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(54) **AUXILIARY PLANT FOR A PIERCER**

(57) The invention relates to an auxiliary plant 40 for a piercer 20. The piercer comprises a set of rollers 22 and a plug 24 mounted on a rod 26. The auxiliary plant 40 comprises a plurality of nozzles 400 arranged at a predetermined radial distance from the rod and designed

to dispense an anti-oxidizing fluid 50 in a plurality of positions distributed axially along the rolling axis X. The invention also relates to a piercer 20 comprising such an auxiliary plant 40.

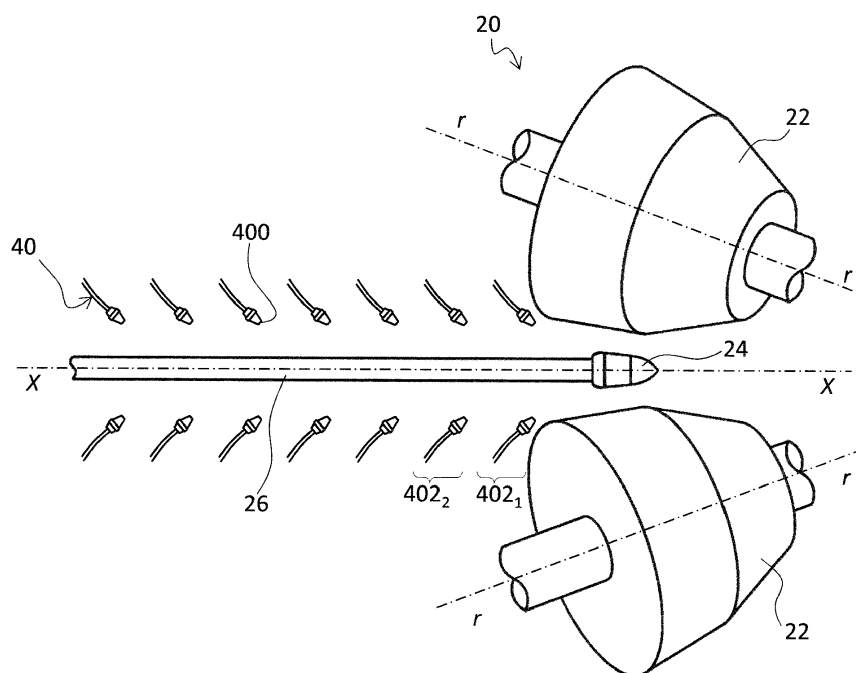


Fig. 6

Description

[0001] The present invention relates to an auxiliary plant for a piercer, in particular a plant for dispensing an anti-oxidizing fluid in piercers and in rolling machines in general. The invention also relates to a piercer comprising such an auxiliary plant.

[0002] In a manner known per se, the production of hollow articles, such as seamless tubes, starts with piercing of a billet so as to obtain a hollow compact body referred to as a pierced blank. The machines designed to carry out this production step are generally called "piercers". By way of example, particular reference will be made below to piercers comprising a pair of skew-axis rollers (i.e. with axes which are not parallel and which do not lie in the same plane) and a plug mounted on a rod. This reference, however, is not intended to be limiting and, as the person skilled in the art may easily understand, the teachings of the present invention may be suitably applied to any other type of piercer or rolling machine.

[0003] Considering, therefore, the piercing step, the billet is fed to the piercer. The rollers push the billet axially against the plug so that it is pierced along its longitudinal axis. The rod is connected to a thrust block designed to oppose the axial thrust which is produced during piercing.

[0004] In order to be able to be processed in the manner described above, the billet is preferably heated in a furnace, usually to temperatures of between about 1200°C and 1300°C. Further heat is also generated locally by the friction of the material of the billet against the plug.

[0005] During this production step, a major problem consists in oxidation of the metallic material being processed, typically steel. In fact, at the temperatures which are typical during this step, the metallic material is extremely reactive and, upon coming into contact with the atmospheric oxygen, it oxidizes rapidly, forming so-called scale. This problem arises in particular in connection with the internal surface of the pierced blank. In fact, on the one hand this surface, which is gradually formed as piercing proceeds, is extremely reactive because it never came into contact with the air. On the other hand the advancing movement of the plug inside the material of the billet produces an effect similar to that of a plunger and constantly draws in fresh air inside the cavity which is formed in the billet during piercing (or rolling). An even greater suction effect occurs when, at the end of piercing, the rod is extracted from the pierced blank. In this case the volume inside the pierced blank previously occupied by the rod is freed, drawing in, as a result of the vacuum effect, further fresh air from the surrounding environment.

[0006] The scale constitutes a problem because its presence inside the tube during the subsequent processing steps results in the formation of unacceptable defects. The scale is in fact colder than the high-temperature metallic material from which it is formed. It is therefore harder and more brittle and tends to become detached in an

uncontrolled manner from the surface on which it is generated.

[0007] The presence of scale between the mandrel and the tube being rolled may result, for example, in unacceptable irregularities on the inner wall of the tube itself. In fact cavities may be formed on the rolled product as a result of pressing of the scale situated between mandrel and pierced blank. Furthermore, the presence of scale inside the pierced blank during the successive rolling steps, such as elongation, may cause damage to the processing tools, such as scoring, grooving or scratching of the mandrel.

[0008] In order to reduce the negative effects of oxidation, there exist known treatments which can be carried out on the pierced blank, once it has been extracted from the rod of the piercer and before being conveyed to the following processing steps. Treatments of this type, which are commonly called deoxidation or deoxidizing treatments, are described for example in IT1160196.

[0009] In accordance with the prior art, this operation is carried out only at the end of the piercing rolling operation and when the rod and the plug are extracted from the pierced blank. In this connection, in accordance with the prior art, a special station situated along the production line downstream of the piercer is responsible for the deoxidizing treatment. The pierced blank is treated internally with deoxidizing agents, typically borax or substances similar to it. These treatments are aimed at removal of the oxides once they have been formed.

[0010] As the person skilled in the art may fully understand, the industrial use of these substances creates major problems for environmental safety and for the workers owing to the toxicity of the substances used.

[0011] Moreover, the need for deoxidizing treatment negatively influences the time for transfer of the pierced blank between rotary piercer and machines for the subsequent processing operations. The deoxidizing treatment and the cycle times associated with it furthermore influence the overall costs of the production process.

[0012] Furthermore, oxidation of the pierced blank results in the reduction of the overall output of the plant, owing to the loss of useful mass associated with the formation and the removal of scale.

[0013] Finally, the presence of a special deoxidation station results in an increase in the overall dimensions of the plant.

[0014] The Japanese document JP S 59-33011 A describes a slightly different solution, whereby the deoxidizing fluid is dispensed during piercing, directly inside the pierced blank. In accordance with this solution, in fact, the rod is hollow and a series of nozzles provided immediately behind the plug are intended to dispense the deoxidizing fluid. The object of this solution is to solve some of the problems mentioned above in connection with the preceding solutions. This solution, however, is particularly costly and delicate owing to the complications involved. In fact the connection between the rod and the thrusting block necessarily requires seals which are able

to prevent fluid losses also when the rod is rotating. Moreover, the hollow rod is more delicate than a solid rod.

[0015] The object of the present invention is therefore to overcome at least partially the drawbacks mentioned above with reference to the prior art.

[0016] In particular, a task of the present invention is to provide an auxiliary plant which is able to prevent the formation of oxide instead of removing it once it has formed.

[0017] Moreover, a task of the present invention is to provide an auxiliary plant for a piercer able to avoid or greatly limit the use of toxic substances such as borax.

