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(54) **MACHINE AND METHOD FOR BENDING A TUBULAR PRODUCT**

(57) Machine for bending a tubular product (P) comprising a feed device (11) configured to feed the tubular product (P) along an axis of feed (F), a support arm (18) with an oblong development and installed on a support structure (17), parallel to the axis of feed (F), and a bending device (12) disposed downstream of said feed device (11), installed on said support arm (18) and configured to bend the tubular product (P). The machine comprises a cutting device (24) configured to at least partly cut the tubular product (P), and installed aligned with the axis of feed (F), upstream of the bending device (12) and in a position comprised along the longitudinal extension of the support arm (18).

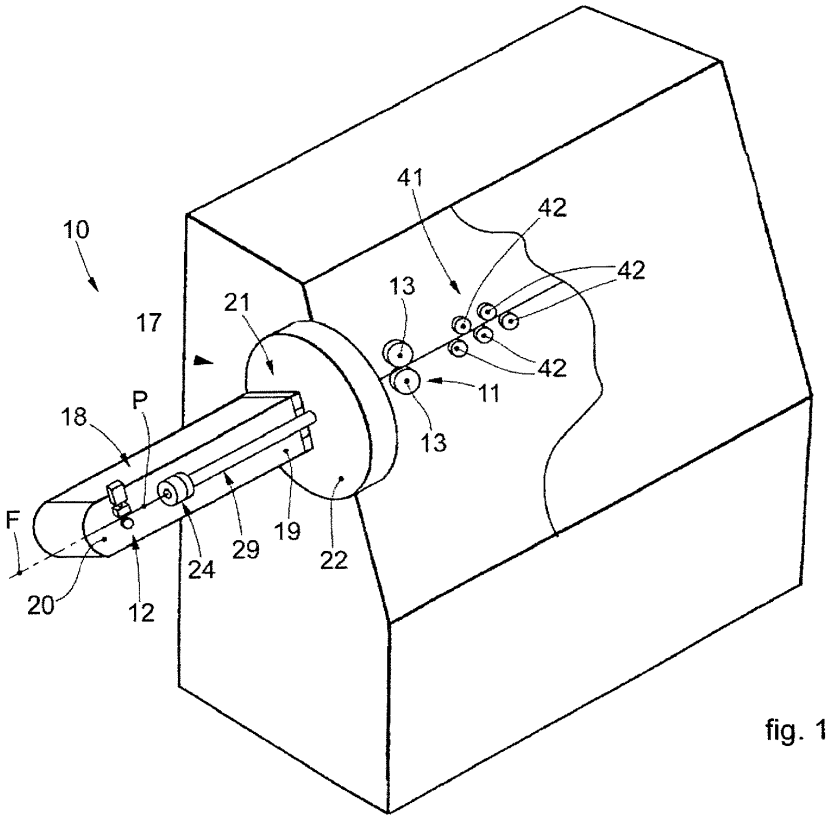

fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a machine for bending a tubular product, for example a metal tube for making fluid-dynamic pipes, conduits, plants or other.

[0002] In particular, the machine according to the present invention allows to bend tubular products in an automated manner, to obtain them in an already finished or semi-finished form.

[0003] The present invention also concerns the method for bending a tubular product.

BACKGROUND OF THE INVENTION

[0004] Machines for bending tubular products are known, which comprise devices to feed a tubular product to a bending device.

[0005] In particular, the feed devices feed the tubular product, in the form of a straightened segment or roll, to the bending device after possibly straightening it with suitable straightening devices, for example of the type with rollers.

[0006] The feed devices are configured to feed the tubular product along a rectilinear axis of feed of the machine.

[0007] The bending device is installed on a support arm with an oblong development which is in turn installed on a support structure, parallel to the axis of feed of the tubular product.

[0008] The support arm is also selectively rotatable around an axis of rotation substantially coinciding with the axis of feed of the tubular product.

[0009] The rotation of the support arm allows to position the bending device on planes that are angularly offset with respect to each other. It is therefore possible to bend the tubular product on angularly offset bending planes, obtaining very articulated configurations of the tubular product.

[0010] It is also known that bending machines are equipped with cutting devices to cut the bent finished product from the tubular product.

[0011] For example, a first solution is known, in which the cutting device is installed downstream of the bending device and cuts the tubular product by removing material, for example with a circular saw.

[0012] This solution generates offcuts, waste of material and causes problems in recovering the work chips.

[0013] Furthermore, for articulated conformations of the finished product, the cutting device can interfere with curved portions of the tubular product.

[0014] A bending machine is also known, provided with a cutting device equipped with orbital cutting incision blades, that is, which can be moved circumferentially around the tubular product in order to cut it.

