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(54) **Method and device for cleaning the circumferential outer surface of welded metal pipes**

(57) In a method for cleaning the circumferential outer surface (3) of a welded metal pipe (1) a leaser beam (7) focalized above the level of the surface (3) is used for melting, evaporating and/or sublimating extraneous materials and flaws present on the surface of the pipe (1).

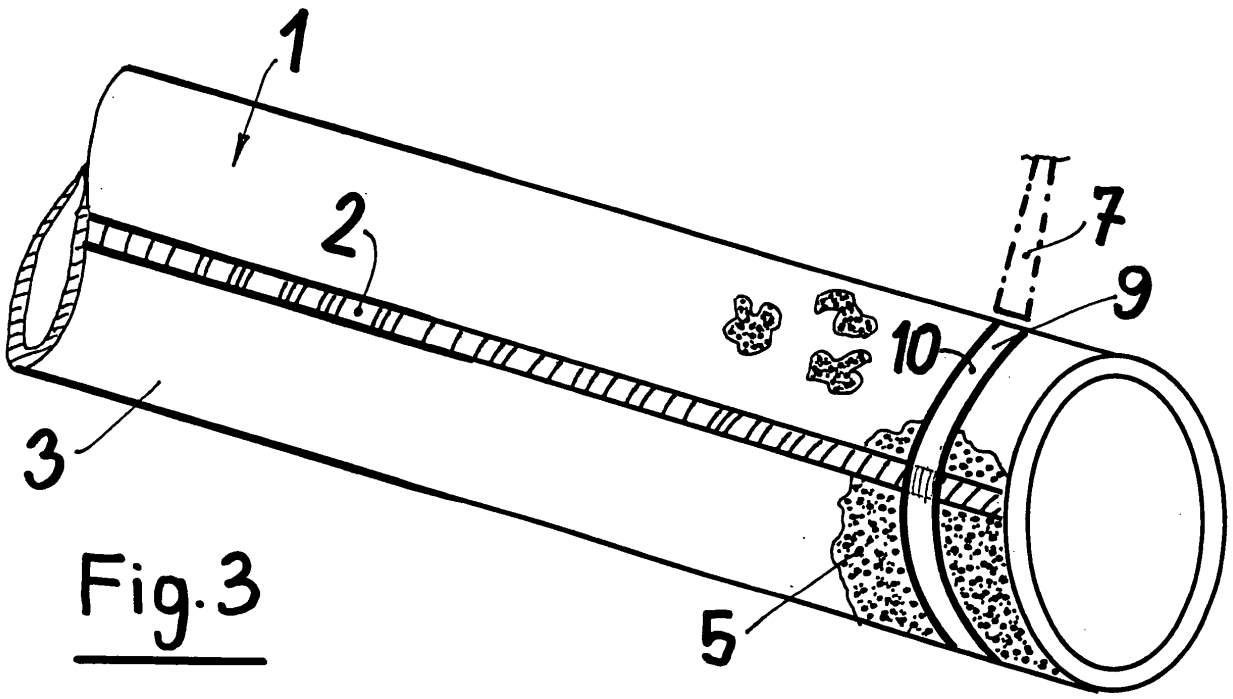


Fig.3

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a method for cleaning the outer surface of welded metal pipes, thereby allowing the position of the welding bead of said tubes to be optically detected.

[0002] The invention further relates to a device for carrying out this method.

[0003] As is known, a detection of the position of the welding bead on the outer surfaces of welded metal pipes would improve any pipe making methods, since said position detection would allow the welding bead of a welded pipe to be properly processed, thereby enhancing the aesthetic and functional properties of said welded pipe.

[0004] This is, for example, true as the welding operations are performed on a concealed face of a furniture component, or in engagement holes for rods, screws and bolts, the welding bead could interfere with.

[0005] A further practical example is a welding of folding workpieces, since in such an application the welding bead negatively affect a proper operation and strength of the bent workpiece.

[0006] Prior detection methods, automatically detect the position of a welding bead on the outer surface of a welded pipe by optical detecting systems including an optical sensor which detects said welding bead position from brightness variations on the pipe surface, which generate contrast regions including a light band, corresponding to the welding bead, on a dark pipe, or vice versa.