[0018] Furthermore, a task of the present invention is to provide an auxiliary plant for a piercer which is able to reduce or eliminate the cycle times associated with the anti-oxidation treatment.

[0019] Moreover, a task of the present invention is to improve the overall output of the rolling plant owing to the prevention of oxidation and of the loss of mass due to the scale derived therefrom.

[0020] Furthermore, a task of the present invention is to provide an auxiliary plant for a piercer which is simple, low-cost and robust.

[0021] Finally, a task of the present invention is to provide an auxiliary plant for a piercer which does not occupy a specially assigned area.

[0022] The object and tasks indicated above are achieved by an auxiliary plant according to Claim 1. The characteristic features and further advantages of the invention will emerge from the description, provided hereinbelow, of a number of examples of embodiment, provided by way of a non-limiting example, with reference to the accompanying drawings.

- Figure 1 shows in schematic form a side view of a piercer of a known type;
- Figure 2 shows a plan view of a different piercer of the known type;
- Figure 3 shows in schematic form an initial first step of the piercing operation;
- Figure 4 shows in schematic form a second intermediate step of the piercing operation;
- Figure 5 shows in schematic form a third final step of the piercing operation;
- Figure 6 shows in schematic form a side view of a first embodiment of the auxiliary plant according to the invention;
- Figure 7 shows in schematic form a side view of a second embodiment of the auxiliary plant according to the invention;
- Figure 8 shows in schematic form a side view of a third embodiment of the auxiliary plant according to the invention;
- Figure 9 shows a view similar to that of Figure 3, in which the piercer comprises an auxiliary plant according to the invention;
- Figure 10 shows a view, on a larger scale, of the detail indicated by A in Figure 9;

- Figure 11 shows, in a detail similar to that of Figure 10, an intermediate rolling step similar to that of Figure 4;
- Figure 12 shows a triad arrangement according to the invention in a first closed configuration; and
- Figure 13 shows the triad arrangement according to Figure 12 in a second open configuration.

[0023] With reference to the attached figures, 20 denotes overall a rotary piercer which comprises a set of rollers 24 and a plug 24 mounted on a rod 26. The invention relates to an auxiliary plant 40 for the piercer 20. The auxiliary plant 40 comprises a plurality of nozzles 400 arranged at a predetermined radial distance from the rod 26 and designed to dispense an anti-oxidizing fluid 50 in a plurality of positions distributed axially along the rolling axis X.

[0024] In the present document, both as regards the description of the prior art and as regards the description of the invention, a number of agreed meanings are assumed. "Axial" or "longitudinal" refers to the direction of any straight line parallel to the rolling axis X corresponding to the axis of the pierced blank. "Radial" or "lateral" refers to the direction of any straight half-line having its origin on the axis X and perpendicular thereto.

[0025] In the present description, reference will also be made to the middle of the piercer 20. The middle is uniquely defined in the manner described below. The axes r of the rollers 22 of the piercer 20 are skew. The term "skew-axis" is used to define rolling machines in which the working rollers 22 have axes r which are not parallel to each other and which do not lie in the same plane. From among all the planes perpendicular to the axis X, it is possible to define the plane μ which intersects the outer surfaces of the rollers 22 where the relative distance is minimum. The intersection of this plane μ with the axis X defines the middle point M of the piercer 20.

[0026] For example, in Figure 1, where the piercer 20 is of the type with two rollers 22, two points J and K may be defined, these points lying on the outer surface of each of the rolling rollers 22, so that the distance is as small as possible. The plane μ is perpendicular to the axis X and passes through J and K and the intersection of this plane μ with the axis X defines the middle point M of the piercer 20.

[0027] The middle M of the rolling mill constitutes a fixed and geometrically precise reference point for defining the position of the different elements along the rolling axis X.

[0028] The aforementioned geometrical considerations may be easily understood with reference to Figure 1.

[0029] Moreover, in the plan view of Figure 2, where the axes r are shown projected in a horizontal plane, it can be seen how the respective projections intersect each other along the rolling axis X precisely at the middle point M and therefore in the middle plane μ .

[0030] Furthermore, in the context of the present description, the term "deoxidant" or "deoxidizing" refers to

the treatments of the prior art aimed at removing the oxide once it has formed, while the term "anti-oxidizing" refers to the treatment according to the invention aimed at preventing the formation of oxide.

[0031] In a similar manner to that described for the prior art, when a billet 60 is fed to the piercer 20, the rollers 22 push it axially against the plug 24 (see in particular Figures 3 to 5). In this way the billet 60 is pierced along its longitudinal axis which coincides with the rolling axis X. The rod 26 is connected to a thrust block (not shown in the figures) designed to oppose the axial thrust which is generated during piercing.

[0032] Differently from that envisaged in JP S 59-33011 where the nozzles are provided on the rod, in the plant 40 according to the invention the nozzles 400 are arranged at a predetermined radial distance from the rod 26. The effect of this characteristic feature will be described further below in detail.

[0033] Moreover, while in JP S 59-33011 the nozzles dispense the fluid in a single position along the rolling axis (i.e. at a specific distance from the plane μ passing through the middle point M of the piercer), in the plant 40 according to the invention the nozzles 400 are designed to dispense the fluid 50 in a plurality of positions distributed axially along the rolling axis (i.e. at a plurality of different distances from the plane μ passing through the middle point M of the piercer 20).

[0034] In the description which follows, the reference number 58 refers to the "part being processed" or simply "workpiece" where this expression indicates in each case the billet 60 (shown in Figure 3), the pierced blank 64 (shown in Figure 5) or also any intermediate product 62 which is only partially pierced (shown in Figure 4).

[0035] As can be noted from the comparison between Figures 3, 4 and 5, the workpiece 58 advances along the rolling axis X. Conventionally, the front end of the workpiece 58, i.e. that facing in the direction of advancing movement, is called "head", and is indicated hereinbelow by 580. Moreover, the rear end of the workpiece 58, i.e. that directed in the opposite direction to the direction of advancing movement, is called "tail" and is indicated hereinbelow by 582.

[0036] In order to be able to be processed in the manner described above, the billet 60 is preferably heated to temperatures of between about 1200°C and 1300°C. Further heat is also generated locally by the friction of the material of the workpiece 58 against the plug 24.

[0037] As mentioned above, the auxiliary plant 40 according to the invention is designed to dispense an anti-oxidizing fluid 50 in a plurality of positions close to the rod 26. More particularly, the auxiliary plant 40 is designed to dispense the anti-oxidizing fluid 50 so that it envelopes constantly the head 580 of the workpiece 58, from the moment it comes into contact with the plug 24 and during the whole of its advancing movement along the rolling axis X. Advantageously, therefore, the auxiliary plant 40 is designed to form a cloud or a mass of anti-oxidizing fluid 50 in the vicinity of the head 580 of

the workpiece 58. See in this connection the schematic diagram shown in Figure 10.

[0038] In accordance with certain embodiments, shown schematically in Figure 6, the auxiliary plant 40 comprises a plurality of nozzles 400 mounted in a fixed manner along the rod 26. The rod 26 defines the path followed by the head 580 during its axial advancing movement.

[0039] The nozzles 400 are preferably arranged in arrays 402 distributed along the rolling axis X. Advantageously, in each array 402, the nozzles 400 are arranged so as to form a cloud which surrounds the head 580 completely. In this connection it should be noted that, in the schematic illustration shown in Figure 10, for greater clarity only one nozzle 400 is shown, for which reason the cloud of anti-oxidizing fluid 50 could appear incomplete.

