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(54) Title: A HYDRAULIC DUCT WITH A DEVICE FOR PRODUCING HYDROELECTRIC ENERGY

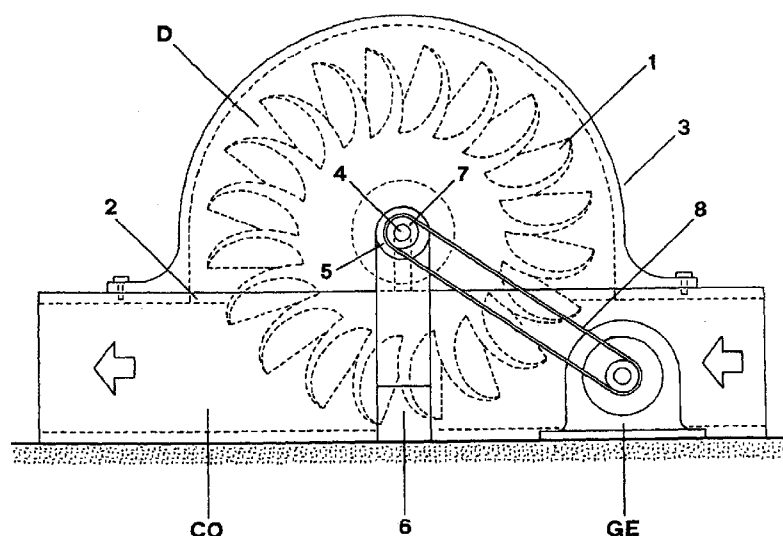


FIG.1

(57) Abstract: The present invention concerns a hydraulic duct (CO) with a device for the production of hydroelectric energy (D), comprising a hydraulic wheel (1) put into rotation by the water flow passing through said duct. Said hydraulic wheel (1) has a driving shaft (4) carrying a pair of pulleys (7) for shifting the rotating movement thereof towards an equivalent number of electric generators (GE) connected to the same by means of transmission belts (8), so as to determine the working thereof and, consequently, the production of low-cost energy using the water coming from drainpipes of an already existing hydroelectric power plant.

A HYDRAULIC DUCT WITH A DEVICE FOR PRODUCING HYDROELECTRIC ENERGY

The present invention concerns the field of facilities for producing hydroelectric energy.

More in detail, it concerns a hydraulic duct provided with a hydroelectric device operated by the water flow passing through the same.

As known, the working principle of the existing hydroelectric power plants implies the use of groups of turbines operated by masses of moving water, connected to the same number of groups of alternators, for transforming the rotating movement into electric energy.

It is also known that, at the end of a normal productive cycle, said water masses are led downstream of the facilities through drainpipes without any kind of device for exploiting the kinetic energy of a fluid in motion.

Aim of the present invention is to obtain low-cost electric energy by exploiting the kinetic energy still present in the waters drained, at the end of a normal productive cycle, through the drainpipes of a hydroelectric power plant of known type.

The aim is reached by means of a hydraulic duct with a device for producing hydroelectric energy comprising:

- a hydraulic wheel put into rotation by a water flow passing through said duct;
- a driving shaft integral with said hydraulic wheel;

- a mechanical system arranged for transferring the rotation movement of said driving shaft towards a pair of electric generators.

The present invention shows the following advantages:

- it allows to produce low-cost electric energy;
- it allows to optimize the exploitation of the water resources of the territory;
- it may be used for increasing the energetic output of already existing hydroelectric power plants, without any direct intervention on the equipments of the same;
- it has low installation and maintenance costs.

Further aspects of the present invention will be described more in detail hereinbelow, with the help of the drawings in which a preferred embodiment is shown, illustrated by way of non-limiting example.

Enclosed figures 1 and 2 show the structure of a hydraulic duct according to the present invention from a lateral view in transparency and in cross section.