[0007] It should be apparent that such an optical detection system would be very inefficient or "blind" for a pipe having an outer surface scratched or covered by dirt, fat, oil, rust or paint stains, or a pipe with poor optical characteristics of its material and weldment region.

[0008] Actually, in such a case, a prior optical system would either detect a low signal/noise ratio contrast or several signal brightness peaks, which cannot be so distinguished from one another as to allow to precisely detect the position of said welding bead.

SUMMARY OF THE INVENTION

[0009] Accordingly, the aim of the present invention is to provide a method for cleaning pipes, in particular the outer surface of a metal tube, for removing therefrom elements hindering an optical read-out of the position of a welding bead.

[0010] A further object of the present invention is to provide a device for carrying out the above cleaning method.

[0011] The above objects are achieved by a method for cleaning the circumferential outer surface of a welded metal pipe, said method being characterized in that said surface is cleaned by melting, evaporating and/or sublimating extraneous materials or flaws on said surface.

[0012] Said objects are further achieved by the device for carrying out the above method, said device being characterized in that it comprises a laser beam source.

[0013] More specifically, the above and other objects are achieved by a cleaning method and device respectively according to claims 1 and 6.

[0014] Preferred embodiments of the invention are defined in the remaining subclaims.

[0015] Thus, by the cleaning method and device according to the invention, the outer surface of a welded tube is so processed and cleaned to provide a clear optical contrast between the material of the pipe and its welding bead, thereby allowing a position detecting system to precisely detect and locate the position of the pipe welding bead, to in turn allow an operator to accurately set a proper position for performing further processing operations on said welding bead.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above mentioned objects, advantaged and features will become more apparent from the following disclosure of a preferred embodiment of the inventive cleaning method and device which are illustrated, by way of a non limitative example, in the accompanying drawings, where:

Figure 1 is a schematic view showing an operating step for causing a laser beam to properly impinge on the outer surface of a pipe to be cleaned;

Figure 2 is a further schematic view showing a cleaning operation being performed on the pipe of figure 1; and

Figure 3 shows the cleaning result achieved according to the invention;

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] The reference number 1 generally shows a pipe to be cleaned by a cleaning method according to the invention.

[0018] Said pipe is a metal pipe, and has been welded at a welding bead 2 on the pipe surface 3 which welding bead 2 is partially smeared or covered by oil, fat or rust stains 4, paint layers 5, scratches or notches 6.

[0019] For eliminating the above flaws, which would hinder an optical detection for properly detecting the position of the welding bead 2 on the outer surface 3 of the pipe 1, the method according to the invention provides to cause a laser beam to impinge on said surface 3, said laser beam 7 being properly focalized on the surface 3 level. To that end, the laser beam 7 emitting head 8 is so arranged to cause said impinging laser beam to be only absorbed by the surface layers of said pipe 1, thereby allowing the laser impinging portion 9 of the surface 3 of the pipe 1 to be properly cleaned by melting, evaporating and/or sublimating the dirt, fat, oil and paint stains

4, 5, and scratches 6, the cleaning being achieved by melting, evaporating and/or sublimating the first surface layer 10 of said pipe 1 (figure 3).

[0020] To easily remove the molten material 11 and vapors 12 from said surface portion 9 in addition to the laser beam 7, an aiding gas jet 13 (figure 2) is further caused to impinge on said portion 9, thereby forming on the surface 3 of the pipe 1 and easily detectable and identifiable optical contrast between said surface material and said welding bead 2 of said pipe 1.

[0021] The laser beam 7 emitting head 8 used in the inventive method and device may comprise, for example, a laser beam emitting system of a commercially available type, such as of a type made by the same Applicant.

[0022] The advantages of the method and device according to the invention can be easily deduced from the following example.

Claims

1. A cleaning method for cleaning a circumferential outer surface (3) for a welded metal pipe (1), **characterized in that** said surface is cleaned by melting, evaporating and/or sublimating extraneous materials and flaws from said surface (3) of said pipe (1).

2. A method, according to claim 1, **characterized in that** said surface (3) is cleaned by a laser beam (7) focalized on a level of said pipe (1) surface (3).