[0040] Preferably the auxiliary plant 40 is designed to manage the dispensing of the anti-oxidizing fluid 50 so as to optimize its use. For example, in accordance with the embodiments of the type shown in Figure 6, the activation of each single array 402 may be controlled so that it dispenses the anti-oxidizing fluid 50 only for the period of time during which the head 580 is located in the vicinity thereof. In accordance with an embodiment of the invention, each single array 402 is therefore activated when the head 580 is situated closer at a predetermined distance. The array 402 therefore dispenses the anti-oxidizing fluid 50 forming a cloud which surrounds the head 580 while it is located in the vicinity thereof. Then, when the head 580 passes beyond the array 402 and moves away by a predetermined distance, the array 402 may be deactivated.

[0041] In accordance with certain embodiments, shown schematically in Figure 7, the auxiliary plant 40 comprises a carriage 404 on which a plurality of nozzles 400 are mounted. The carriage 404 is movable along rod 26 which defines the path followed by the head 580 during its axial advancing movement. Advantageously, the nozzles 400 are arranged on the carriage 404 so as to form a cloud which surrounds entirely the head 580. In accordance with this type of embodiment, the carriage 404 precedes the head 580 during its movement along the rolling axis X while remaining at a predetermined distance therefrom. In this way the nozzles 400 are able to dispense the anti-oxidizing fluid 50 constantly in the vicinity of the head 580.

[0042] In accordance with certain embodiments shown schematically in Figure 8, the auxiliary plant 40 adopts a mixed solution which combines the two solutions described above. In particular, the auxiliary plant 40 may comprise both nozzles 400 mounted in a fixed manner and nozzles 400 mounted on a carriage 404. In this case the operating logic is also of a mixed nature. For example, the fixed nozzles 400 are controlled so as to dispense the anti-oxidizing fluid 50 when the head 580 is located in the vicinity thereof, while the carriage 404 precedes the head 580 at a predetermined distance during its movement along the axis X.

[0043] This latter embodiment is particularly advantageous when the form of the piercer 20 does not allow the carriage 404 to get close enough to the plug 24. In fact, if dispensing of the anti-oxidizing fluid 50 were to occur at too great a distance, it would be ineffective because the anti-oxidizing fluid could become diluted or dispersed in the atmosphere. In this case, the head 580 would remain partially exposed to the air during the initial stages of piercing. In this case, it is simpler to provide inside the piercer 20 nozzles 400 which are fixed in the vicinity of the plug 24.

[0044] Usually the piercer 20 of the known type comprises triad arrangements 278 suitable for radially constraining the rod 26. In fact, during piercing, the rod 26 is stressed by a considerable axial compressive load which potentially results in buckling instability (also called Eulerian instability). As the person skilled in the art may easily understand, by imposing axial constraints along the rod 26 it is possible to limit the free inflection length and therefore increase considerably the axial load without the risk of buckling instability.

[0045] The attached Figures 12 and 13 show a triad arrangement 28 of the known type. As can be seen, the triad arrangement 28 comprises three rollers 280 which, by means of the respective lever systems 282 which support them, may be pressed radially against the rod 26 (see Figure 12). The structure of the triad arrangement 28 allows, in a manner known per se, to effectively grip rods 26 with different diameters. Moreover, the rollers 280 of the triad arrangement 28 of the known type may be moved away radially from the rod 26 so as to allow the axial transit of the workpiece 58. Finally, the rollers 280 of the triad arrangement 28 of the known type may be arranged in an open configuration (see Figure 13). In this case an opening 284 is widened and allows the rod 26 with the pierced blank 64 mounted on it to be radially or laterally removed.

[0046] In accordance with certain embodiments of the invention, the nozzles 400 may be mounted in a fixed manner on the triad arrangements 28, for example the nozzles may be mounted on the lever systems 282. In this way the nozzles 400 may be arranged in the vicinity of the rod 26 where the head 580 of the workpiece 58 passes, without interfering with the rollers 280.

[0047] As can be seen in Figures 12 and 13, the triad arrangement 28 leaves the radial opening 284 constantly free in the top right-hand zone. In accordance with certain embodiments of the invention, the carriage 404 may support the nozzles 400 by means of an arm positioned so as to move in the axial direction through the opening 284. In this way the nozzles 400 may be arranged close to the rod 26 and be displaced in the axial direction together with the carriage 404, without interfering with the triad arrangement 28.

[0048] Advantageously, the anti-oxidizing fluid 50 used in the plant 40 according to the invention performs an action preventing the formation of the metal oxides which give rise to scale. For this reason, the anti-oxidizing action

performed by the plant according to the invention differs markedly from the known solutions in which a deoxidizing treatment is performed, i.e. a treatment intended to remove the oxides once they have formed.

[0049] It is obviously entirely possible that the auxiliary plant 40 according to the invention may also be combined with conventional solutions intended to carry out a deoxidizing treatment. Such a combination is particularly advantageous for example when the auxiliary plant 40 is installed in an existing rolling plant, already provided with a deoxidation station. In this case it obviously would not make much sense to remove the deoxidation station, while it may be advantageous to maintain it and, where possible, reduce or fully avoid usage thereof.

[0050] In accordance with certain possible embodiments of the invention, the anti-oxidizing fluid 50 may comprise a gas, a gas mixture, a gas and liquid mixture, a gas and powder mixture, a liquid, a liquid mixture, a liquid and gas mixture or a liquid and powder mixture.

[0051] In accordance with certain possible embodiments of the invention, the anti-oxidizing fluid 50 may comprise an inert gas or a mixture of inert gases which are suitable for saturating the zone in which the anti-oxidizing fluid is dispensed. In this way the anti-oxidizing fluid 50 removes the air from the region around the head 580, which thus passes through a modified atmosphere zone where there is no oxygen. In accordance with these embodiments, the anti-oxidizing fluid 50 may for example comprise, by way of a non-limiting example, nitrogen, helium, argon or a mixture thereof.

[0052] In accordance with certain possible embodiments of the invention, the anti-oxidizing fluid 50 may comprise components which, in the conditions in which they are once they have been dispensed, bond with the oxygen and sequester it entirely. In this case also, the head 580 thus passes through a modified atmosphere zone where there is no oxygen. In accordance with these embodiments, the anti-oxidizing fluid 50 may for example give rise to a very rapid combustion or oxidation reaction. In order to achieve this effect, the anti-oxidizing fluid 50 may for example comprise, by way of a non-limiting example, a fluid or a mixture of combustible fluids such as natural gas, liquid propane gas, kerosene or acetylene. If the anti-oxidizing fluid 50 gives rise to a highly exothermic reaction, the result is also achieved that heat is not removed from the workpiece 58.

[0053] In accordance with certain possible embodiments of the invention, the anti-oxidizing fluid 50 may comprise components which, in the conditions in which they are once they have been dispensed, release a great quantity of inert gas, the increased volume of which removes the air from around the head 580 which thus passes through a modified atmosphere zone where there is no oxygen. In accordance with these embodiments, the anti-oxidizing fluid 50 may for example comprise, by way of a non-limiting example, ammonium phosphate, urea, potassium bicarbonate or sodium bicarbonate.

[0054] As the person skilled in the art may easily un-

derstand, the overall effect of the anti-oxidizing fluid 50 may be advantageously the sum of different effects obtained by different components. For example, the formation of inert gases, the increased volume and the sequestering of the atmospheric oxygen may be favourably combined, with a synergistic effect.

