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54 Application of polyglycols soluble in water as lubricant in mechanical expanders effecting the cold straightening and gauging of lengthwise welded steel tubes.

57 A lubricant comprising water-soluble mixtures of polyglycols or glycolcopolymers obtained by the copolymerisation of propylene oxide and ethylene oxide, both etherised and having the following properties: a resistance to compression higher than 12kg/mm²; resistance to washing with water at low water pressure (lower than 3-4kg/cm²); no resistance at high water pressure (higher than 3-4kg/cm²). The lubricant can be discharged after each working cycle in the waste water.

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Application of polyglycols soluble in water as lubricant in mechanical expanders effecting the cold straightening and gauging of lengthwise welded steel tubes.

The invention refers to a new application of polyglycols soluble in water, with high EP -extreme pressure- properties, to lubricate heavy operating machines in which sliding frictions take place at a high pressure due to the reciprocal sliding of the surfaces of the working members: more in detail, it is concerned with a new application of polyglycols as lubricants to waste after each working cycle, in machines in which the operating conditions are identical to the ones that take place in a mechanical expander made by Mannesmann Meer AG Monchengladbach, better known as a cold doublehead mechanical expander with two expansion units, A.O. Smith system, to effect the straightening of tubes with a diameter from 30 to 56 inches, thick from 6,35 to 25,4 mm., length from 10 to 18 m. $\pm$ 200 mm., in order to correct the "banana" effect due to the welding and to carry out their gauging.

This machine (see figure) , that has been preferred to the expanders of hydraulic type because of its better functionality, is formed by a truncated pyramid or wedge 1 and by

wedge-shaped elements 2 placed side by side and joined together by means of a ring so to form with their outer surface a cylindrical surface.

The wedge-shaped elements 2 slide simultaneously on the surface 5 of the wedge 1, and move themselves radially in a centrifugal direction, conveying their pressure on the inner surface of the tube 4 if the tension-rod 3 moves itself in the direction of the arrow.

So each expander needs a lubricant qualified to absorb the 10 high pressures that can exceed 12 Kg./sq.mm., because of the friction that takes place between the surfaces in reciprocal contact of the wedge-shaped element 2 and of the wedge 1 that causes the expansion.

Moreover as the lubricant falls in the tube, it is almost 15 always necessary to clean the inner surface of the tube itself at the end of the straightening, if the conditions of the inner surface of the tube must be checked visually and if other treatments such as for instance, sandblasting and special varnishings must be carried out.

20 Unfortunately, at present, the builder of these expanders suggests to use, as lubricant EP -extreme pressure-, mineral oils that are emulsifiable in water; consequently in order to remove the lubricant that wets the inner surface of the tube, at the end of every working cycle, chemical solvents 25 must be used.

Therefore, as the solvents are polluting and not biodegradable products and the lubricant contains slags and ferrous scales due to the cold-working of the expander and, after all, the lubricant itself is, for its own qualities, a 30 polluting substance, it is preferable its wasting, rather than its recovering.

On the other hand the wasting of the lubricant, i.e. its discharge in water would give rise to further considerable expenses and to a considerable increase of the cost of the finished tubes, being necessary to carry out particular
5 treatments of great quantities of exhausted lubricant to avoid pollutions, before its discharging: the mechanical expander above mentioned, builded by Mannesmann, daily wastes various hundreds Kilos of lubricant.

The invention as claimed is intendend to remedy these draw-
10 backs due to the use of emulsifiable EP lubricating oil in this type of expander for welded tubes and in other operating machines in wich the same lubricating conditions take place i.e. dirtying of the worked surfaces by the lubricant and wasting of the exhausted lubricant itself.

15 Infact, the applications as lubricant of the polyglycols soluble in water, with high EP properties (resistance to specified pressures heavier than 12 Kg./sq.mm.) and high viscosity, in the case we have mentioned, solves the general problem connected with the reduction of the manufacturing
20 costs of the welded tubes, because of the lower cost of such lubricant compared with the cost of the mineral lubricating oils and because of the possibility to discharge directly the exhausted lubricant in water without submitting itself to particular treatments if its concentration is within the
25 allowed limits.