[0015] In this solution, the cutting blades are installed on a support with a fork conformation. In order to cut the tubular product, the support is moved so that the arms of the fork are positioned to partly surround the tubular product to be cut. Subsequently the cutting blades are driven to incise and cut the tubular product in the desired position.

[0016] This solution, although it solves the problem of generating chip, is not very versatile since the cutting device is normally positioned at the side of the bending device and the fork configuration of the support does not always allow to position the cutting blades in the desired cutting position, for example due to a possible interference with a bent portion of the product.

[0017] A solution is also known that provides to install the cutting device upstream of the support arm and downstream of the feed devices. In this solution, the cutting device is equipped with incision blades that incise the tubular product circumferentially without effecting a real separation.

[0018] The incision obtained generates a preferential tearing line of the tubular product along which, by the action of subsequent bending of the bending device, it is possible to separate the finished product from the tubular product being worked.

[0019] However, this solution has the disadvantage that if the incision is made in direct proximity to a bent portion of the finished product, the bending action, which also determines the subsequent separation, can cause an unwanted deformation of the end incised. For example, finished products may be obtained in which the terminal end has a cross section that is inclined, not perpendicular, with respect to the axis of the tube.

[0020] This deformation can cause an oval section of the finished product at least in the end portion, which requires a subsequent finishing operation.

[0021] In a totally different field from that of bending tubular products, bending machines are known for metal bars, such as reinforcement round pieces.

[0022] An example of this type of machine is described in EP-A-0.419.443. However, these machines cannot be used for bending tubular products since a bending action would entail generating a narrowing of the tubular cavity and therefore a reduction in sizes of the passage cross section of the tube.

[0023] Document EP-A-0.419.443 describes cutting shears which, due to the action of two blades moved sliding against each other, generate a cutting by deforming the bar. Although using shears for cutting bars is extremely effective, the same cannot be said for cutting tubular products.

[0024] Indeed, using shears for cutting tubular products generates in the cutting zone a localized deformation of the tube and an occlusion of the tubular passage cavity.

[0025] This requires further finishing operations to finish the cut ends of the tubular product, with connected times and costs.

[0026] It is therefore a purpose of the present invention to obtain a machine for bending metal products that is extremely versatile and that allows to obtain tubular prod-

ucts with shaped configurations, even very complex ones.

[0027] Another purpose of the present invention is to obtain a machine for bending metal products that allows to limit, and even completely eliminate, all working offcuts.

[0028] Another purpose of the present invention is to obtain a machine for bending metal products that is particularly efficient and allows to obtain, directly in the finished form, a final product that is already curved and cut to size.

[0029] Another purpose is to perfect a bending method for tubular products that is particularly efficient and versatile.

[0030] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0031] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0032] In accordance with the above purposes, a machine for bending a tubular product according to the present invention comprises:

- a feed device configured to feed the tubular product along an axis of feed,
- a support arm with an oblong development and installed, on a support structure, parallel to the axis of feed, the support arm being able to rotate with respect to an axis of rotation coinciding with the axis of feed, and
- a bending device disposed downstream of the feed device, installed on the support arm and configured to bend the tubular product.

[0033] According to one aspect of the present invention, the machine comprises a cutting device configured to at least partly cut the tubular product, and installed aligned with the axis of feed, upstream of the bending device and in a position comprised along the longitudinal extension of the support arm.

[0034] According to another aspect of the present invention, the cutting device is of the orbital type and comprises a support body installed aligned with the axis of feed and on which at least one cutting tool is installed. In particular a drive member is associated with the support body, configured to make the at least one cutting tool rotate orbitally around the axis of feed, to perform the cutting of the tubular product.

[0035] In this way it is possible to obtain a machine able to obtain bent tubular products of quality that, once bent, can be directly cut in line, without requiring lateral movements of the cutting device, and preventing possible interferences with the latter.

[0036] This makes the machine extremely versatile since it allows to obtain bent tubular products in direct proximity to the bend effected which do not need further finishing operations.

[0037] Moreover, the use of a cutting device of the orbital type allows to carry out the cutting of the tubular product without deforming, that is varying, the sizes and the shape of the internal cavity of the tube. Moreover, the use of a cutting device of the orbital type prevents generating cutting chips which become offcuts.

[0038] The present invention also concerns a method for bending a tubular product that comprises:

- feeding a tubular product along an axis of feed;
- positioning a bending device associated with a support arm with an oblong development and installed on a support structure, parallel to the axis of feed, the positioning providing at least the rotation of the support arm around an axis of rotation coinciding with said axis of feed;
- bending the tubular product with the bending device.

[0039] According to a possible implementation of the present invention, the method comprises cutting, at least partly, the bent tubular product with a cutting device installed aligned with the axis of feed, upstream of the bending device and in a position comprised along the longitudinal extension of the support arm.

