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(54) **Equipment for pickling metallic wire coils**

(57) Equipment for pickling metallic wire coils (4) comprising a pickling tank (2) and a supporting device (3) for said coils (4) through at least one arm (11) ar-

ranged substantially horizontally for supporting a respective coil (4), which is distinguished in that such at least one arm (11) is rotatable, for supporting the coil (4) while rolling onto the arm (11).

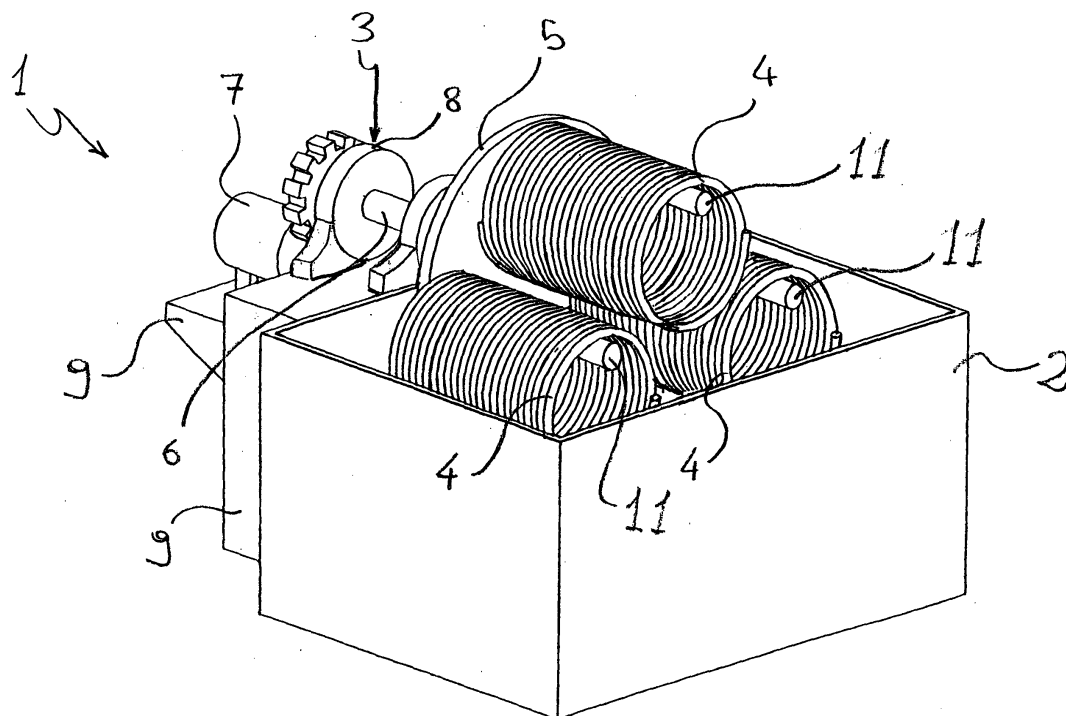


FIG. 1

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Description

Field of application

[0001] The present invention relates to equipment for pickling metallic wire coils, for example of steel or other metals or alloy.

[0002] More in particular, the invention relates to equipment for pickling metallic wire coils of the type comprising a pickling tank and a supporting device for the coils through at least one arm arranged substantially horizontally for supporting a respective coil.

[0003] The invention also relates to a method for the pickling treatment of a metallic wire coil through dipping in a pickling bath, and the following description is made with reference to this specific field of application only in order to simplify its exposure.

Prior art

[0004] It is known to submit a steel wire, before its drawing, to a pickling treatment, that is to say a surface cleaning generally obtained by dipping it in a solution of a strong acid, for example sulfuric acid.

[0005] In order to carry out such a treatment, pickling equipment are usually used, which comprise a pickling tank associated to a supporting device for the steel wire coils. The supporting device is equipped with arms arranged substantially horizontally and movable along the longitudinal axis of the tank, arms on which the steel wire coils are placed.

[0006] A drawback of such a supporting device consists in a non-effective pickling action in the area of mutual contact between the inner part of the coil and the supporting surface of the arm itself.

