoted by 90° using a pivot device, that a cambered floor for a container with a vertically extending axis of symmetry is clamped in a centered manner using the clamping device and the cambered floor is rotated about the axis of symmetry and the cutting head is moved by the chassis, the vertical drive, the

rotary drive, the pivot drive and the feed drive relative to the cambered floor so that a cutting beam exiting in a beam direction from the cutting head cuts the contour at the cambered floor. A method of this type according to the invention is executable using the tube profile cutting machine according to the invention and is characterized by the advantages recited supra.

ADVANTAGEOUS EMBODIMENT

[0004] The invention is subsequently is described based on an embodiment with reference to drawing figures, wherein:

[0005] FIG. 1 illustrates a tube profile cutting machine according to the invention cutting a contour at a tube;

[0006] FIG. 2a illustrates the tube profile cutting machine according to the invention cutting a contour at a cambered floor; and

[0007] FIGs. 2b/c illustrate details of the preceding figures.

[0008] The illustrated tube profile cutting machine 1 according to the invention includes a cutting device 2 and a clamping device 3. The clamping device 3 is fixated in place on a base that is not illustrated and includes a three jaw clamping chuck 4.

[0009] The clamping chuck 4 has an interior diameter of 1200 mm and an exterior diameter of 2500 mm and thus facilitates clamping tubes centered relative to a longitudinal axis 5 wherein an exterior diameter of the tubes is smaller than 1200 mm or an exterior diameter of the tubes is greater than 2500 mm.

[0010] The clamping chuck 4 is pivotable by a pivoting device 6 about a horizontally extending pivot axis 7 of a pivot joint 8 by 90° and thus rotatable about the longitudinal axis 5 for machining tubes and rotatable about the vertically extending symmetry axis 9 for machining cambered floors.

[0011] The cutting device 2 is movable by the chassis 10 parallel to the longitudinal axis 5 and movable by a vertical drive 11 along a vertical axis 12 and rotatable by 360° about the vertical axis 12 by a rotary drive 13.

[0012] A cutting head 14 (a blow torch) arranged at the cutting device 2 is pivotable by a pivot drive 15 about a horizontal pivot axis 16 by 70° from vertical. From the cutting head 14 a non illustrated burning beam is orientable in a beam

direction 17 towards the tube or the cambered floor. The cutting head 14 is feedable by a feed drive 18 in the beam direction 17.

[0013] The controlled axes are motion coordinated with each other during the cutting process and facilitate exact positioning of the work piece relative to the cutting head 14. All controlled axes are configured with non illustrated AC-servo drives and controllers.

[0014] A laser sensor that is not illustrated continuously controls a distance of the cutting head 14 from a surface of the work piece.

REFERENCE NUMERALS AND DESIGNATIONS

[0015]	1	tube profile cutting machine
[0016]	2	cutting device
[0017]	3	clamping device
[0018]	4	clamping chuck
[0019]	5	longitudinal axis
[0020]	6	pivot device
[0021]	7	pivot axis
[0022]	8	pivot joint
[0023]	9	symmetry axis
[0024]	10	chassis
[0025]	11	vertical drive
[0026]	12	vertical axis
[0027]	13	rotary drive
[0028]	14	cutting head
[0029]	15	pivot drive
[0030]	16	pivot axis
[0031]	17	beam direction
[0032]	18	feed drive

PATENT CLAIMS

1. A tube profile cutting machine (1), comprising:
 - a. a cutting device (2);
 - b. a clamping device (3) by which a tube is clampable centered about a horizontal longitudinal axis (5) and rotatable about the horizontal longitudinal axis (5);
 - c. a chassis (10) by which the tube and/or the cutting device (2) are movable parallel to the longitudinal axis (5) and relative to one another;
 - d. a vertical drive (11) by which the cutting device (2) is movable along a vertical axis (12);
 - e. a rotary drive (13) by which the cutting device (2) is rotatable about the vertical axis (12);
 - f. a cutting head (14) arranged at the cutting device (2);
 - g. a pivot drive (15) by which the cutting head (14) is pivotable about a horizontal pivot axis (16); and
 - h. a feed drive (18) by which the cutting head (14) is feedable in a beam direction (17),wherein the cutting head (14) is movable relative to the tube by the chassis (10), the vertical drive (11), the rotary drive (13), the pivot drive (15) and the feed drive (18) so that a cutting beam exiting from the cutting head (14) in the beam direction (17) cuts a contour at the tube,
characterized by a pivot device (6) by which the clamping device (3) pivotable by 90° so that a cambered floor for a container with a vertical axis of symmetry (9) is clampable in a centered manner and rotatable about the axis of symmetry (9).
2. The tube profile cutting machine according to the preceding claim,
characterized in that the pivot device (6) includes a pivot joint (8) with a horizontally extending pivot axis (7).
3. A method for cutting a profile,
wherein at a tube profile cutting machine (1) including
a cutting device (2),

a clamping device (3) by which a pipe is clampable centered about a horizontal longitudinal axis (5) and rotatable about the horizontal longitudinal axis (5);

a chassis (10) by which the tube and/or the cutting device (2) are movable parallel to the longitudinal axis (5) and relative to one another,

a vertical drive (11) by which the cutting device (2) is movable along a vertical axis (12),

a rotary drive (13) by which the cutting device (2) is rotatable about the vertical axis (12),

a cutting head (14) arranged at the cutting device (2),

a pivot drive (15) by which the cutting head (14) is pivotable about a horizontal pivot axis (16),

a feed drive (18) by which the cutting head (14) is feedable in a beam direction (17),

characterized in that

the clamping device (3) is pivoted by a pivot device (6) by 90°,

a cambered floor for a container with a vertical axis of symmetry (9) is clamped in a centered manner and rotated about the axis of symmetry (9), and

the cutting head (14) is moved relative to the cambered floor by the chassis (10), the vertical drive (11), the rotary drive (13), the pivot drive (15) and the feed drive (18), and

that a cutting beam exiting from the cutting head (14) in the beam direction (17) cuts a contour at the cambered floor.