[0040] According to another aspect of the present invention, the cutting of the tubular product provides to make at least one cutting tool rotate orbitally around the axis of feed and around the tubular product to perform the cutting of the latter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a perspective view of a machine for bending a metal product, in accordance with a first embodiment;
- fig. 2 is a schematic section view of part of a machine for bending the metal product;
- fig. 3 is a view in section along the line III-III of fig.2;
- fig. 4 schematically shows a possible variant embodiment of fig. 2.

[0042] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0043] With reference to the attached drawings, a machine for bending a tubular product P is indicated in its entirety by the reference number 10.

[0044] In the embodiments that follow, the representations are deliberately schematic, to better comprise the characteristics of the machine according to the present invention.

[0045] Operating details such as, for example, the diameters of the tubes, the radii of curvature made, the particular operating components, have been chosen deliberately randomly so as not to limit the individual embodiments to specific operating solutions, also considering the fact that one of the main advantages of the present invention is that the machine has great operating applicability for bending substantially any type of tube whatsoever, with any radius of curvature.

[0046] According to the present invention, the tubular product P can be supplied to the machine 10 both in the form of roll or coil, and subsequently straightened, and also in the form of a segment from which the final products are cut.

[0047] According to embodiments shown in figs. 1, 2 and 4, the machine 10 comprises a feed device 11 to feed the tubular product P and a bending device 12 configured to bend the tubular product P according to desired geometries.

[0048] The feed device 11 is configured to feed a tubular product P along an axis of feed F.

[0049] According to possible embodiments the feed device 11 can be configured to feed the tubular product P both toward the bending device 12 and also in the opposite direction.

[0050] According to a possible embodiment shown for example in fig. 1, the feed device 11 can comprise at least a pair of drawing rolls 13, between which the tubular product P is made to pass and advance.

[0051] According to a variant embodiment shown in figs. 2 and 4, the feed device 11 can comprise vise elements 14 configured to grip a portion of the tubular product P and to make it advance along the axis of feed F by means of an alternate gripping and releasing motion in a direction parallel to the axis of feed F.

[0052] According to embodiments shown in figs. 2 and 4, the bending device 12 comprises a contrast element 15 and a bending element 16 configured to bend the tubular product P around the contrast element 15. The bending element 16 can be configured to grip the tubular product P on the contrast element 15 and is rotatable around the latter to bend the tubular product P.

[0053] It is quite clear that the bending device 12 can also have different configurations from those described here, for example it can be provided with a plurality of contrast elements 15 and bending elements 16, possibly also made in a single body, and each suitable to define a predefined radius of the final product.

[0054] The machine 10 according to the present invention comprises a support structure 17 on which a support arm 18 is installed, with an oblong development and disposed with its oblong development parallel to the axis of feed F.

[0055] The support arm 18 is selectively rotatable with respect to an axis of rotation coinciding with the axis of feed F of the tubular product P.

[0056] In particular, it is provided that, during rotation, the support arm 18 keeps itself, with its oblong development, substantially parallel to the axis of feed F.

[0057] According to the solution shown in figs. 1, 2 and 4, the support arm 18 has a first end 19 associated with the support structure 17, and a second end 20, opposite the first end 19, and positioned cantilevered with respect to the support structure 17.

[0058] The bending device 12 is installed on the support arm 18.

[0059] The rotation of the support arm 18 around the axis of feed F allows to position the bending device 12 on different planes, reciprocally angled with respect to each other. In this way it is possible to bend the tubular product P on different planes, reciprocally angled with respect to each other.

[0060] According to the solution shown in figs. 1, 2 and 4, the bending device 12 is installed in correspondence with the second end 20 of the support arm 18.

[0061] According to possible solutions, the support arm 18 is installed on a rotation member 21 associated with the support structure 17 and configured to make the support arm 18 rotate around the axis of feed F.

[0062] The rotation member 21 can comprise a discoid body 22 in correspondence with which the support arm 18 is installed with its first end 19.

[0063] The discoid body 22 is connected to drive members, not shown in the drawings, suitable to make the discoid body 22 rotate, and also the support arm 18 associated with it, around the axis of feed F.

[0064] According to possible solutions, shown for example in figs. 1, 2 and 4, the support arm 18 and the rotation member 21 can comprise radial positioning devices 23 configured to position the support arm 18 radially with respect to the axis of feed F. In this way it is possible to move the support arm 18 closer to/away from the tubular product P being worked, in order to dispose it for example in a position where it does not interfere with the work in progress, or to position the bending device 12 in a suitable position for working the tubular product P.

[0065] The radial positioning devices 23 can comprise, merely by way of example, guides, racks, drive members.

[0066] According to one aspect of the present invention, the machine 10 comprises a cutting device 24 configured to at least partly cut the tubular product P.