[0007] In order to overcome such a drawback, supporting devices have been proposed in the field, to which oscillating or vibrating apparatuses are applied, which enable to maintain the steel wire coils vibrating during the pickling treatment.

[0008] Although advantageous in some aspects, these last devices according to the prior art are not able to overcome the aforesaid drawback but only to smooth it, and are further complicated and expensive to be manufactured, noisy while in operation and require a frequent and expensive maintenance.

Summary of the present invention

[0009] The problem underlying the present invention is that of realizing an equipment for pickling metallic wire coils, which is able to overcome the drawbacks mentioned with reference to the prior art.

[0010] According to the invention, the aforesaid problem is solved by a pickling equipment of the above identified type, which is characterized in that said at least one arm of the supporting device is rotatable, for supporting the coil while rolling onto the arm.

[0011] In other words, thanks to the presence of the rotatable arm, the supporting device according to the invention advantageously allows a rotation, preferably continuous and regular, of the metallic wire coil with respect to the arm that supports it. Hence it allows a displacement of the supporting point between the inner part of the coil and the supporting surface of the rotatable arm during the pickling treatment.

[0012] In doing so, an effective pickling action is achieved in each point of the metallic wire coil.

[0013] The features and advantages of the invention will be better clear from the following indicative and non-limiting description of an embodiment thereof, made with reference to the attached drawings.

Brief description of the drawings.

[0014]

- figure 1 shows in perspective view the equipment for pickling according to the invention;
- figure 2 shows a schematic side view of the equipment of figure 1;
- figure 3 shows a schematic front view of the equipment of figure 1.

Detailed description of a preferred embodiment.

[0015] With reference to the figures 1-3, the equipment for pickling 1 according to the invention comprises a pickling tank 2 and a supporting device 3 for the coils 4 made of metallic wire, for example steel wire.

[0016] The supporting device 3 comprises in turn a discoidal body 5, fixedly connected to the end of a shaft 6, in turn fixedly connected to the shaft 6a of an electric motor 7, and born by a fixed bracket 8 foreseen at the edges of the pickling tank 2.

[0017] The body 5 is rotatably supported by the supporting device 3 around a predetermined axis A.

[0018] The supporting device 3 further comprises a supporting frame 9 for the various parts of such a device.

[0019] The discoidal body 5 is cantilevered above the tank 2 and is partially submerged in a pickling bath 10, for example a bath of acid such as sulfuric acid, contained inside the tank 2.

[0020] More in particular, the body 5 is located with respect to the pickling tank 2 in such a way as to be drawing into the tank 2 exclusively with a lower portion thereof.

[0021] Four arms 11 of a predetermined diameter d are fixedly connected to the discoidal body 5. Such arms substantially extend for almost the entire length of the tank 2 and have suitable dimensions for supporting a respective metallic wire coil 4 of predetermined diameter D , without the lower end of the coil being on the other hand in contact with the bottom of the tank itself. In the

figures only three arms 11 and respective coils 4 are represented, the fourth arm and the respective coil being totally inside the tank 2.

[0022] The arms 11 are fixedly connected to the body 5 in an eccentric position with respect to its rotational axis A and arranged equiangularly onto a single circumference of the body 5.

[0023] Finally with a , there is indicated the longitudinal axis of the metallic wire coil 4.

[0024] The operation of the equipment for pickling according to the invention is as follows.

[0025] The metallic wire coils 4 are loaded onto the corresponding arms 11 of the discoidal body 5, which is made rotate by the activation of the electric motor 7.

[0026] When the discoidal body 5 is rotating, the arms 11 fixedly connected thereto will also be rotating and, given the relevant friction existing in the arm-coil contact area, at each turn of the discoidal body 5 a rotation of the coils 4 will also occur equal to circumference of the arm 11 supporting them.

[0027] It is clear that this rotation of the metallic wire coil 4 has the effect of providing the continuous variation of its supporting area onto the arm 11. In other words, the coil will never be standing on the respective supporting arm at a same generatrix.

[0028] As a result, it is possible to carry out the pickling of the entire coil in that all parts thereof enter in contact with the pickling bath 10.