[0055] In the light of the description provided above, the person skilled in the art may easily understand the operating principle of the auxiliary plant 40 according to the invention, said operation being briefly described here with reference to Figures 10 and 11. As can be seen in Figure 10, before piercing commences, the first array 402₁ of nozzles starts to dispense the anti-oxidizing fluid 50 so as to form a cloud around the plug 24. When piercing has started, the head 580 is therefore immersed in the cloud of anti-oxidizing fluid 50. In the plants schematically shown in Figure 7, the first array 402₁ is that which is mounted on the carriage 404. In this case, as piercing progresses, the carriage 404 moves along the axis X together with the head 580. Instead, in the plants shown schematically in Figures 6 and 8, the first array 402₁ of nozzles 400 is fixed. Therefore, as piercing progresses, the head 580 passes beyond the first array 402₁ and moves towards the second array 402₂ which will be activated when the head is situated close at a predetermined distance. In turn the second array 402₂ may be fixed (as shown in the diagram of Figure 6) or may be movable (as shown in the diagram of Figure 8).

[0056] Figure 11 shows in schematic form the condition where a first array 402₁ has already been deactivated, while the following array 402₂ is active and dispenses the anti-oxidizing fluid 50. From the cross-section it can be seen how the cloud of anti-oxidizing fluid 50 which is created in the proximity of the head 580 is drawn inside the workpiece 58 owing to the plunger effect generated by the plug 24 as piercing proceeds.

[0057] The invention also relates to a piercer 20 comprising a set of rollers 22 and a plug 24 mounted on a rod 26. The piercer according to the invention further comprises an auxiliary plant 40 designed to dispense an anti-oxidizing fluid 50 in a plurality of positions close to the rod 26.

[0058] As the person skilled in the art may easily understand, the auxiliary plant 40 according to the invention ensures that, during the entire piercing step, the inner surface of the pierced blank 64 does not come into contact with oxygen. This gives rise to the enormous advantage of preventing the formation of scale during the entire piercing step. However, if suitable counter measures are not taken, when the rod 26 is extracted from the pierced blank 64, fresh air is sucked back into the latter and the oxidation process may begin.

[0059] For this reason, the auxiliary plant 40 and the piercer 20 according to the invention are preferably used in a rolling plant in which, after piercing, the rod 26 is aligned with the mandrel and the pierced blank 64 is made to slide directly from one to the other. In accordance with this solution, in fact, no fresh air is sucked inside the

pierced blank 64 and the processing operation may proceed with the formation of an extremely small amount of scale or no scale at all.

[0060] As the person skilled in the art may easily understand from the description provided above, with the present invention it is possible to overcome at least partly the drawbacks mentioned with reference to the prior art.

[0061] In particular, the present invention provides a piercer and an associated auxiliary plant which are able to prevent the formation of oxide instead of removing it once it has formed.

[0062] Moreover, the present invention provides a piercer and an associated auxiliary plant which are able to avoid or limit greatly the use of toxic substances such as borax.

[0063] Furthermore, the present invention provides a piercer and an associated auxiliary plant which are able to reduce or eliminate the cycle times associated with the anti-oxidation treatment.

[0064] Finally, the present invention provides an auxiliary plant which does not occupy a specially designated area.

[0065] The person skilled in the art, in order to satisfy specific requirements, may make modifications to the embodiments described above and/or replace the parts described with equivalent parts, without thereby departing from the scope of the accompanying claims.

Claims

1. Auxiliary plant (40) for a piercer (20), in which the piercer comprises a set of rollers (22) and a plug (24) mounted on a rod (26) arranged along a rolling axis X, wherein the auxiliary plant (40) comprises a plurality of nozzles (400) arranged at a predetermined radial distance from the rod (26) and designed to dispense an anti-oxidizing fluid (50) in a plurality of positions distributed axially along the rolling axis X.
2. Auxiliary plant (40) according to Claim 1, wherein at least some of said nozzles (400) are arranged in arrays (402) fixed in the axial direction and said arrays (402) are distributed along the rolling axis X.
3. Auxiliary plant (40) according to Claim 1 or 2, wherein at least some of said nozzles (400) are mounted on a carriage (404) movable in a direction parallel to the rolling axis X.
4. Auxiliary plant (40) according to any one of Claims 1 to 3, wherein the anti-oxidizing fluid (50) comprises one or more components selected from among: a gas, a gas mixture, a gas and liquid mixture, a gas and powder mixture, a liquid, a liquid mixture, a liquid and gas mixture, and a liquid and powder mixture.
5. Auxiliary plant (40) according to Claim 4, wherein

the anti-oxidizing fluid (50) comprises one or more combustible components.

6. Piercer (20) comprising a set of rollers (22) and a plug (24) mounted on a rod (26) arranged along a rolling axis X, wherein the piercer (20) is designed to pierce longitudinally a workpiece (58), by causing the latter to advance along the rolling axis X, and further comprises an auxiliary plant (4) according to any one of Claims 1 to 5. 5
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7. Piercer (20) according to Claim 6, wherein the auxiliary plant (40) is designed to dispense the anti-oxidizing fluid (50) so that it envelopes constantly the end of the workpiece (58) which faces the direction of the advancing movement. 15

8. Piercer (20) according to Claim 6 or 7, wherein the nozzles (400) of the auxiliary plant (40) are arranged at a predetermined radial distance from the rolling axis X and wherein this predetermined radial distance is greater than the maximum permissible radius of the workpiece (58). 20

9. Piercer (20) according to any one of Claims 6 to 8, further comprising at least one triad arrangement (28) suitable for radially constraining the rod (26) and wherein the auxiliary plant (40) comprises nozzles (400) mounted on the triad arrangement (28). 25
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10. Piercer (20) according to Claim 9, wherein the at least one triad arrangement (28) defines an opening (284) for allowing radial removal of the rod (26) and wherein the auxiliary plant (40) comprises a carriage (404) movable along the rolling axis X and supporting a plurality of nozzles (400) by means of an arm which moves in an axial direction through the opening (284). 35

11. Piercer (20) according to any one of Claims 6 to 10, wherein the auxiliary plant (40) is designed to dispense the anti-oxidizing fluid (50) outside of the workpiece (58). 40

12. Piercer (20) according to any one of Claims 6 to 11, further comprising a rolling cage (30) inside which the rollers (22) and the plug (24) are arranged and wherein at least some of the nozzle (400) of the auxiliary plant are mounted inside the rolling stand (30). 45
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13. Method for longitudinally piercing a workpiece (58), the method comprising the steps of:
 - providing a piercer comprising a set of rollers (22) and a plug (24) mounted on a rod (26) arranged along a rolling axis X; 55
 - providing an auxiliary plant (40) according to any one of Claims 1 to 5;

- piercing longitudinally a workpiece (58) by causing it to advance along the rolling axis X;
 - dispensing the anti-oxidizing fluid (50) so that it envelopes constantly the end of the workpiece (58) which faces the direction of the advancing movement.