[0067] The cutting device 24 is installed upstream of the bending device 12, in a position comprised along the longitudinal extension of the support arm 18 and aligned with the axis of feed F of the tubular product P.

[0068] Here and hereafter in the description and the claims by "position comprised along the longitudinal ex-

tension" we mean a position of the cutting device 24 between the first end 19 and the second end 20 of the support arm 18.

[0069] According to a possible solution, the cutting device 24 comprises a support body 25 installed aligned with the axis of feed F and on which at least one cutting tool 27 is installed, in this specific case two cutting tools 27, configured to at least partly cut the tubular product P.

[0070] A drive member 28 can be associated with the support body 25, and is configured to make the at least one cutting tool 27 rotate around the axis of feed F. In this way it is possible to define a cutting device 24 of the orbital type.

[0071] According to a possible embodiment, the support body 25 can be provided with a through cavity 26 through which, during use, the tubular product P is made to pass. The through cavity 26 is therefore aligned with the axis of feed F of the tubular product P.

[0072] The support body 25, or at least part of it, can be selectively movable radially toward/away from the axis of feed F, to control the depth of the cut on the tubular product P.

[0073] As described hereafter, the cutting device 24 can also make only an incision, or a complete cut, on the tubular product P.

[0074] According to embodiments shown in figs. 2-4, the cutting tools 27 can comprise cutting blades with a disc conformation. Cutting blades with a disc conformation are advantageous in that they do not cause any offcuts, with their consequent problems of disposal and recovery, and the cut is performed only by the penetration of the blade.

[0075] According to a possible embodiment, the cutting device 24 is installed on a support element 29 attached to the rotation member 21 and configured to support the cutting device 24, keeping it aligned with the axis of feed F.

[0076] The support element 29 can have an oblong development, and is installed substantially parallel to the axis of feed F.

[0077] According to embodiments shown in figs. 1, 2 and 4, the support element 29 is defined by a tubular body 30 provided with an axial cavity, aligned with the axis of feed F and inside which, during use, the tubular product P is made to pass. In this way, when the rotation member 21 makes the support arm 18 rotate around the axis of feed F, the cutting device 24 remains always aligned with the latter, and therefore with the tubular product P being worked. This condition ensures that the cutting device 24 does not interfere with portions of the tubular product P that have been bent.

[0078] According to a possible embodiment, the tubular body 30 is attached with a first end to the rotation member 21, while the other end is located cantilevered with respect to the latter and is configured to support the cutting device 24.

[0079] According to one embodiment, shown schematically in fig. 4, the cutting device 24 can be connected to movement members 31 configured to move the cutting device 24 parallel to the axis of feed F. In this way it is possible to move the cutting device 24 toward/away from the bending device 12, to define for example the correct position to make the cut on the bent tubular product P, or to take the cutting device 24 to a position where it does not interfere with the bending operations performed.

[0080] Merely by way of example, the movement members 31 can be chosen from a group comprising a linear actuator, a rotary actuator, an articulated mechanism, one or more movement guides or a possible combination thereof.

[0081] A possible solution can provide that the movement members 31 are associated with the cutting device 24 and with the support element 29, for example it can be provided that a ball bearing mechanism can be installed on the support element 29, along which the cutting device 24 is selectively translatable.

[0082] According to a possible variant embodiment shown in fig. 4, the machine 10 according to the present invention can comprise at least a gripping device, different from the possible feed device 12 described with reference to figs. 2 and 4, and configured to grip a longitudinal portion of the tubular product P.

[0083] The gripping device, combined for example with the action of the feed device 11 and/or with another gripping device as described hereafter, generates an axial tension on the tubular product P being worked, parallel to the axis of feed F, such as to detach a tubular portion of the tubular product P if the latter has been incised by the cutting device 24.

[0084] In the case shown in fig. 4, the machine 10 comprises a first gripping device 32 and a second gripping device 33, disposed upstream and downstream of the cutting device 24 and each configured to grip a respective portion of the tubular product P.

[0085] At least one of either the first gripping device 32 or the second gripping device 33, in the case shown here the second gripping device 33, can be associated with a translation member 34 configured to move the respective gripping device 32, 33 in a direction parallel to the axis of feed F.

[0086] In this way, once at least a pre-incision of the tubular product P has been made, the first gripping device 32 and the second gripping device 33 grip respective portions of the tubular product P located upstream and respectively downstream of the pre-incision made. By activating the first gripping device 32, the second gripping device 33 and the translation member 34, it is possible to generate a traction on the tubular product P and consequently a separation thereof.

[0087] According to possible variant embodiments of the present invention, shown for example with reference to figs. 2 and 4, the machine 10 can comprise a bending core 35 positionable inside the tubular product P to contrast the action of the bending device 12 from the inside, and to conform as desired the bending of the tubular product P.