[0029] Furthermore, it has been advantageously found that the slight rolling movement of the metallic wire coil when it is submerged into the pickling bath improves the interaction between the pickling liquid (the acid) and the surface of the metallic wire, promoting the pickling treatment of the coil.

[0030] Advantageously, the equipment according to the invention allows - by suitably adjusting the number of turns of the supporting arms - obtaining a complete and homogeneous pickling of the metallic wire coils. Further on, such equipment has a greater productivity with respect to the equipment of the prior art, in that it allows carrying out the pickling treatment in a constant and controlled way.

[0031] To this respect, particularly advantageous results have been obtained with supporting arms 11 having a diameter d comprised between 0,2 and 0,5, preferably 1/3, the diameter D of the metallic wire coil 4, which is for example comprised between 200 and 500 mm.

[0032] In this way it is possible to optimize the pickling treatment of the metallic wire coils 4.

[0033] According to a particularly advantageous aspect of the present invention, the supporting arms 11 are detachable from the body 5 and may be replaced with arms having a different diameter. So doing, it is possible to adapt the diameter of the arms according to the diameter of the coils that they have to support.

[0034] It shall be noted that the equipment according to the present invention is extremely simple and eco-

nomie to be manufactured. It does not require the application of external apparatuses and is also noiseless during its operation since any device provided with alternate motion have been removed (oscillators, vibrators). The same is particularly reliable and resistant to wear, so that it can guarantee prolonged operative cycles without the need of interventions for maintenance or replacement of parts of the equipment.

[0035] A further advantage achieved by the present equipment consists in that the rotation of the discoidal body 5 and hence of the arms 11 fixedly connected thereto implies a cyclical dipping and extraction of the metallic wire coils 4 from the pickling bath 10.

[0036] To this respect, it is worth noting that the rotational motion of the arms 11 causes the dipping and extraction steps of the coils to follow each other in a continuous way and without collisions. Such steps also allow a replacement of the pickling liquid in contact with a same coil avoiding the formation of active hydrogen inside the pickling bath, to all advantage of the metallic wire structure, that is not weakened.

[0037] Further on, when the metallic wire coil stands between two consecutive dipping steps, it is essentially free from drippings of the pickling liquid located onto the lower generatrix. In fact, the rotation of the coil causes such liquid to be maintained in motion and at the same time homogeneously distributed onto the surface of the coil, thus homogeneously pursuing its pickling action.

[0038] According to a further aspect of the present invention, there is also provided a method for the pickling treatment of a metallic wire coil through dipping in a pickling bath, which is characterized in that it comprises the step of:

- making the metallic wire coil rotate around its longitudinal axis a during such treatment.

[0039] The practical implementation of this method allows achieving the above-identified advantages with reference to the pickling equipment.

Claims

1. Equipment for pickling metallic wire coils (4) comprising a pickling tank (2) and a supporting device (3) for said coils (4) through at least one arm (11) arranged substantially horizontally for supporting a respective coil (4), **characterized in that** said at least one arm (11) is rotatable, for supporting the coil (4) while rolling onto the arm (11).
2. Equipment according to claim 1, **characterized in that** said supporting device (3) comprises a body (5) rotatably supported by the supporting device (3) around a predetermined axis (A) and **in that** said at least one arm (11) is fixedly connected to the body (5) in an eccentric position with respect to said ro-

tational axis (A).