3. A method, according to claim 2, **characterized in that** said laser beam (7) is caused to impinge on a circumferential portion (9) of said pipe (1) surface (3) thereby cleaning said area (9) by melting, evaporating and/or sublimating fat, oil and paint deposit (4, 5) forming materials and removing scratches (6) from said surface (3) by melting, evaporating and/or sublimating a first surface layer (10) of said pipe (1).

4. A method, according to claims 2 or 3, **characterized in that**, in addition to said laser beam (7), a jet (13) of a removing gas to remove from said area molten materials (11) and vapors (12) generated from the cleaning treatment, is further caused to impinge on said portion (9).

5. A device for carrying out the method according to claims 1 to 4, **characterized in that** said device comprises a laser beam source.

6. An optical detecting method for optically detecting a position of a welding bead (2) on an outer surface (3) of a welded metal pipe (1), **characterized in that** a circumferential surface (3) of said pipe (1) is processed by a cleaning method according to one or more of claims 1 to 5.

7. A metal pipe welded by a welding bead (2), **characterized in that** said metal pipe (1) has a pipe surface (3) cleaned by a cleaning method according to one or more of claims 1 to 5.

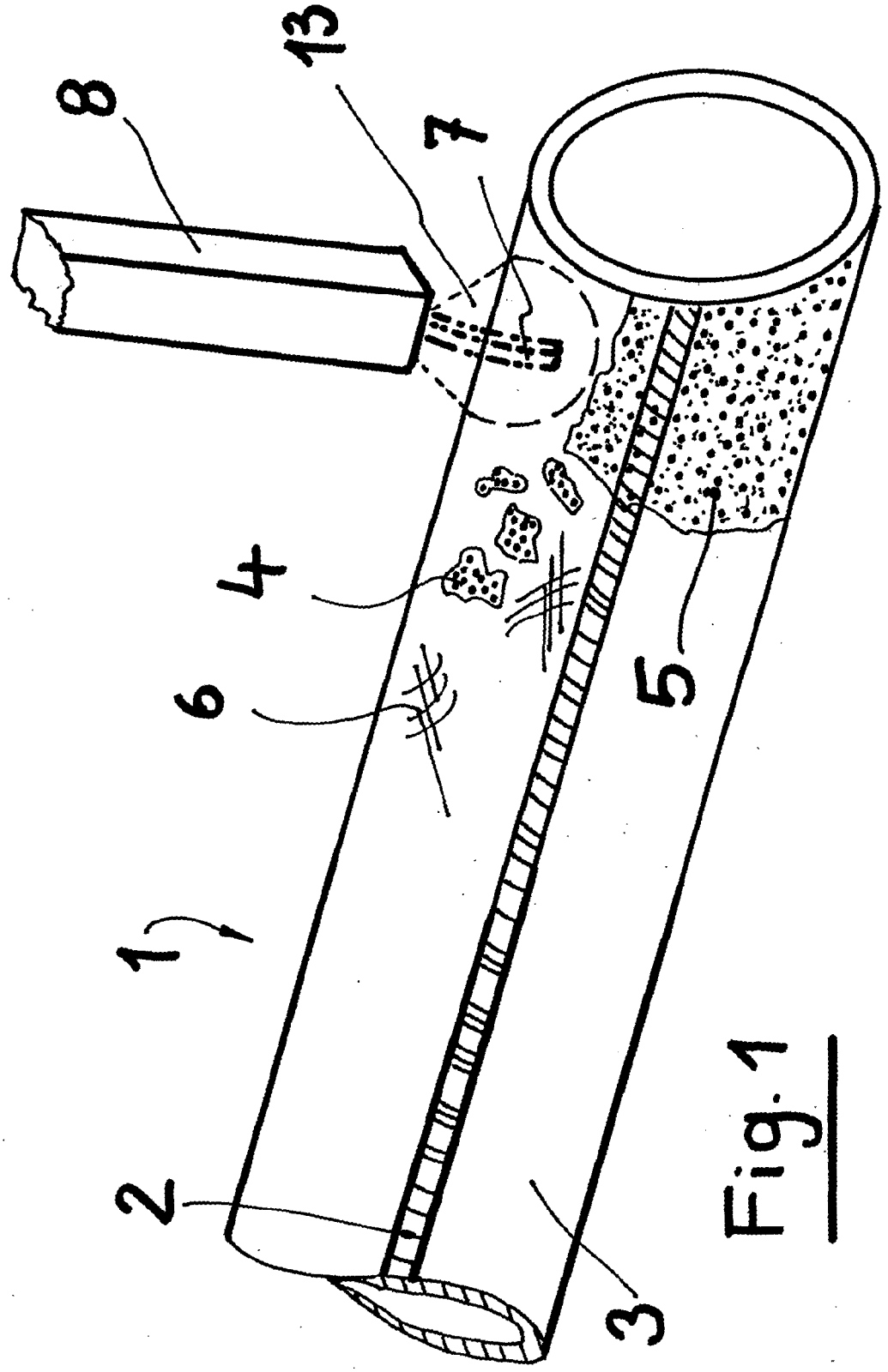


Fig. 1

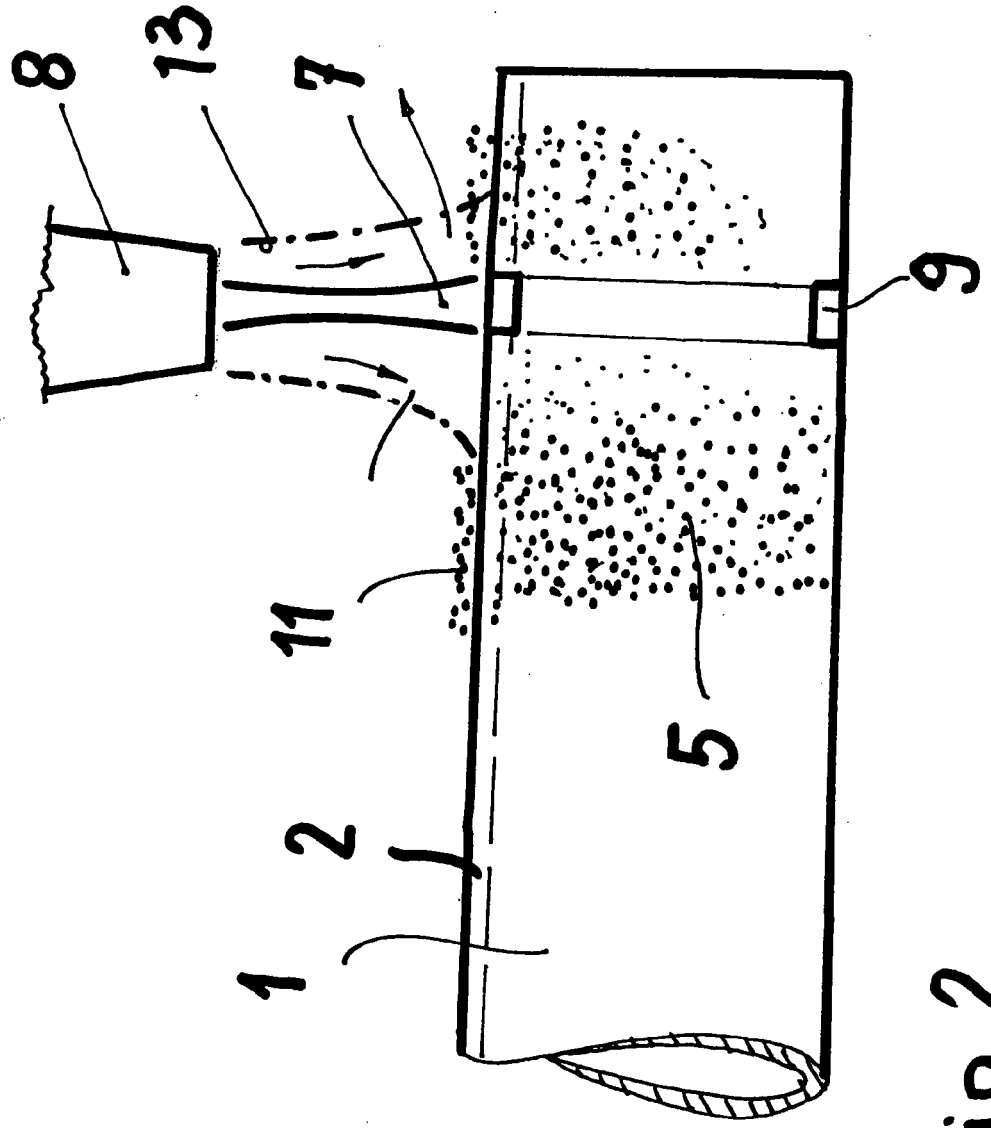


Fig. 2

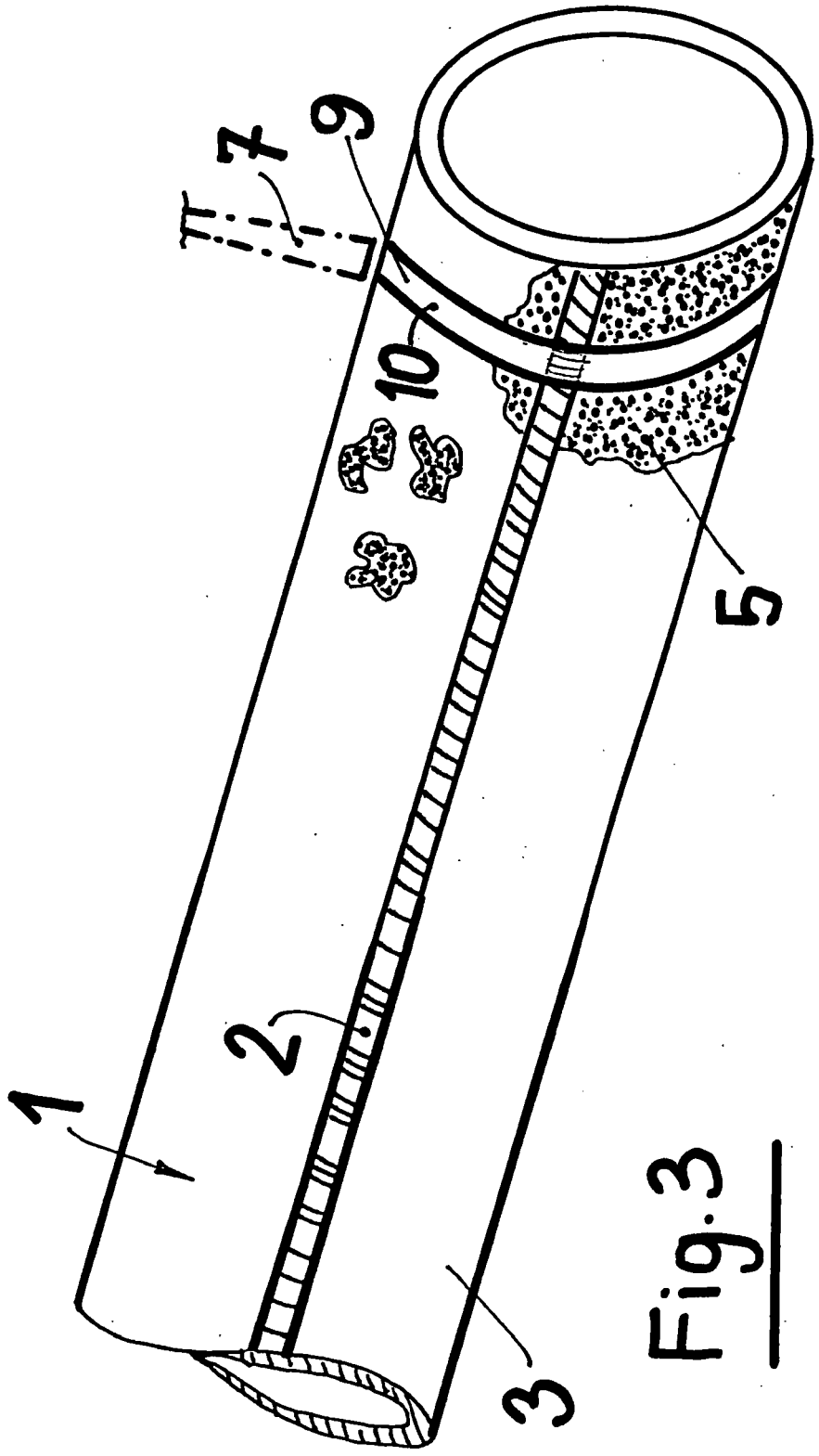


Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 8241

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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	10 September 2008	Muller, Gérard

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X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 00 8241

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