[0088] Holding devices 36 can be associated with the bending core 35, to keep it in a predefined position inside the tubular product P.

[0089] The holding condition of the holding devices 36 is such that when the feed device 11 feeds the tubular product P to the bending device 12, and the latter is driven, the bending core 35 is kept in a predefined position with respect to the bending device 12.

[0090] This working condition allows to feed the tubular product P substantially continuously.

[0091] According to a possible and non-restrictive embodiment of the present invention, the holding devices 36 comprise magnetic elements 37, disposed on the perimeter around the tubular product P and in a position coordinated with that of the bending core 35. The magnetic holding action carried out by the magnetic elements 37 allows to keep the bending core 35 in the predefined position for making the bend.

[0092] Thanks to the magnetic elements 37 it is therefore possible to dispose the bending core 35 in correspondence with the central zone of magnetic equilibrium, thus remaining in a substantially suspended condition inside the space defined by the magnetic elements 37.

[0093] This allows to eliminate the production of offcuts since, once a first portion of the tubular product P has been bent according to the desired pattern, the tubular product P itself can be cut exactly to size, only separating the bent portion and avoiding on each occasion having to remove the bending core 35.

[0094] According to embodiments shown in figs. 2 and 4, the bending core 35 comprises a support element 38 cooperating with the holding devices 36 and provided to hold the bending core 35 in the correct bending position.

[0095] According to a possible solution, the holding device 36 can be selectively movable in a direction parallel to the axis of feed F to modify the position of the bending core 35 inside the tubular product P.

[0096] According to possible solutions, for example if the tubular product P is supplied from a roll, the machine 10 can be provided with straightening devices 41 configured to straighten the tubular product P and supply it in a straight configuration to the bending device 12.

[0097] According to a possible solution of the present invention (figs. 1, 2 and 4), the straightening devices 41 can be positioned upstream of the feed device 11 to supply to the latter the already straightened tubular product P.

[0098] It is quite clear that the straightening device 41 can be positioned in any position whatsoever upstream of the bending device 12.

[0099] The straightening devices 41 can be defined by a plurality of straightening rollers 42, between which the tubular product P is made to pass.

[0100] According to the embodiment shown in fig. 2, we will now describe a possible functioning mode of the machine according to the present invention.

[0101] The tubular product P is fed along the axis of feed F toward the bending device 12, possibly subjecting it to a straightening action by means of the straightening devices 41.

[0102] During this step, inside the tubular cavity of the tubular product P, the bending core 35 can be disposed and kept in position. The bending core 35 is positioned in correspondence with the bending device 12 to control the bending of the tubular product P.

[0103] In this condition, the support arm 18 is positioned, with the radial positioning devices 23, so as to dispose the bending device 12 in correspondence with the tubular product P.

[0104] Then one or more bending operations are performed on the tubular product P according to one or more radii of curvature depending on the specific bending requirements.

[0105] Subsequently, the tubular product P is cut by the cutting device 24, to separate the bent product.

[0106] In this condition, it can be provided that the cutting device 24 is moved along the axis of feed F to position it in the correct position with respect to the bent product, to perform the cut.

[0107] Alternatively, or in combination, it can be provided that the feed device 11 makes the tubular product P retreat or advance, to position the bent product in a correct position with respect to the cutting device 24.

[0108] The cutting of the tubular product P can be the through type, that is, the cutting device 24 performs a complete separation of the bent product directly, cutting its thickness completely, or it can be a partial cut, that is, making only a pre-incision on the tubular product P which does not completely cut through its thickness. Making only a pre-incision on the tubular product P avoids generating deformations of the cut end which extend toward the inside of the tubular product P, which reduce its diameter and which can require further operations, for example socketing, in order to restore the diameter of the bent product.

[0109] In this last condition it can be provided that the separation of the bent product is performed by the bending device 12, which generates the axial tearing tension sufficient to separate it. For example, it can be provided that the tearing action is performed with the last bending operation, which is provided for the bent product to be obtained.

[0110] According to a possible variant embodiment, described with reference to fig. 2, it can be provided that the axial tearing tension on the tubular product P is conferred by the combined cooperation of the bending device 12 and the feed device 11. For example, once the tubular product P has been bent, the bending devices 12 can keep it gripped between its components, the cutting device 24 makes the pre-incision, and the feed devices 11 are driven in the opposite direction to the normal feed direction so as to generate, together with the bending devices 12, the tension needed to make the separation.

[0111] According to another variant embodiment, described with reference to fig. 4, the action of separating the tubular product P is performed by the combined action

of the first gripping device 32 and the second gripping device 33 which, when the cut is being performed, or once the pre-incision has been made, grip the tubular product P, and at least one of them, in this specific case the second gripping device 33, is moved axially to generate the tension needed to make the separation.