Relating to the figures, the present invention comprises a hydraulic duct CO with a preferably quadrangular section, communicating with the drainpipes of an existing hydroelectric power plant, and comprising a hydroelectric device D mainly consisting of:

- a hydraulic wheel 1, out of carbon fibre or material with similar mechanical features, passing through an opening 2 on the upper wall of said duct CO so as to result partially immersed in the water flow transported by the same, and embedded in a

special containing structure 3 applied to said duct CO in correspondence with said opening 2, so as to restore the perfect hydraulic sealing of the same;

- a driving shaft 4, integral with said hydraulic wheel 1, rotating on lubricated bearings 5 placed on top of a pair of vertical supports 6 for holding said driving shaft 4 and the hydraulic wheel 1 related thereto;
- a pair of pulleys 7 placed at the ends of said driving shaft 4, arranged for transferring the rotating movement of said hydraulic wheel 1 towards an equivalent number of electric generators GE connected to said pulleys by means of suitable transmission belts 8, so as to determine the working thereof.

According to the present invention, the hydraulic duct CO has an upper opening 2 arranged for allowing the immersion of the lower paddles of said hydraulic wheel 1 of said device D into the water flow passing through the same, whereby said hydraulic wheel 1 is embedded in a special containing structure 3 applied to said duct CO, in correspondence with said upper opening 2, so as to restore the perfect hydraulic sealing thereof.

Said structure 3 consists of a pair of independent hulls 9-10 that can be easily removed for repair or maintenance of the inner elements of said device D, provided with lateral openings 11 arranged for allowing the installation onto said duct CO without interfering with the normal working of said driving shaft 4 connected to the hydraulic wheel 1 of said device.

The impact of the water on the lower paddles of said hydraulic wheel 1 determines the rotation of the same and of the driving shaft 4 integral thereto, onto said lubricated bearings 5 placed on the top of said vertical supports 6 arranged for holding said driving shaft 4 and consequently said hydraulic wheel 1 connected thereto.

A pair of pulleys 7, placed at the ends of said driving shaft 4, shift the rotating movement of the hydraulic wheel 1 towards an equivalent number of electric generators GE, connected to said pulleys by means of suitable transmission belts 8, in order to activate the same and, consequently, to obtain the production of low-cost energy by reuse of the water masses drained, at the end of the production cycle, from the drainpipes of pre-existing hydroelectric power plant, and appropriately led into said duct CO so as to be transferred, as usual, downstream of said facilities.

Should one of the electric generators GE break down, it is possible to insulate such element detaching the relative transmission belt 8 from the driving shaft 4 of the hydraulic wheel 1 of the hydroelectric device D, repair or replace the same without incurring in the stop of the whole plant.

Furthermore, above mentioned ducts CO have the following features:

- they may be provided with a number of devices D variable according to the capacity of the transported water flow and consequently of the electric energy that may be obtained from the same;

- they may be fed without distinction with water coming from the drainpipes of pre-existing hydroelectric power plants, or with water provided by rivers of medium and great dimensions;
- said ducts may be installed on the surface or even in special underground tunnels so as to reduce their environmental impact.