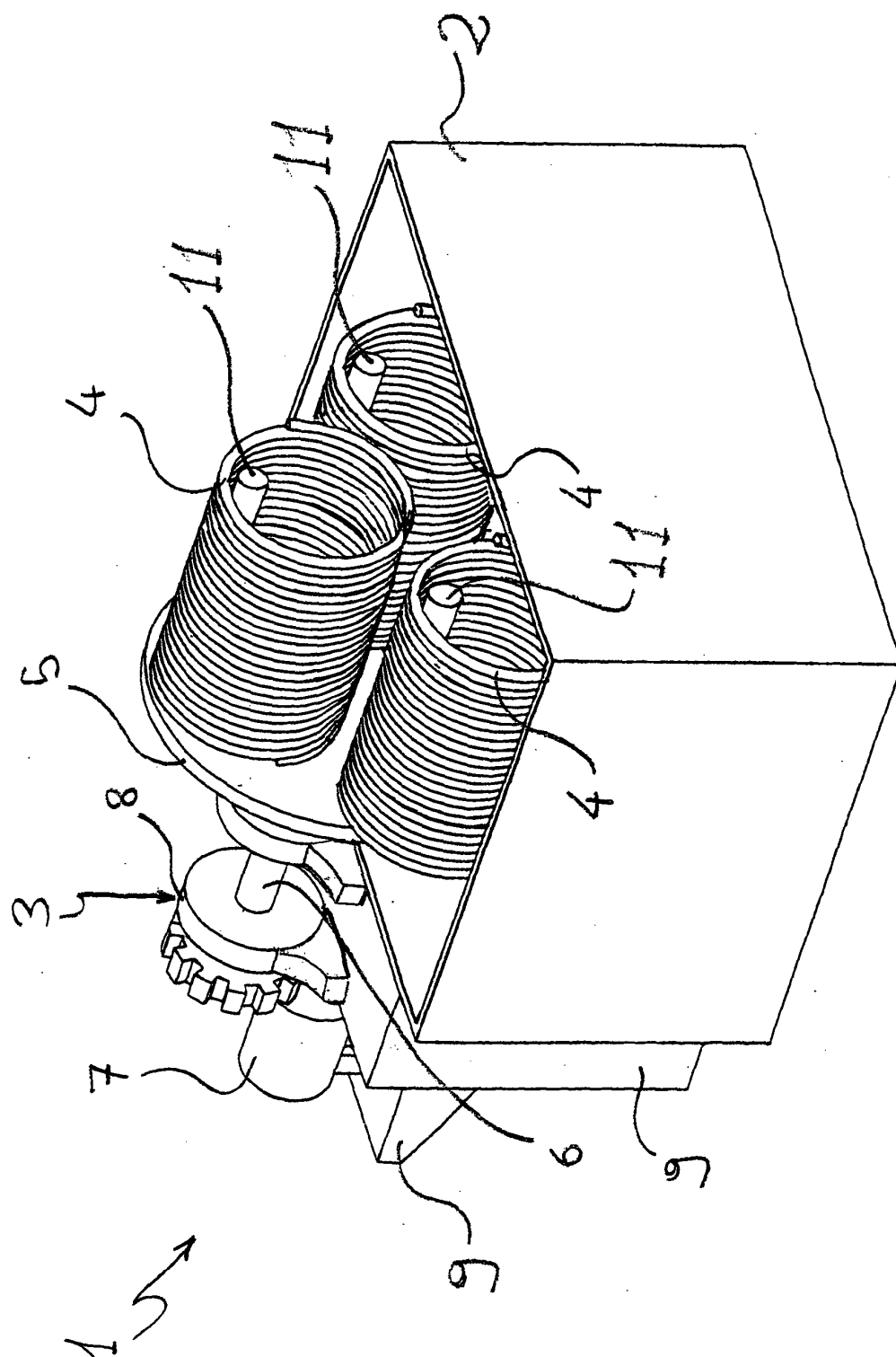
3. Equipment according to claim 2, **characterized in that** said rotatable body (5) is a disc. 5
4. Equipment according to claim 2, **characterized in that** the supporting arms (11) are in the number of four and are arranged equiangularly onto a single circumference of said body (5). 10
5. Equipment according to claim 2, **characterized in that** said body (5) is positioned with respect to said pickling tank (2) in such a way as to be drawing into said tank (2) exclusively with a lower portion thereof. 15
6. Equipment according to claim 1, **characterized in that** said at least one supporting arm (11) has a diameter d comprised between 0,2 and 0,5, preferably $1/3$, the diameter D of the respective metallic wire coil (4). 20
7. Equipment according to claim 1, **characterized in that** said at least one arm (11) is detachable from said supporting device (3). 25
8. Method for the pickling treatment of a metallic wire coil through dipping in a pickling bath, **characterized in that** it comprises the step of: 30
 - making the metallic wire coil rotate around a longitudinal axis (a) thereof during such treatment. 35