[0112] According to a possible variant embodiment, not shown, the function of one of either the first gripping device 32 or the second gripping device 33 can be performed by the feed device 11, for example by the vise elements 14, or the drawing rollers 13, allowing to reduce the operating members of the machine 10.

[0113] During the cutting or separation operations, a radial distancing of the support arm 18 can be provided, to dispose it in a position where it does not interfere with the operating components in action.

[0114] It is clear that modifications and/or additions of parts may be made to the machine 10 and method for bending a tubular product as described heretofore, without departing from the field and scope of the present invention.

[0115] For example, it can be provided that the cutting device 24 is disposed in direct proximity, that is, at a distance of less than 150mm, from the bending device 12. In this way it is possible to optimize the process times of the machine 10 and cut the bent product also in direct proximity to the curve just made.

[0116] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of machine and method for bending a tubular product, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Machine for bending a tubular product (P) comprising:

   - a feed device (11) configured to feed said tubular product (P) along an axis of feed (F),
   - a support arm (18) with an oblong development and installed, on a support structure (17), parallel to said axis of feed (F), said support arm (18) being able to rotate with respect to an axis of rotation coinciding with said axis of feed (F), and
   - a bending device (12) disposed downstream of said feed device (11), installed on said support arm (18) and configured to bend said tubular product (P),

   characterized in that it comprises a cutting device (24) configured to at least partly cut said tubular product (P), and installed aligned with said axis of feed (F), upstream of said bending device (12) and in a position comprised along the longitudinal extension of said support arm (18), **in that** said cutting device (24) is the orbital type and comprises a support body (25) installed aligned with said axis of feed (F) and on which at least one cutting tool (27) is installed, and **in that** a drive member (28) is associated with said support body (25), configured to make the at least one cutting tool (27) rotate around said axis of feed (F), to perform the cutting of said tubular product (P).

2. Machine as in claim 1, **characterized in that** said support arm (18) is installed on a rotation member (21) associated with the support structure (17) and configured to make the support arm (18) rotate around said axis of feed (F).

3. Machine as in claim 2, **characterized in that** said cutting device (24) is installed on a support element (29) attached to the rotation member (21) and configured to support the cutting device (24), keeping it aligned with said axis of feed (F).

4. Machine as in claim 3, **characterized in that** said support element (29) is defined by a tubular body (30), provided with an axial cavity aligned with said axis of feed (F) and inside which the tubular product (P) is made to pass.

5. Machine as in claim 3 or 4, **characterized in that** said cutting device (24) is connected to movement members (31) configured to move the cutting device (24) parallel to the axis of feed (F).

6. Machine as in any claim hereinbefore, **characterized in that** it comprises at least a gripping device (32, 33) configured to grip a longitudinal portion of the tubular product (P).

7. Machine as in claim 6, **characterized in that** it comprises a first gripping device (32) and a second gripping device (33) disposed upstream and downstream of said cutting device (24) and each configured to grip a respective portion of said tubular product (P), and **in that** at least one of either said first gripping device (32) or said second gripping device (33) is associated with a translation member (34) configured to move the respective gripping device (32, 33) in a direction parallel to said axis of feed (F).

8. Method for bending a tubular product (P) that comprises:

   - feeding a tubular product (P) along an axis of feed (F);
   - positioning a bending device (12) associated with a support arm (18) with an oblong development and, installed on a support structure (17),

parallel to said axis of feed (F), said positioning providing at least the rotation of said support arm (18) around an axis of rotation coinciding with said axis of feed (F),
- bending said tubular product (P) with said bending device (12),

characterized in that it comprises cutting, at least partly, the bent tubular product (P) with a cutting device (24) installed aligned with said axis of feed (F), upstream of said bending device (12) and in a position comprised along the longitudinal extension of said support arm (18), and **in that** the cutting of the tubular product (P) provides to make at least one cutting tool (27) rotate orbitally around the axis of feed (F) and around the tubular product (P), to perform the cutting of the latter.

9. Method as in claim 8, **characterized in that** it comprises moving said cutting device (24) parallel to the axis of feed (F), and keeping it aligned with the latter.

10. Method as in claim 8 and 9, **characterized in that** said cutting device (24) performs a pre-incision of said tubular product (P), and **in that** it provides to generate an axial tension at least in the pre-incision zone of said tubular product (P) to separate the bent product.