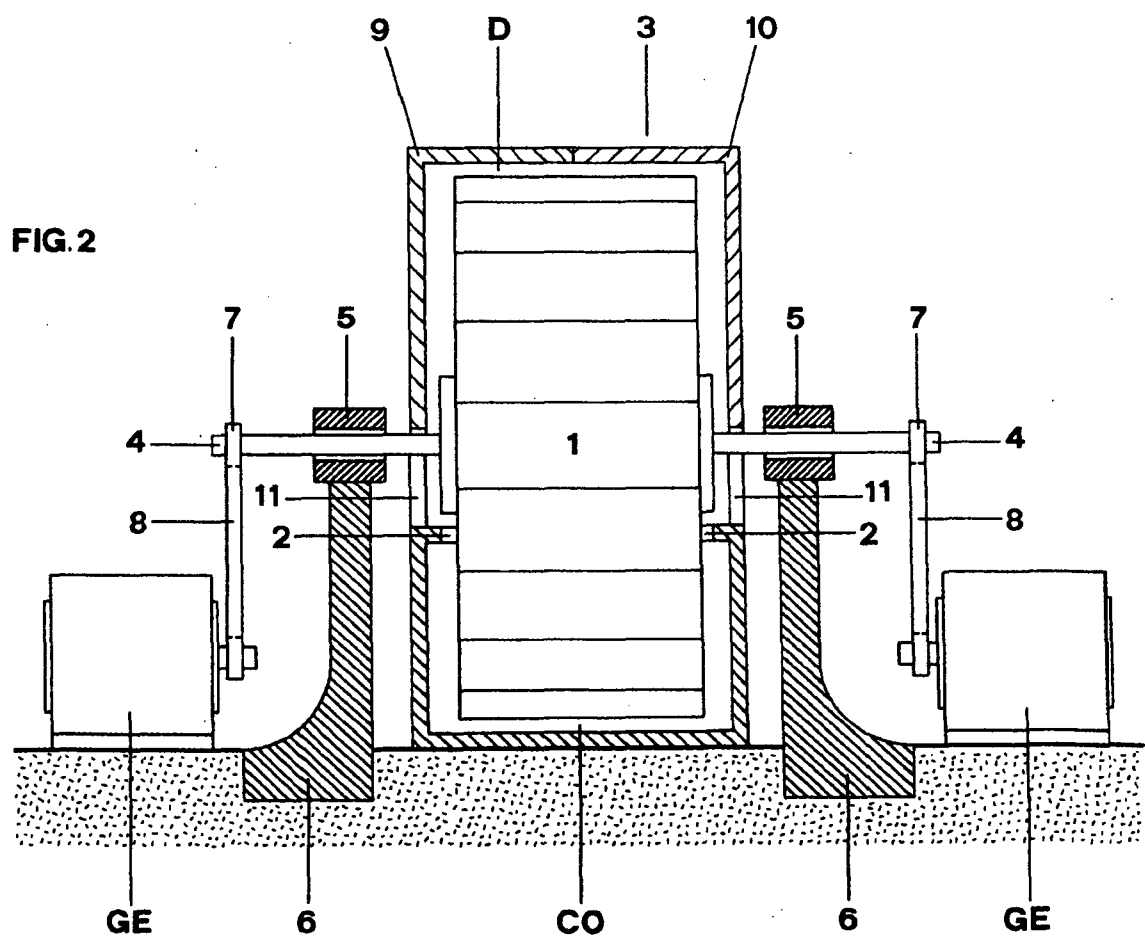
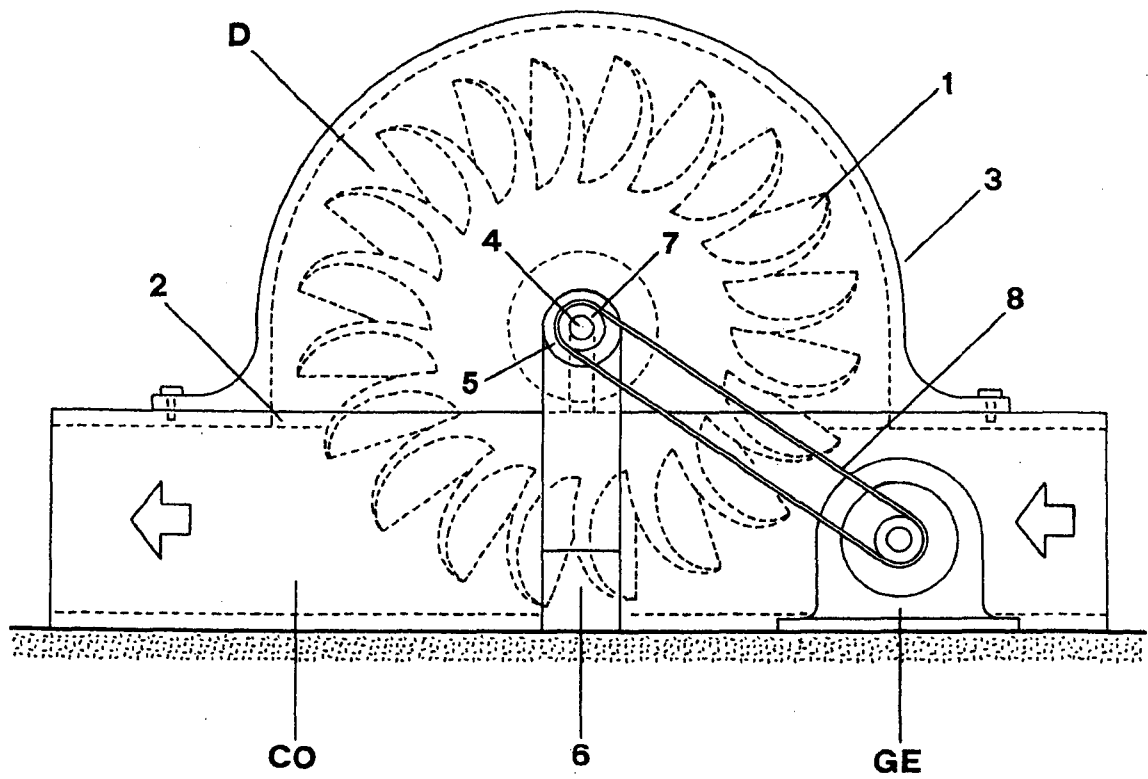
Withstanding the principle of the invention, the embodiment and the details of construction of the same could be amply varied, compared to what has been described and illustrated, without lying outside the scope of the present invention.

