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

Anlage zum Beizen von Metalldrahtbunden

Equipement pour le décapage de bobines de fil métallique

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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 prior-art equipment is disclosed in FR-A-2 221 196.

**[0007]** 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.

**[0008]** 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.

**[0009]** 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

**[0010]** 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.

**[0011]** According to the invention, the aforesaid problem is solved by a pickling equipment according to claim 1.

**[0012]** 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.

**[0013]** In doing so, an effective pickling action is achieved in each point of the metallic wire coil.

**[0014]** 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.

#### [0015]

- 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.

**[0016]** 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.

**[0017]** 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.

**[0018]** The body 5 is rotatably supported by the supporting device 3 around a predetermined axis A.

**[0019]** The supporting device 3 further comprises a supporting frame 9 for the various parts of such a device.

**[0020]** 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.

**[0021]** 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.

**[0022]** 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 rep-

resented, the fourth arm and the respective coil being totally inside the tank 2.

**[0023]** 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.

**[0024]** Finally with  $a$ , there is indicated the longitudinal axis of the metallic wire coil 4.

**[0025]** The operation of the equipment for pickling according to the invention is as follows.

**[0026]** 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.

**[0027]** 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.

**[0028]** 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.

**[0029]** 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.

**[0030]** 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.

**[0031]** 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.

**[0032]** 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.

**[0033]** In this way it is possible to optimize the pickling treatment of the metallic wire coils 4.

**[0034]** 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.

**[0035]** It shall be noted that the equipment according to the present invention is extremely simple and economic 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.

**[0036]** 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.

**[0037]** 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.

**[0038]** 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.

**[0039]** 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, the coil being supported in an eccentric position.

**[0040]** 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), wherein said at least one arm (11) is rotatable, for supporting the coil (4) while rolling onto the arm (11),  
**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 rotational axis (A).
2. Equipement according to claim 1, **characterized in**

that said rotatable body (5) is a disc.

3. Equipment according to claim 1, **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). 5
4. Equipment according to claim 1, **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 10
5. 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). 15
6. Equipment according to claim 1, **characterized in that** said at least one arm (11) is detachable from said supporting device (3). 20
7. Method for the pickling treatment of a metallic wire coil through dipping in a pickling bath, **characterized in that** it comprises the step of: 25
  - making the metallic wire coil rotate around a longitudinal axis (a) thereof during such treatment, the coil being supported in an eccentric position with respect to the rotational axis (A). 30

#### Patentansprüche

1. Einrichtung zum Beizen von Metalldrahtrollen (4), mit einem Beizebehälter (2) und einer Halterungsvorrichtung (3) für die Rollen (4) über zumindest einen Arm (11), der zur Halterung einer jeweiligen Rolle (4) im Wesentlichen horizontal angeordnet ist, wobei der mindestens eine Arm (11) drehbar ist, um die Rolle (4) zu halten, während sie am Arm (11) abwälzt, **dadurch gekennzeichnet, dass** die Halterungsvorrichtung (3) einen Körper (5) aufweist, der durch die Halterungsvorrichtung (3) um eine vorbestimmte Achse (A) drehbar gelagert ist, und der mindestens eine Arm (11) am Körper (5) in Bezug auf die Drehachse (A) in einer außermittigen Position fest angebracht ist. 35 40 45
2. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** es sich bei dem drehbaren Körper (5) um eine Scheibe handelt. 50
3. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** es vier Tragarme (11) gibt und sie auf einer einzelnen Kreislinie des Körpers (5) unter gleichen Winkelabständen angeordnet sind. 55

4. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Körper (5) in Bezug auf den Beizebehälter (2) so positioniert ist, dass er in den Behälter (2) nur mit dessen unteren Teilbereich eintaucht.
5. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der mindestens eine Tragarm (11) einen Durchmesser  $d$  zwischen 0,2 und 0,5, vorzugsweise 1/3 des Durchmessers  $D$  der jeweiligen Metalldrahtrolle (4) hat.
6. Einrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der mindestens eine Arm (11) von der Halterungsvorrichtung (3) abgenommen werden kann.
7. Verfahren zur Beizbehandlung einer Metalldrahtrolle durch Eintauchen in ein Beizebad, **dadurch gekennzeichnet, dass** es folgenden Schritt umfasst:
  - die Metalldrahtrolle sich während dieser Behandlung um eine Längsachse (a) von ihr drehen zu lassen, wobei die Rolle in Bezug auf die Drehachse (A) an einer außermittigen Position gehalten ist.