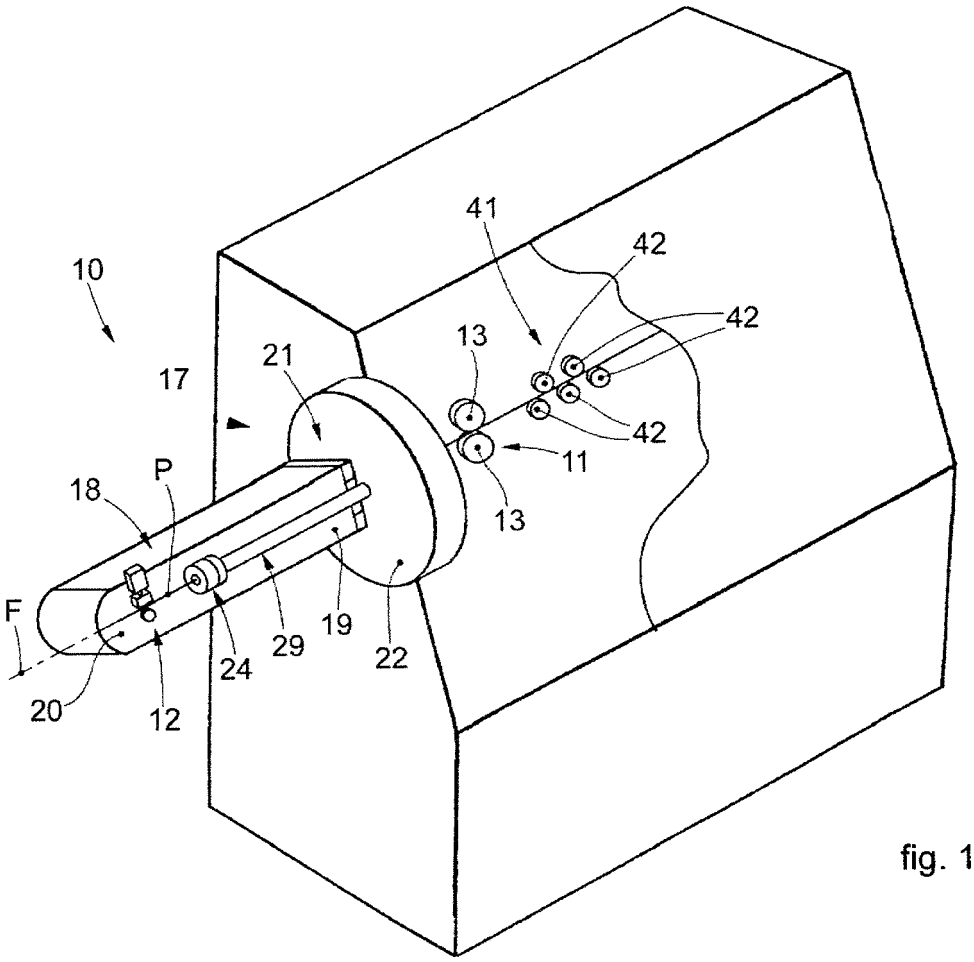

fig. 1

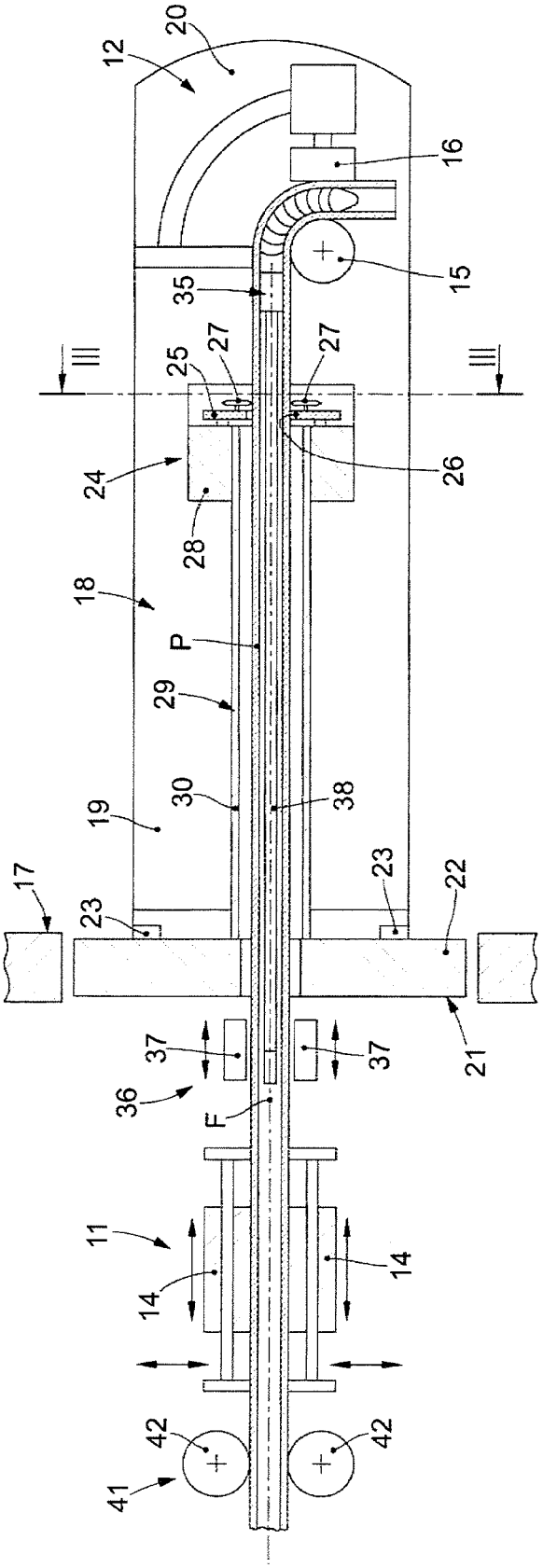
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fig. 2