CLAIMS

1. A hydraulic duct (CO-2) provided with a device (D) for the production of hydroelectric energy, characterized in that it comprises:
 - a hydraulic wheel (1, 3, 9, 10, 11) put into rotation by a water flow passing through said duct (CO);
 - a driving shaft (4, 5, 6) integral with said hydraulic wheel (1);
 - a mechanical system (7, 8) arranged for transferring the rotating movement of the driving shaft (4) towards a pair of electric generators (GE).
2. A hydraulic duct (CO) according to claim 1, characterized in that the device (D) for the production of electric energy has a hydraulic wheel (1) passing through an opening (2) realized in the upper wall of the same.
3. A hydraulic duct (CO) according to claim 1, characterized in that the device (D) for the production of electric energy has a structure (3) for containing said hydraulic wheel (1), and in that said containing structure (3) is placed in correspondence with the upper opening (2) of said duct (CO) so as to restore the perfect hydraulic sealing of the same.
4. A hydraulic duct (CO) according to claim 3, characterized in that said containing structure (3) consists of a pair of independent hulls (9, 10) provided with lateral openings (11).
5. A hydraulic duct (CO) according to claim 1, characterized in that the device (D) for the production of hydroelectric energy has a driving

shaft (4) integral with said hydraulic wheel (1) rotating onto lubricated bearings (5).

6. A hydraulic duct (CO) according to claim 1, characterized in that the device for the production of hydroelectric energy (D) has a pair of vertical supports (6) for holding the driving shaft (4) and the hydraulic wheel (1) related thereto.
7. A hydraulic duct (CO) according to claim 1, characterized in that the device (D) for the production of hydroelectric energy has a couple of pulleys (7) placed at the ends of said driving shaft (4) connected to a corresponding number of electric generators (GE) by means of transmission belts (8).



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 196 48 933 A1 (HILL STEFAN [DE]) 5 March 1998 (1998-03-05) abstract figures 1-3 column 4, lines 35-60 -----	1-7
X	US 2008/203729 A1 (ZAJCHOWSKI THOMAS T [US] ET AL) 28 August 2008 (2008-08-28) abstract paragraphs [0033] - [0035] figures 1,2 -----	1-3
X	FR 2 901 850 A (PORTIER RONALD PIERRE PATRICK [FR]) 7 December 2007 (2007-12-07) abstract figures 1-4 ----- -/--	1-3

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

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14/04/2010

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2005 033383 A1 (GONDOLF FRIEDRICH WILHELM [DE]) 18 January 2007 (2007-01-18) the whole document -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 19648933	A1	05-03-1998	NONE	
US 2008203729	A1	28-08-2008	NONE	
FR 2901850	A	07-12-2007	NONE	
DE 102005033383	A1	18-01-2007	NONE	