

# Granted Patents



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**PATENT NO. 130075 / 2017**

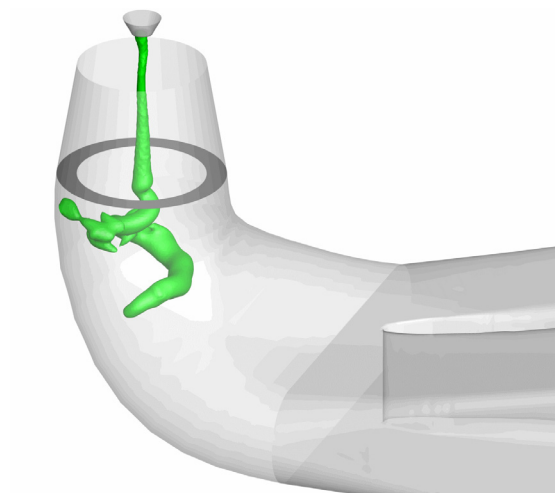
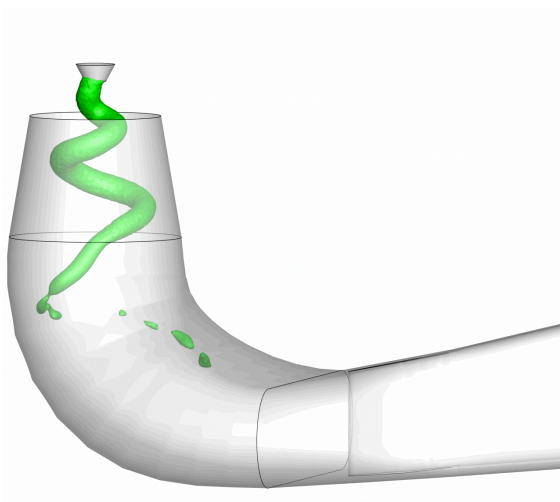
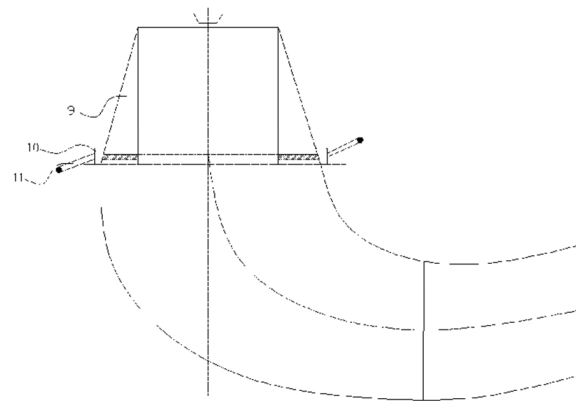
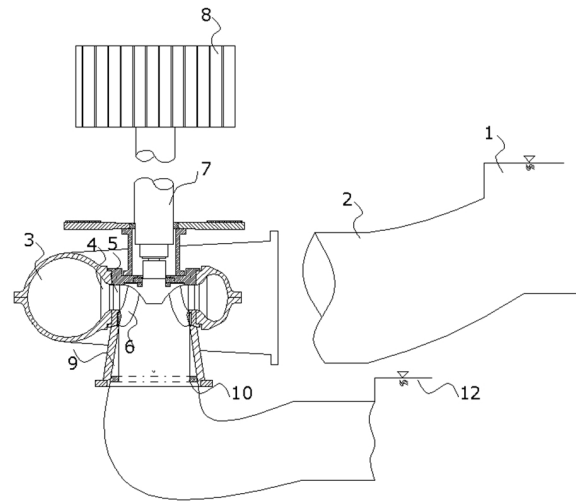
## METHOD AND EQUIPMENT FOR CONTROLLING THE SWIRLING FLOW THROUGH THE CONICAL DIFFUSER OF HYDRAULIC TURBINES



The invention relates to a method and an equipment for controlling the swirling flow through the conical diffuser of hydraulic turbines. The claimed method provides for the elimination of self-induced flow instability, the elimination of pressure fluctuations and vibrations by carrying out a progressive and controlled necking of the cross-section of a water jet flowing through a conical diffuser effected by an operator or an automation mechanism, the controlled necking being carried out in the lower region of the turbine conical diffuser, the cross-section being adjusted based on the principle of closing-opening of a circulation diaphragm which keeps in all positions the circular shape of its cross section, with the centre in the turbine main axis.

The claimed equipment for carrying out the method comprises a penstock (2) which takes over the water from an upstream lake (1) and directs it into a turbine spiral chamber (3), the water passing through a stator (4), and a directing apparatus (5) which guides the water to a rotor (6) and, due to the power generated by the rotor (6), a shaft (7) rotates a generator (8) which produces electricity, at the output of the rotor (6), the water passing through a conical diffuser (9), whose role is to convert the water kinetic energy into potential energy and, when the turbine operates at one point away from the maximum efficiency point.

The rope vortex occurs, with its associated pressure fluctuations, which are harmful to the turbine, but when an adjustable-retractable diaphragm (10) is introduced and manually adjusted by means of a handle (11) or by a servo-mechanism of an automation, the rope vortex disappears along with said pressure fluctuations, further on the water being discharged into a downstream lake (12), the diaphragm (10) being adjusted to various openings, by some diaphragm shutter elements (13).



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## PROCEDURE FOR ARSENIC REMOVAL FROM WATERS AND WASTE IMOBILIZATION IN VITREOUS MATRIX



It is well known that arsenic is a chemical element which arrives into the environment from a variety of natural and anthropogenic sources. Long term exposure leads at appearance of a large number of health problems, such as: skin affections, bladder, kidney and lungs cancer, cardiovascular and respiratory affections and in some cases can lead at diabetes. The underground sources of drinking waters represent one of the most important sources of arsenic intoxication. Into the underground water arsenic can be found as As(V) and most frequent as As(III). From this two forms the last one present higher toxicity. Present invention is related to a method of decontaminating waters with arsenic content using sludge adsorbent material containing iron and to a valorisation of exhausted adsorbent as frites, glass or ceramic glazes. The novelty of this patent is represented by a new approach, when a nonconventional material is used as adsorbent during arsenic removal from drinking waters. This new adsorbent material is represented by a sludge containing iron ions obtained as secondary product from neutralization of wastewaters containing higher quantities of metallic oxides, especially iron one. This approach, presents two different advantages, firstly representing a suitable solution for an economical problem, reducing the usage degree of natural resources, and secondly is eco-friendly by using as adsorbent sludge obtained as secondary product from other industrial process.

In conformity with present invention the sludge with higher content of iron (approximately 33%) is used as adsorbent material during purification of waters with arsenic (III) content between 10 and 700  $\mu\text{g}\cdot\text{L}^{-1}$ . As result, was obtained a waste product with higher toxicity and an arsenic content between 0.01 and 0.2%. Such waste product can be used for production of coloured glasses, or frites with higher content of  $\text{Fe}_2\text{O}_3$ .

Immobilization of arsenic waste resulted from such adsorption by inclusion into the vitreous matrix represents a new solution as also a responsible attitude, sustaining the durable development of human society.

As conclusion present invention resolves such desideratum by using the principle of close technology, by valorisation of arsenic containing waste by immobilization into the vitreous matrix, for production of glasses or ceramic decorative glazes, protecting in this way the environment.