Furthermore, the use of such polyglycols allows to remove entirely, the lubricant that falls in the tube or to remove only the slags and the ferrous scales that have settled on the lubricant itself that wets the wedge of the expander,
30 by washing the tube and the wedges, without using chemical substance, but only by means of water at different pressures: higher ones to clean the tube and lower ones to remove only

the slags and ferrous scales from the wedges.

Infact, the polyglycols remain adherent to the lubricated surfaces of the machine if it undergoes a low pressure water washing (for instance 3-4 Kg./sq.cm.), whereas it is removed
5 if it undergoes high pressure water washing.

These properties can be reached by means of mixture of polyglycols obtained by copolymerization of propylene oxide (C_3H_6O) and of ethylene oxide (C_2H_4O) both etherised, to which are added as additives vegetable oils and derivatives
10 in percentages not higher than 10%.

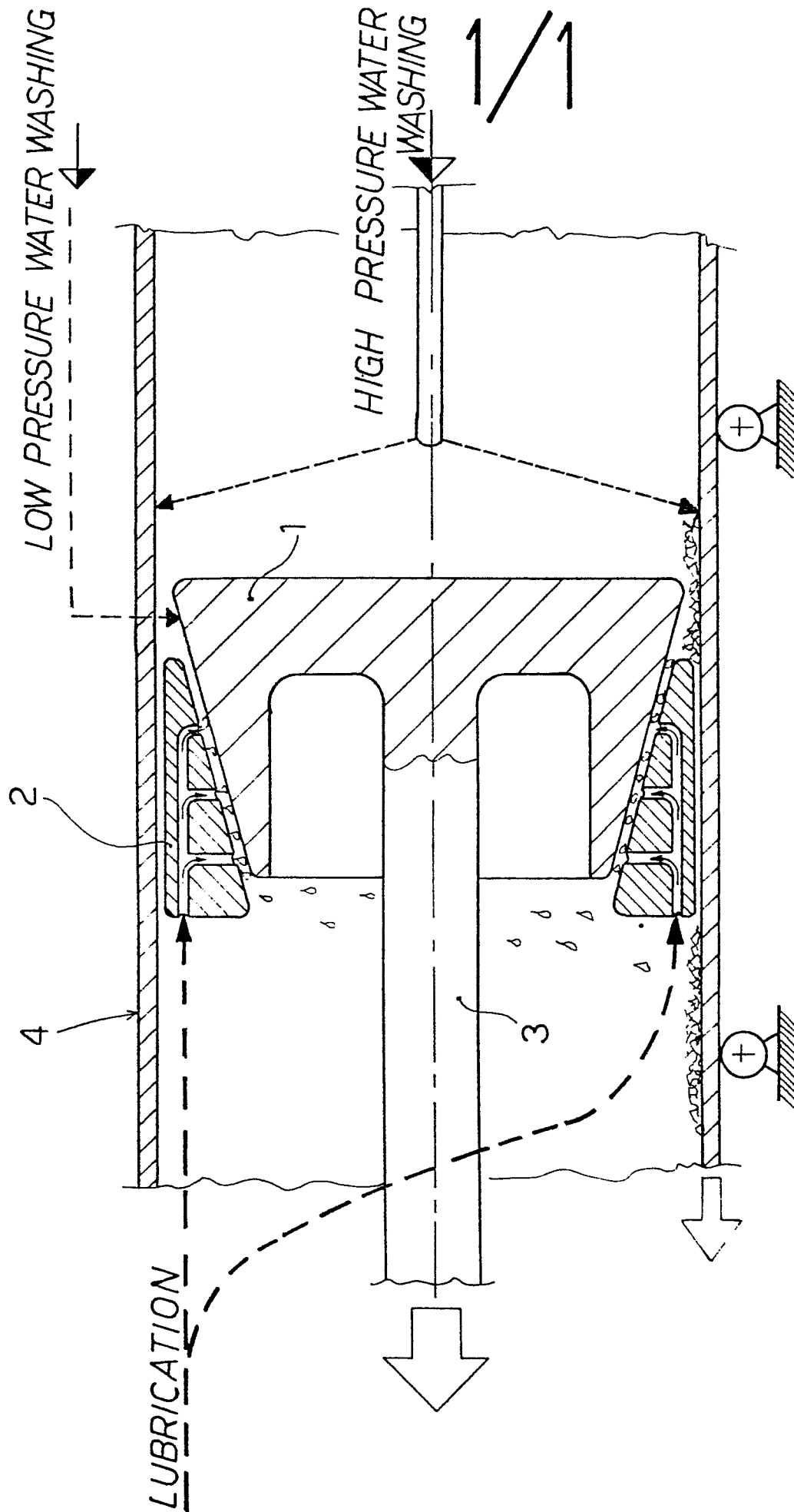
In the case of the above mentioned Mannesmann, cold mechanical double-head expander, if polyglycols as lubricant are used, the working process of the tubes, if sandblasting and varnishing are required, need the following final operation:
15 a) cleaning of the inner surfaces of the tubes, wetted by the lubricant and of the working member of the expander by washing themselves with water at different pressures;
b) visual quality testing;
c) sandblasting and varnishing;
20 d) direct discharge of the exhausted lubricant in the drain water tanks of the factory for its solubility and for its lower toxicity for what concerns pollution.