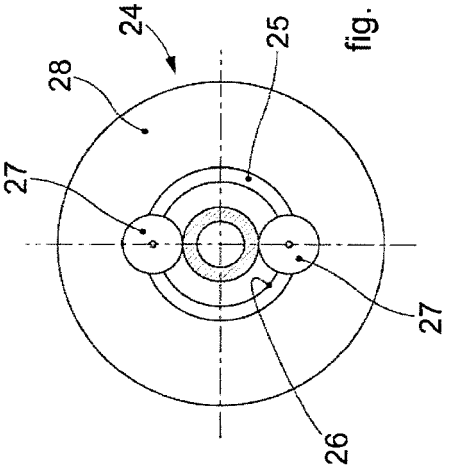
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fig. 3

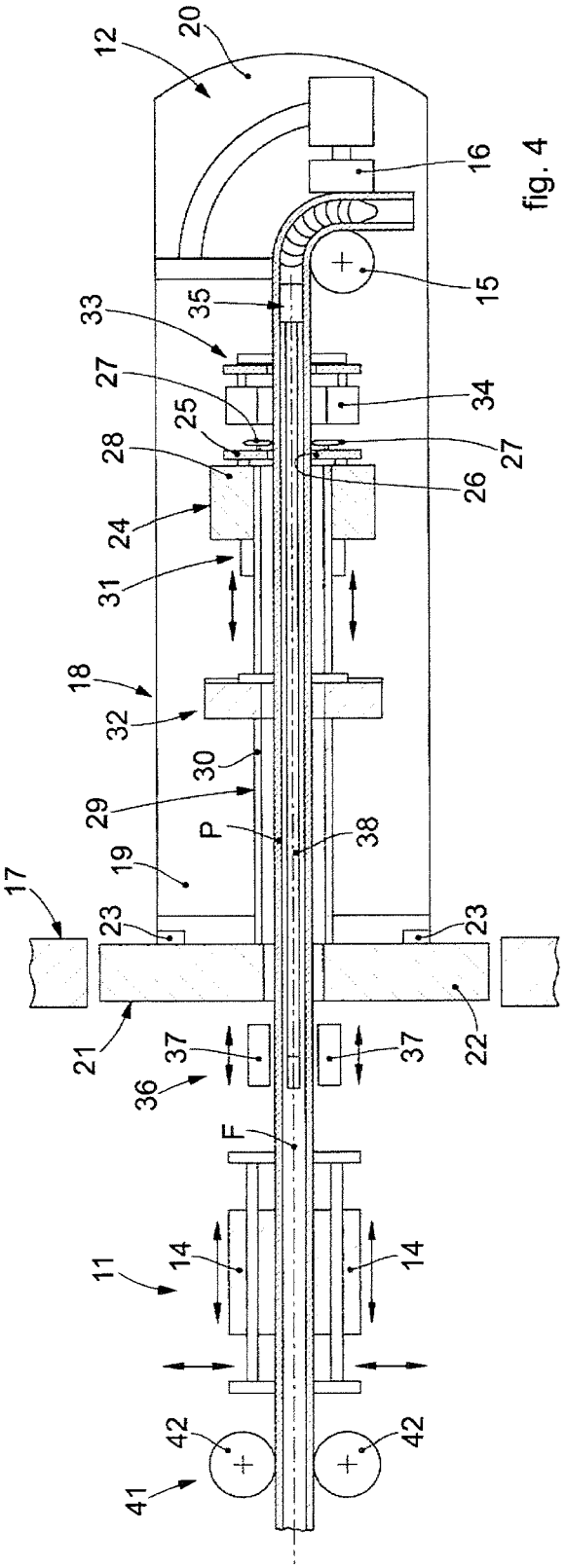
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fig. 4

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 June 2017	Pieracci, Andrea

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