#### Revendications

1. Equipement destiné à décaper des bobines de fil métallique (4), comportant une cuve de décapage (2) et un dispositif de support (3) desdites bobines (4) par l'intermédiaire d'au moins un bras (11) agencé sensiblement horizontalement pour supporter une bobine respective (4), ledit au moins un bras (11) pouvant être mis en rotation pour supporter la bobine (4) en roulement sur le bras (11), **caractérisé en ce que** ledit dispositif de support (3) comporte un corps (5) supporté de manière rotative par le dispositif de support (3) autour d'un axe prédéterminé (A) et **en ce que** ledit au moins un bras (11) est relié de manière fixe au corps (5) dans une position excentrée par rapport audit axe de rotation (A).
2. Equipement selon la revendication 1, **caractérisé en ce que** ledit corps rotatif (5) est un disque.
3. Equipement selon la revendication 1, **caractérisé en ce que** les bras de support (11) sont au nombre de quatre et sont agencés de manière angulairement équidistante sur une seule circonférence dudit corps (5).
4. Equipement selon la revendication 1, **caractérisé en ce que** ledit corps (5) est positionné par rapport à ladite cuve de décapage (2) de manière à être entraîné dans ladite cuve (2) exclusivement avec une

partie inférieure de celui-ci.

5. Equipement selon la revendication 1, **caractérisé en ce que** ledit au moins un bras de support (11) a un diamètre  $d$  compris entre 0,2 et 0,5, de préférence de  $1/3$ , fois le diamètre  $D$  de la bobine de fil métallique (4) respective. 5
6. Equipement selon la revendication 1, **caractérisé en ce que** ledit au moins un bras (11) peut être séparé dudit dispositif de support (3). 10
7. Procédé pour le traitement de décapage d'une bobine de fil métallique par immersion dans un bain de décapage, **caractérisé en ce qu'il** comporte l'étape consistant à : 15
- faire tourner la bobine de fil métallique autour d'un axe longitudinal (a) de celle-ci au cours de ce traitement, la bobine étant supportée dans une position excentrée par rapport à l'axe de rotation (A). 20

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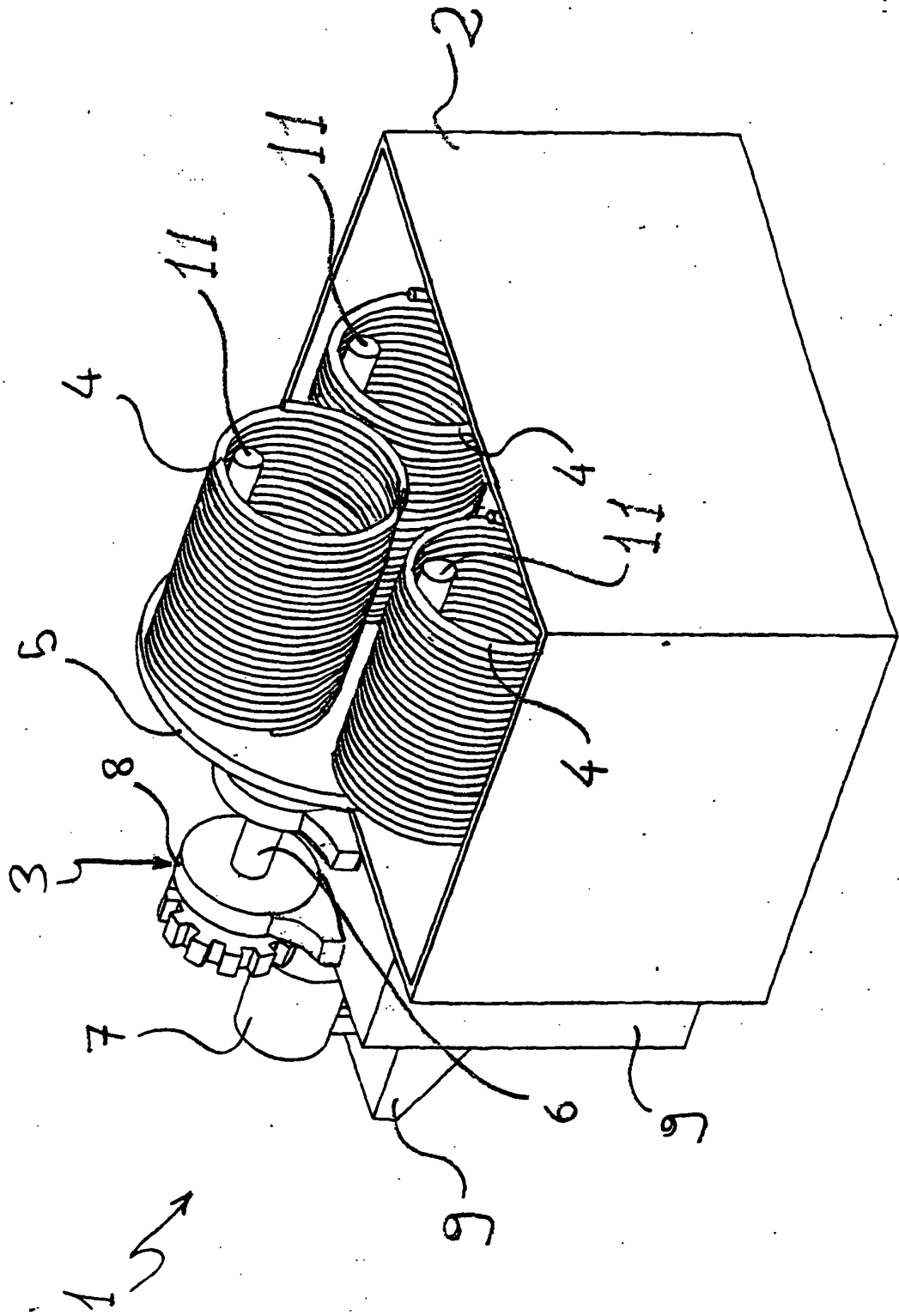