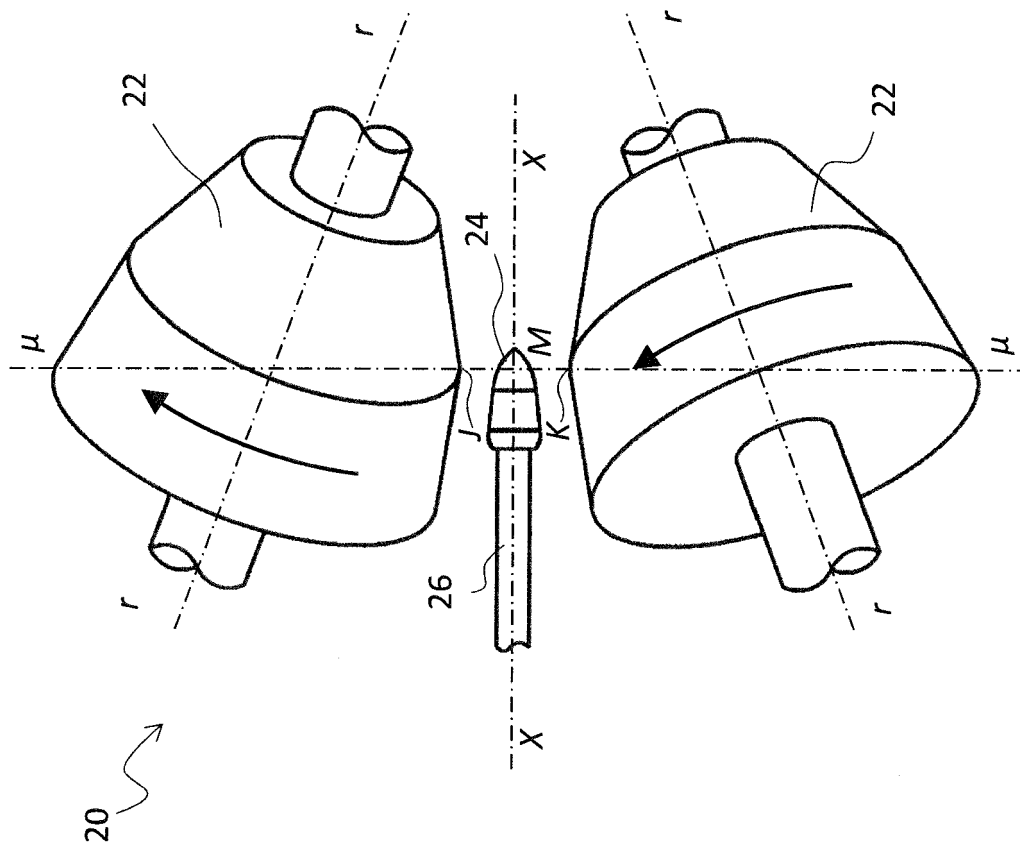


Fig. 1

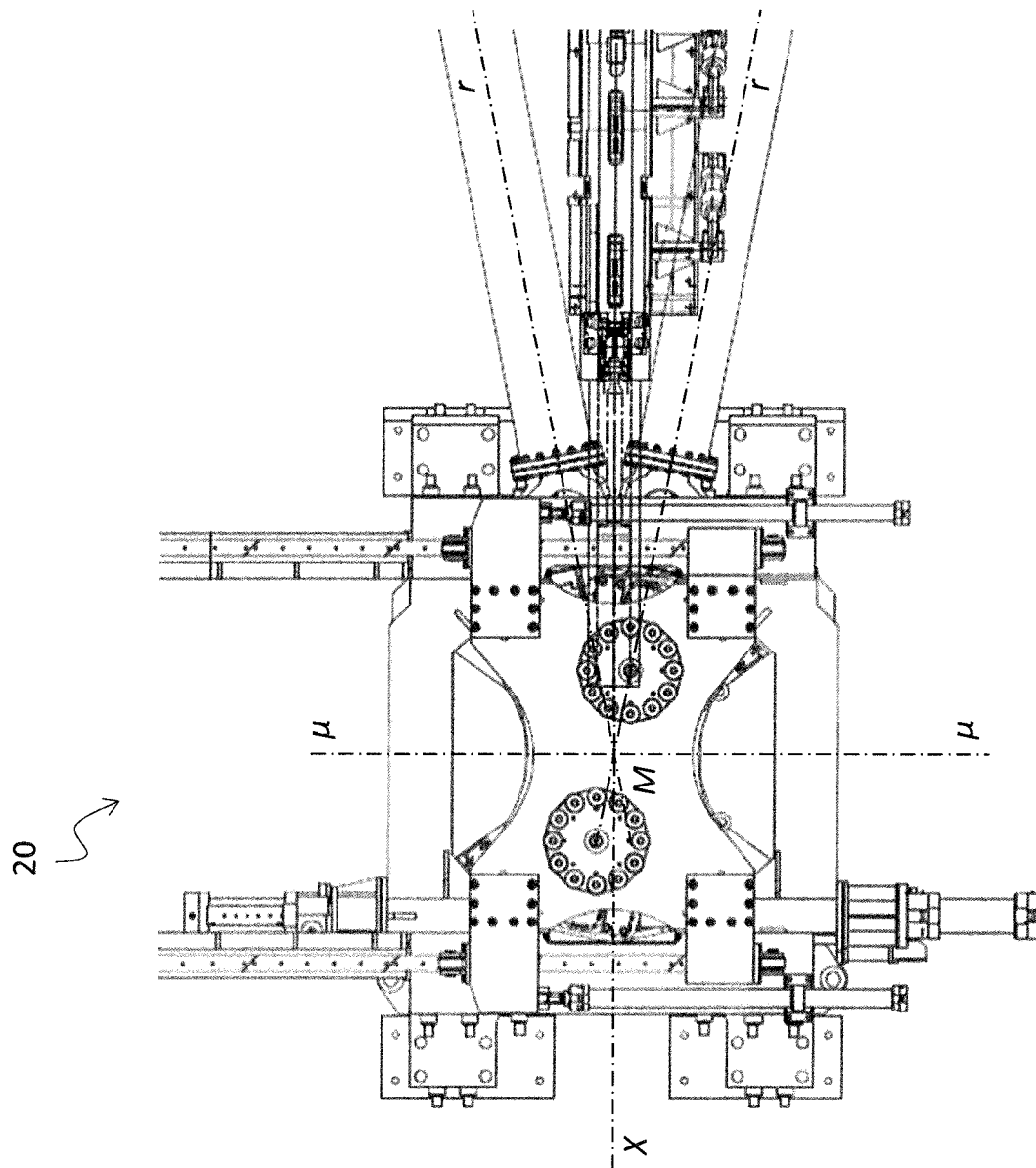


Fig. 2

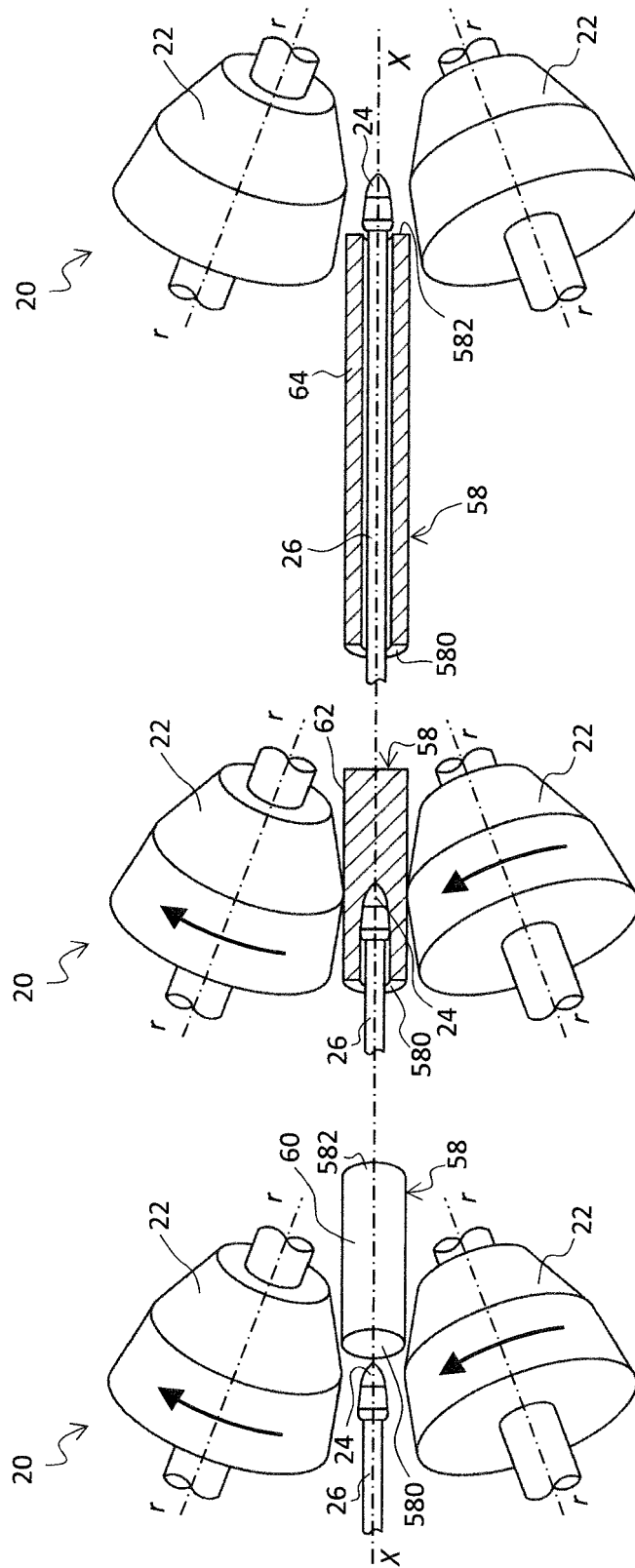


Fig. 3

Fig. 4

Fig. 5

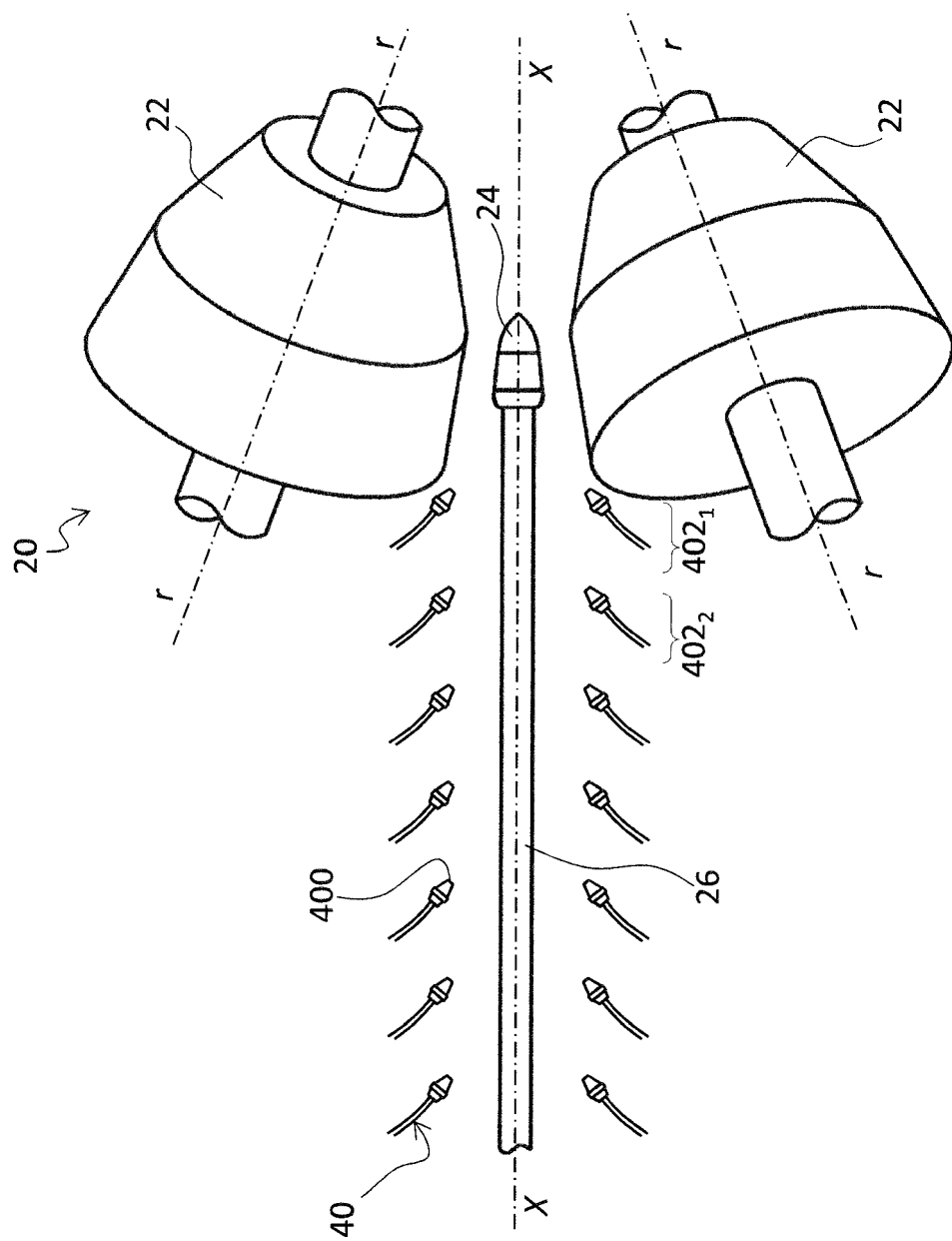