The application of the polyglycols in the cases taken into consideration owing to the fact that they can be discharged
25 in great quantities in water, determines also extra advantages for the industries concerned with this problem because it allows to simplify the equipment and the plants meant for the treatment of industrial exhausts.

That would not be possible when mineral lubricating oils
30 are used because of the extremely low concentration of said lubricating oil allowed in the drain water tanks of the factory (in Italy for instance the allowed concentration is 3 p.p.m. million).

Claims:

1. "Application of polyglycols soluble in water as lubricant in mechanical expanders effecting the cold straightening and gauging of lengthwise welded steel tubes", the application being extendible to the other operating machines
5 in wick the same lubricating conditions take place, the lubricant itself being to waste at the end of the working cycle of each tube, characterized in that the lubricant itself is produced by fixing suitably the proportions of the components of the mixture of polyglycols or of the
10 propylene and ethylene oxides both copolymerized and etherised, so to obtain the following properties:
 - a) resistance to the compression higher than 12 Kg./sq.mm.;
 - b) different resistance to the water washing pressure, i.e. possibility to avoid the removing of the lubricant
15 from the wetted surfaces if the water washing is carried out, for instance, at pressure lower than 3-4 Kg./sq.cm., or to remove the lubricant itself if the water washing pressure is higher than the above mentioned pressure of
20 3-4 Kg./sq.cm..
2. Application as mentioned in the previous claim, characterized in that the final working process of the welded tubes, if also sandblasting and varnishing are required, consist of the following operations:
 - 25 a) cleaning of the tubes by washing themselves with jets of water at high pressure;
 - b) visual quality testing;
 - c) sandblasting and varnishing;
 - d) direct discharging of the exhausted lubricant in the
30 drain water tanks of the factory, within the limits of the allowed concentrations.





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X,Y	<u>FR - A - 2 229 472 (U.O.P.)</u> * claims 1,6,7; page 1, lines 21 - 31; page 2, line 9 - page 3, line 17 * --- Y	1	C 10 M 3/22 1/28 B 21 D 39/20
Y	<u>FR - A - 2 243 035 (CHABAS & BÉSSON S.A.)</u> * claims 1,2 * ---	1	
A	<u>FR - A - 1 365 732 (SHELL)</u> * page 2, column 2, paragraph 2; page 1, column 1, alinéa 4 - page 1, column 2, paragraph 1 * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl. ³) C 10 M B 21 D B 21 C B 23 K
A	<u>FR - A - 1 337 606 (MONTECATINI)</u> * page 1, column 1, paragraph 1 - page 2, column 1, paragraph 4 * -----	1,2	
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons
☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 26-03-1982	Examiner RO TSAERT