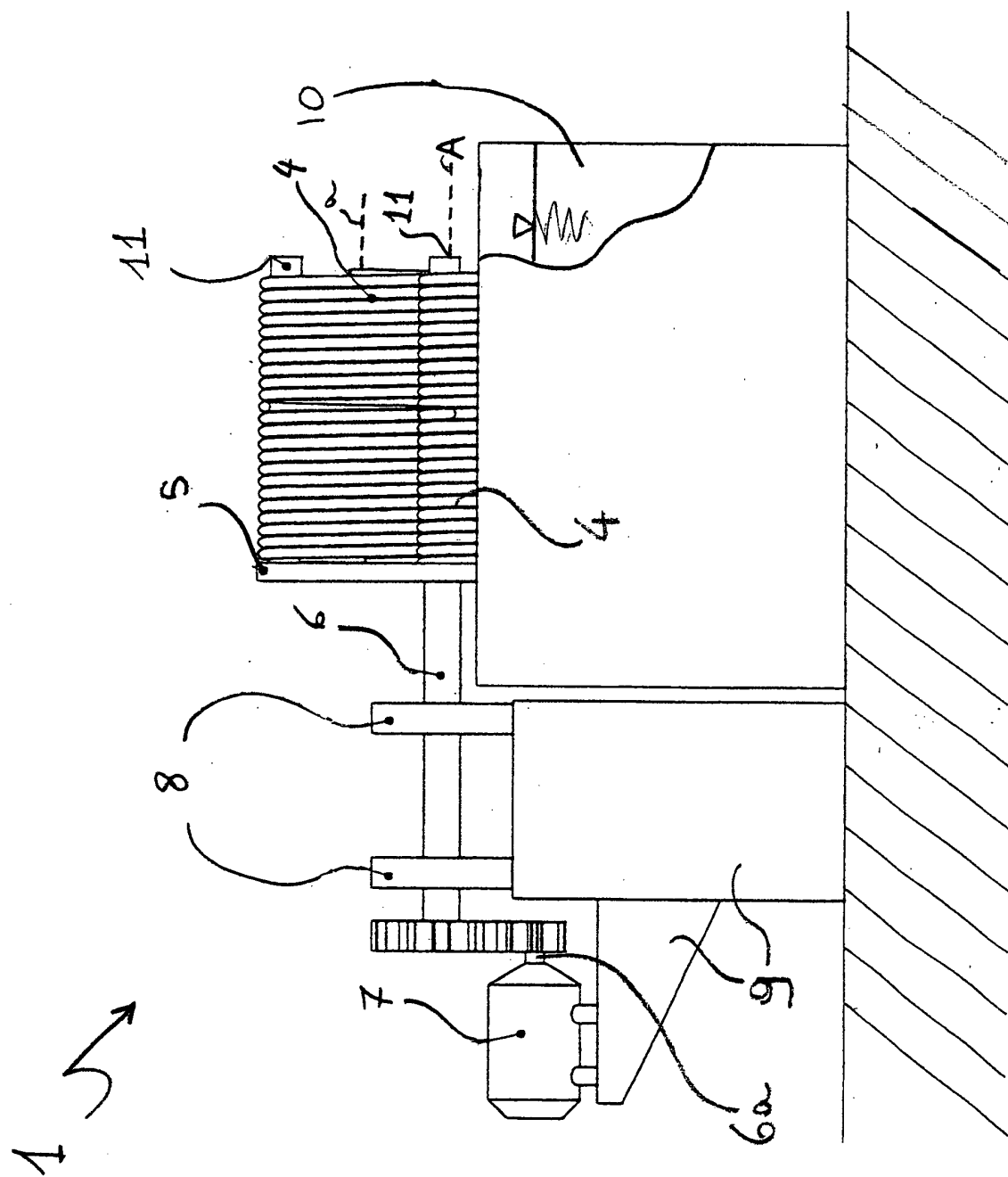
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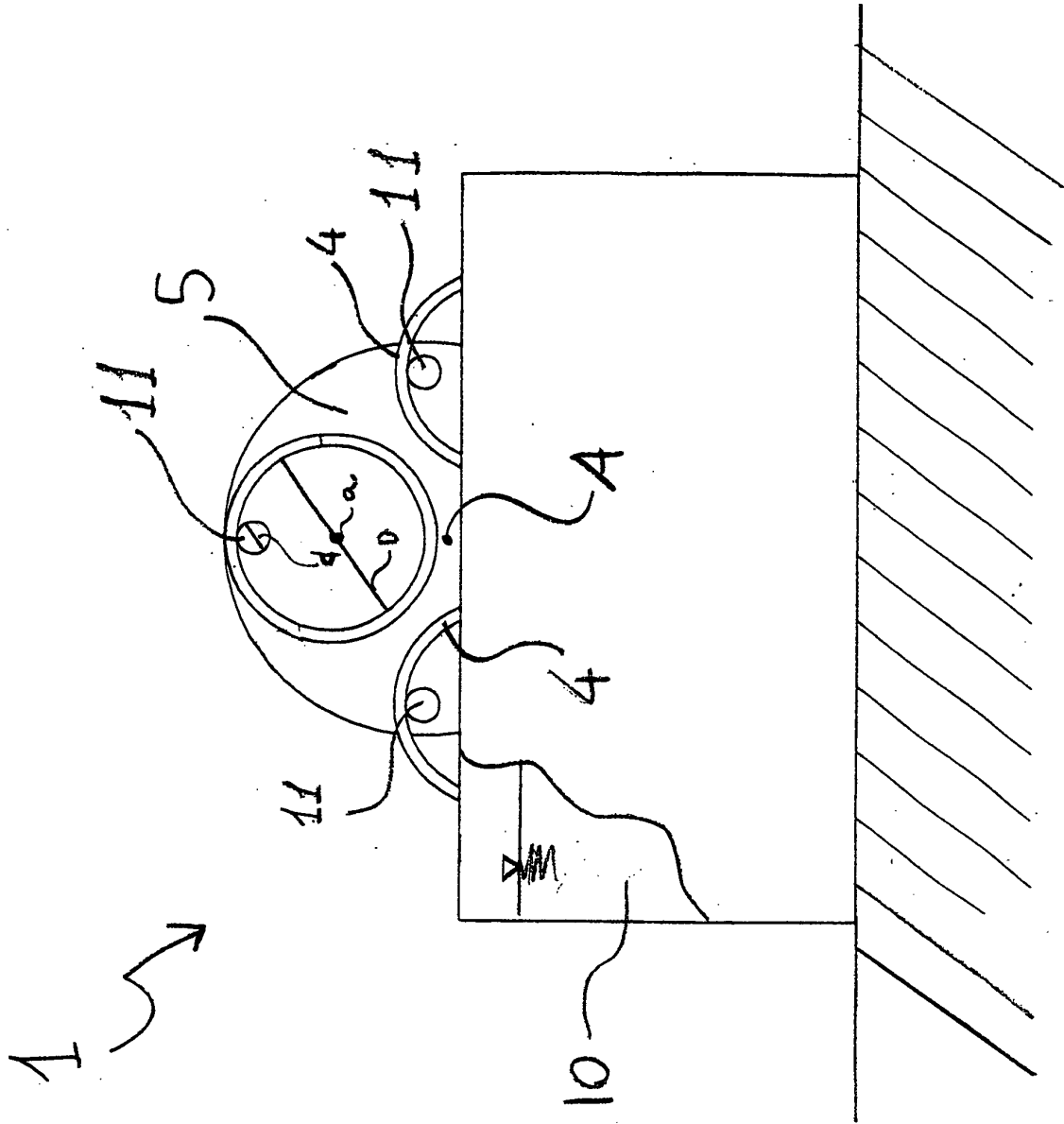


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 01 10 6909

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	FR 2 221 196 A (ETIRAGE PROFILAGE METAUX DAUPH) 11 October 1974 (1974-10-11) * page 1, line 7-38; claims 1-5 *	1	C23G3/00
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 16, 8 May 2001 (2001-05-08) & JP 2001 009519 A (KOBEL STEEL LTD), 16 January 2001 (2001-01-16) * abstract *		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			C23G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 4 September 2001	Examiner Van Leeuwen, R
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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04-09-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2221196 A	11-10-1974	NONE	
JP 2001009519 A	16-01-2001	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82