Fig. 6

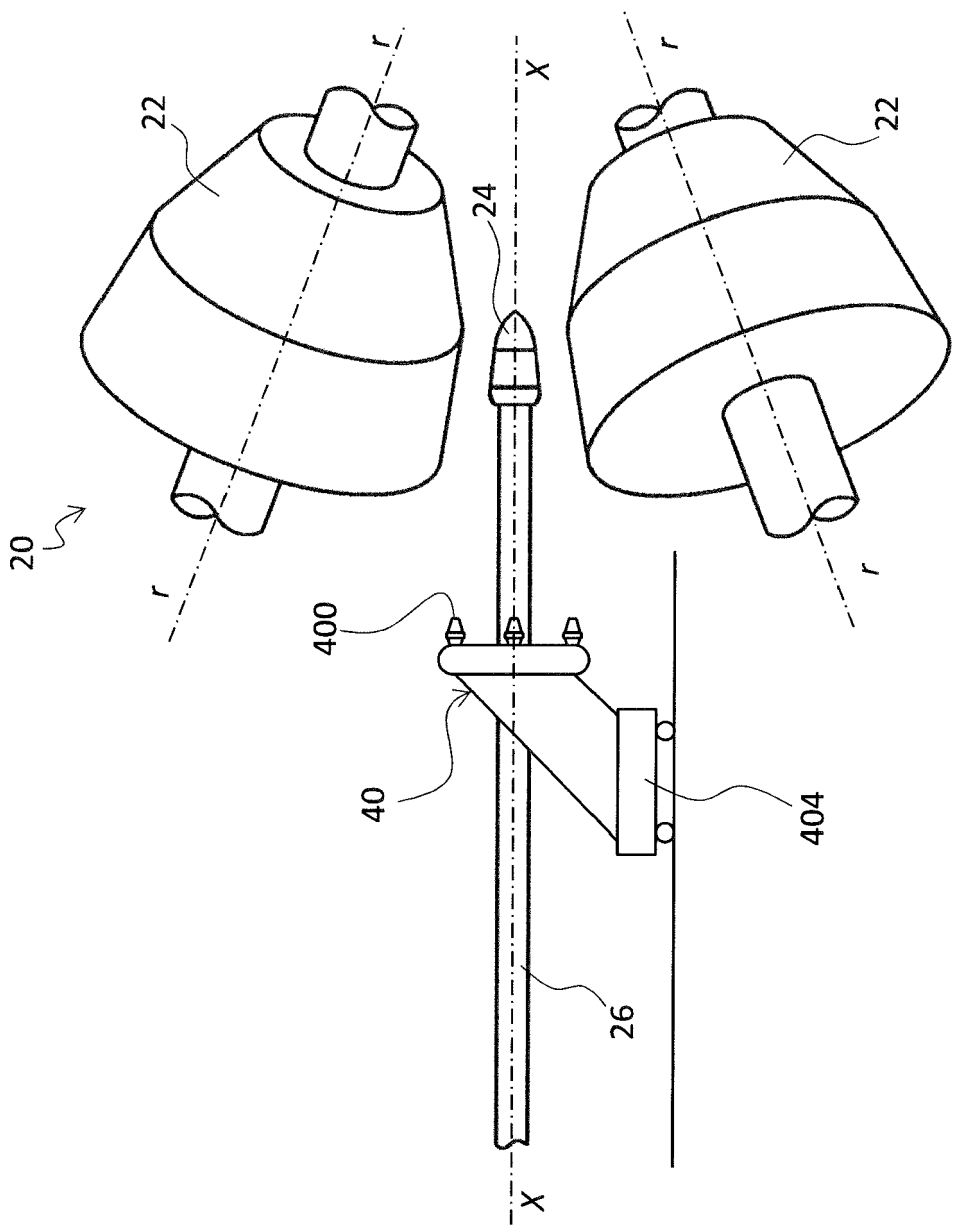


Fig. 7

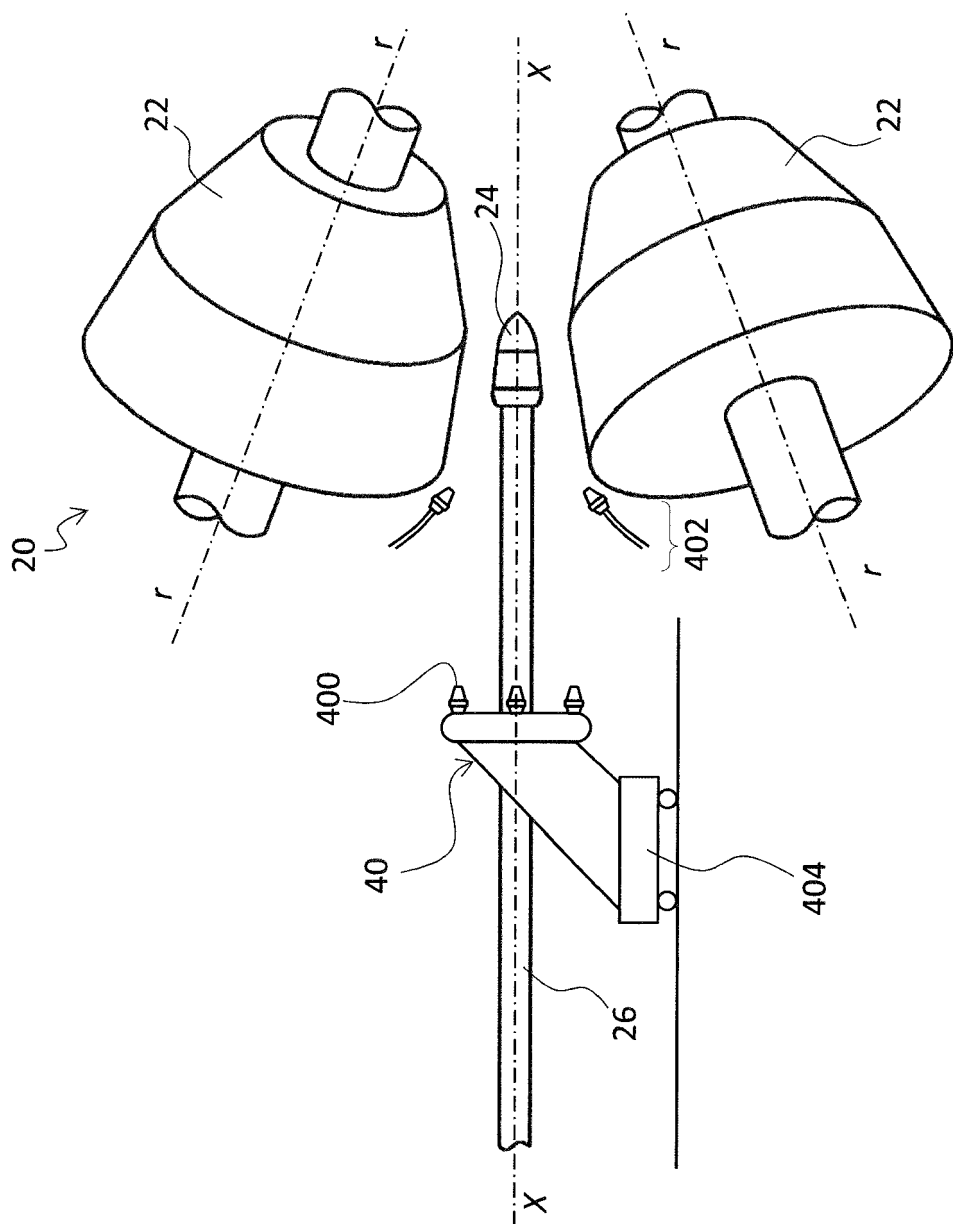


Fig. 8

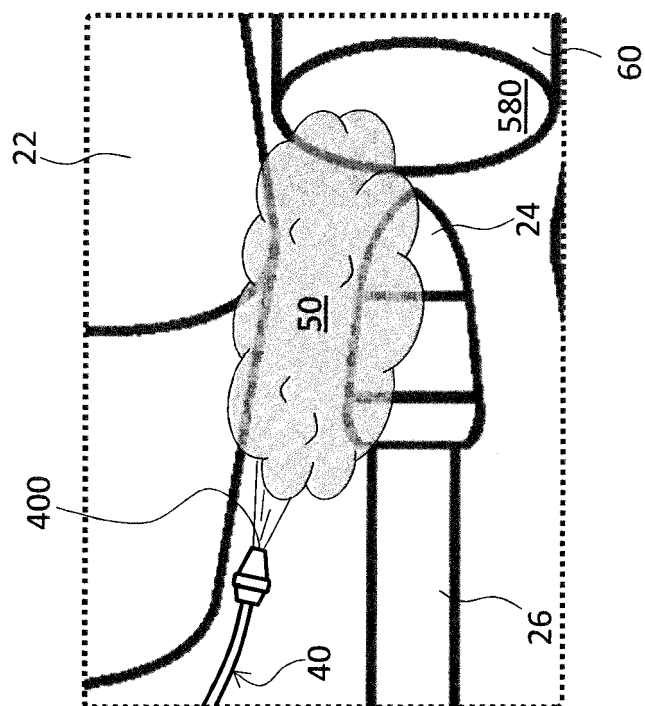


Fig. 10