FIG. 1

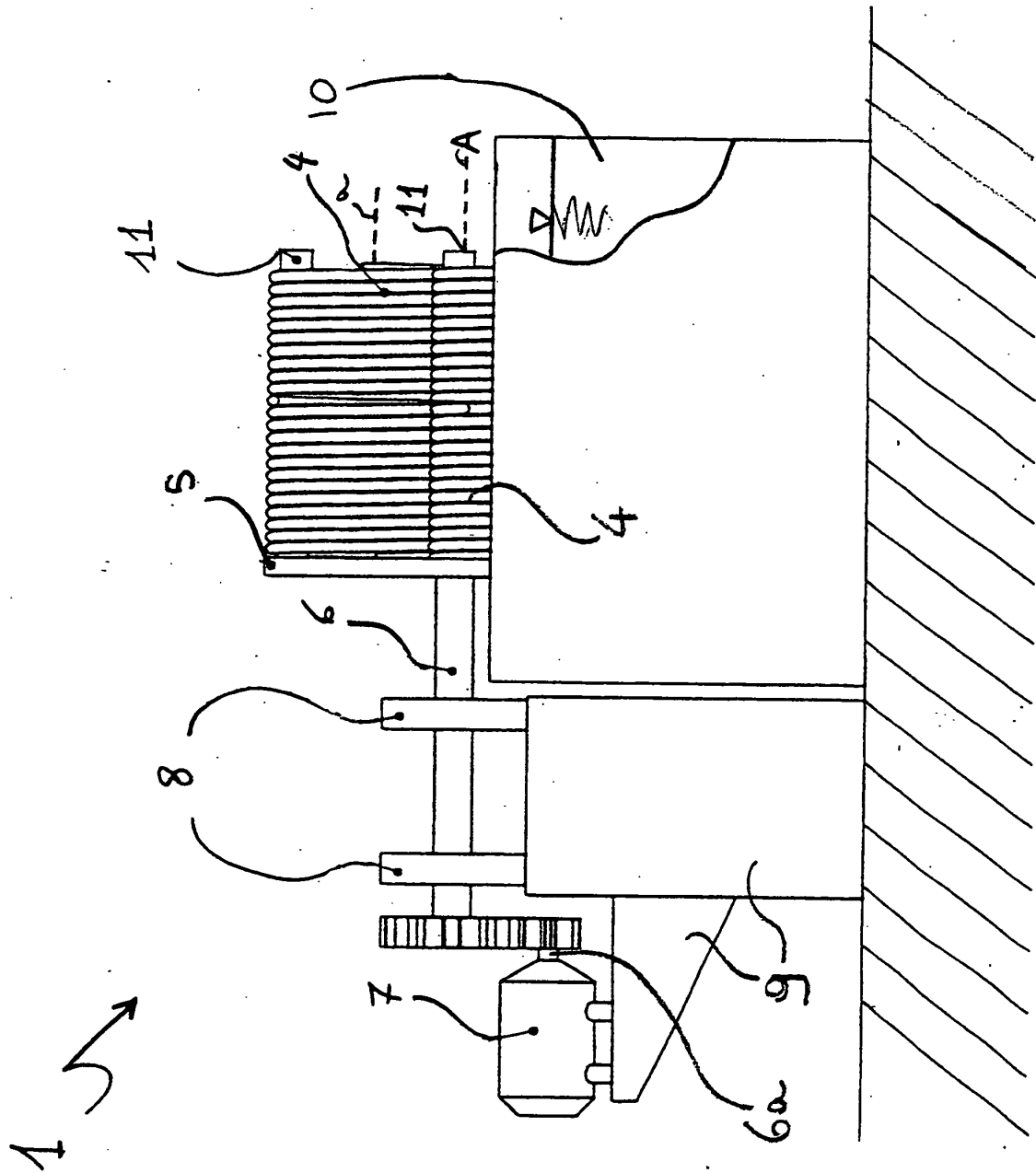


FIG. 2

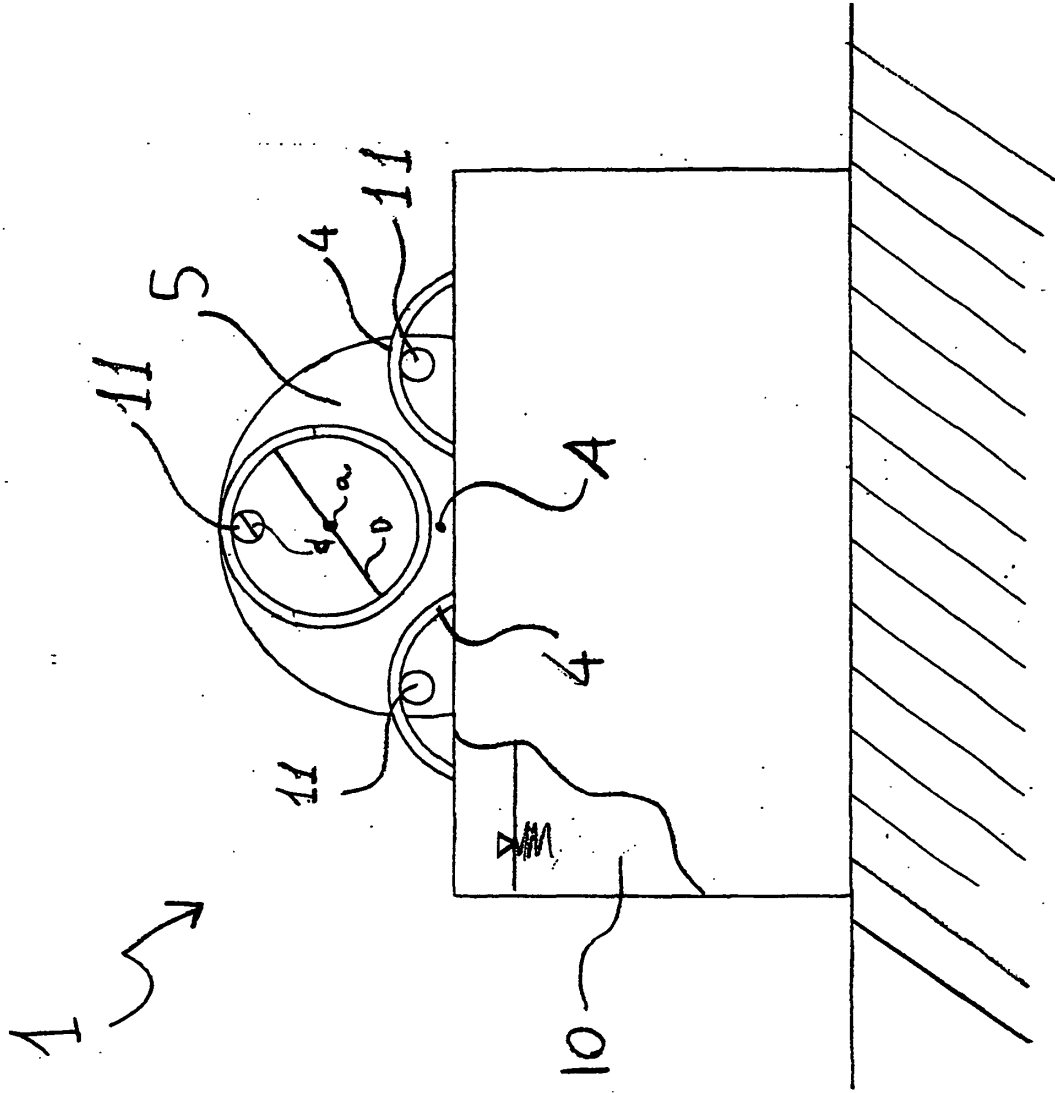


FIG. 3



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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