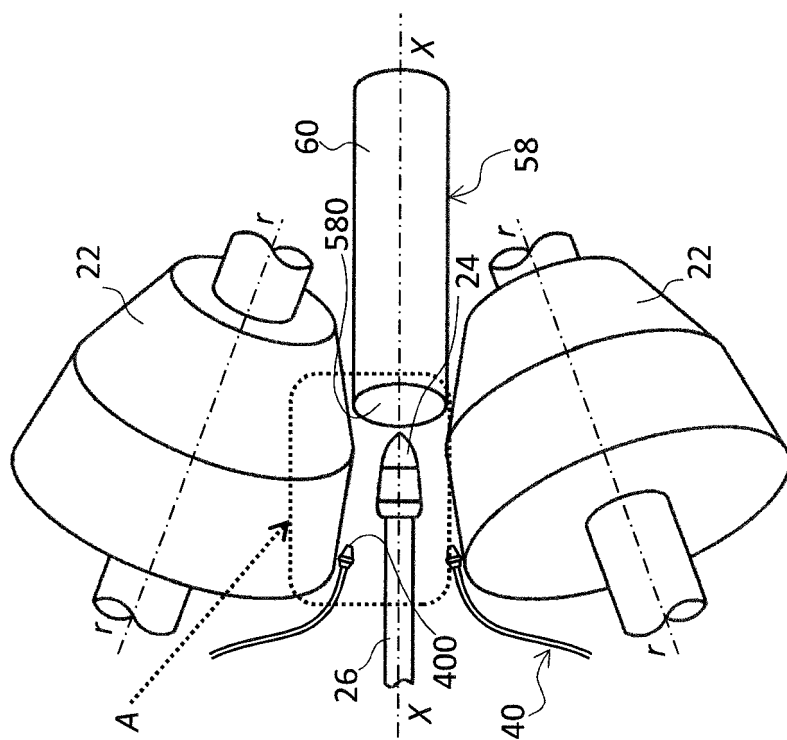


Fig. 9

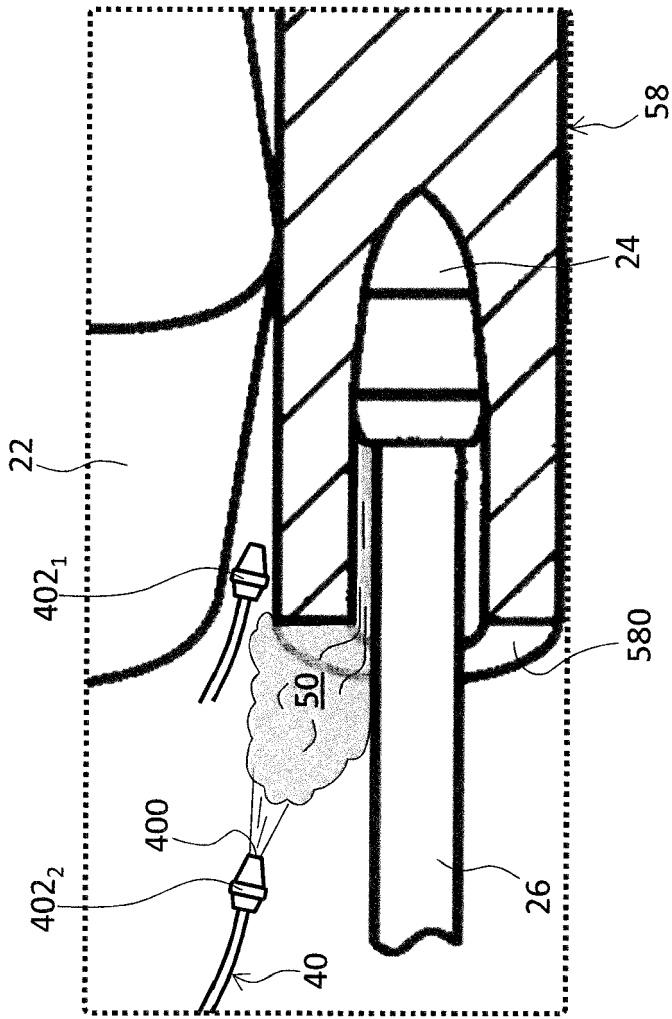


Fig. 11

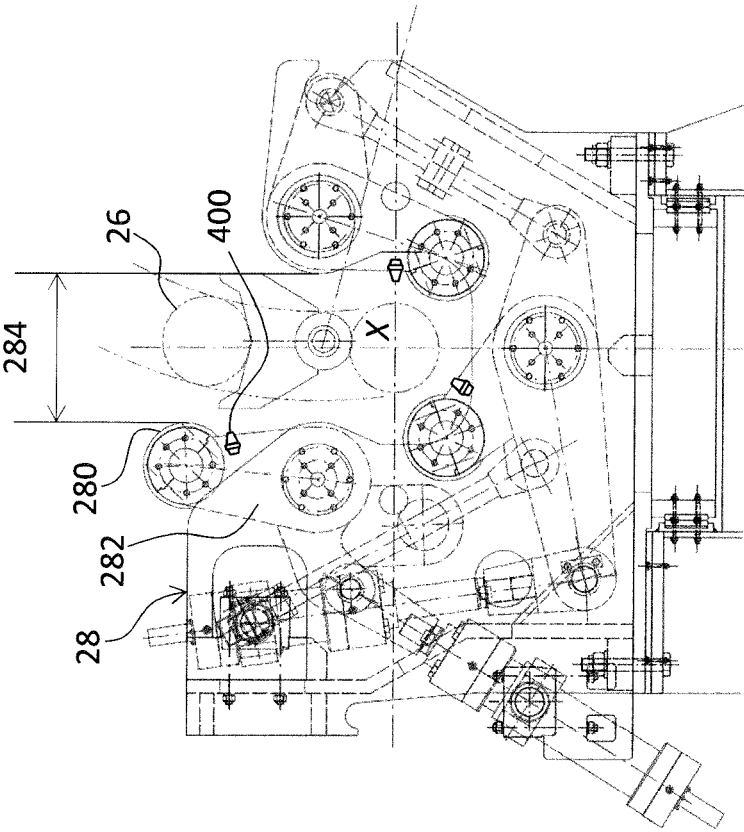


Fig. 13

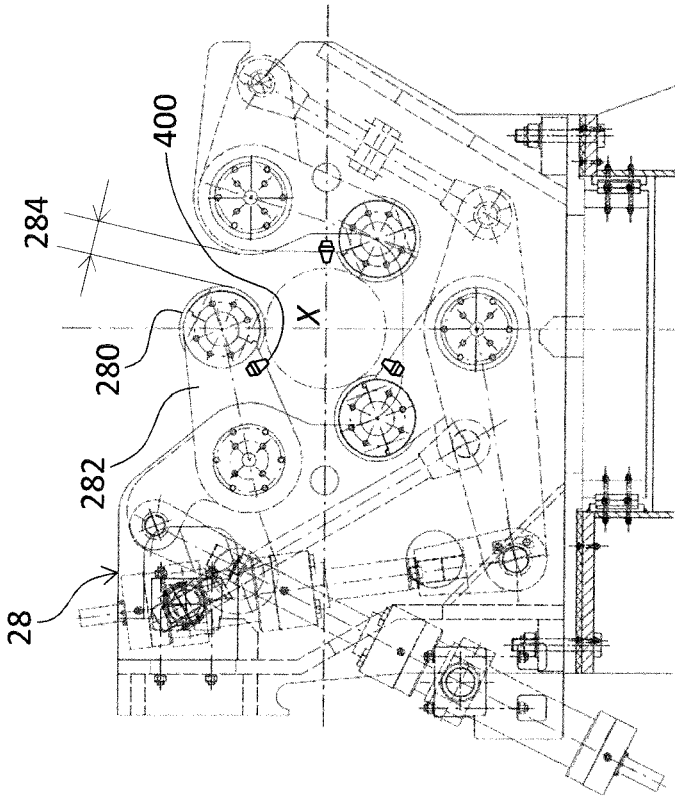


Fig. 12



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Place of search Munich		Date of completion of the search 9 August 2016	Examiner Forciniti, Marco
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