

**"Method for covering a river bottom with dumping material to form a  
bottom protection having a certain profile"**

This invention relates to a method for covering a river bottom with stony material to form a bottom protection having an arbitrarily predetermined profile wherein use is made of a pontoon having open sections through which this material is dumped by means of  
5 scraper beams from slides moving above these open sections.

It has to be noted that the method set forth herein is applicable for laying a bottom covering with an inclined profile starting from an either or not flat and horizontal river bottom as well as for laying an arbitrary bottom covering on a river bottom with an inclined profile or  
10 a profile with varying depths.

The use of pontoons having movable steel slides for applying bottom protections is known and an example thereof is formed by the Dutch patent 171,829. Pontoons of the here described type are floating constructions showing a number of open sections and steel  
15 slides moving above these sections.

When these steel bottoms or slides slide in the longitudinal direction of the pontoon, the dumping material situated thereon abuts against a transverse scraper beam so that the entire dumping material can be dumped therefrom in the river through the corresponding open  
20 section.

It is to be noted that the term "river" includes of course also the term "water basin".

An object of the invention is to outline a method which enables amongst others to apply a bottom protection having an inclined

or horizontal profile onto a river bottom having a flat or irregular profile. An irregular profile refers amongst others to a river bottom with irregular depths.

5 In order to enable this in accordance with the invention, the method according to the invention is characterized in that :

- a) after having drawn up the relief map of the river bottom the position of the pontoon with respect to a certain surface of the river bottom is determined and permanently checked by means of transmitting beacons or satellites ;
- 10 b) the speed at which the slides are moved is determined and if necessary adjusted in function of the inclined or flat profile of the river bottom which is to be obtained ;
- c) the pontoon is moved over its longitudinal axis in the direction wherein the slides are moved or in the opposite direction in function of the relief of the river bottom and/or of the inclined or flat profile of this
- 15 bottom which is to be obtained ;
- d) the position of the pontoon is adjusted in function of the flow velocity of the water ;
- e) the speed at which the slide and pontoon are moved is adjusted in
- 20 function of profile changes of the river bottom or of profile changes of the bottom protection to be formed.

Still according to the invention, the position of the pontoon above the place where stony material has to be dumped is determined taking one or more of the following parameters into account :

- 25 a) the depth of the river ;
- b) the velocity of the flow at the moment of dumping ;
- c) the nature, and for example the specific weight of the stony material.

Other details and particularities of the invention will become apparent from the following description of a method for covering a river

bottom with stony material to form a bottom protection having a certain profile.

5 This description is only given by way of example and does not limit the invention. The reference numerals relate to the figures annexed hereto.

Figures 1 to 3 illustrate three possible situations which are determined by the relative movements of the slides with respect to a pontoon.

10 Figure 4 is a schematically shown cross-section through a bottom having a varying depth onto which a bottom with a certain profile has to be constructed.

The method illustrated by these figures is based on the use of a pontoon or a set of several pontoons having open sections through which stony material can be dumped in the river or, more generally, into  
15 a water basin. The stony material to be dumped is distributed up to a certain thickness over movable slides.

When these slides are moved above the open sections, the stony material is pushed off these slides because the slides move below  
20 scraper beams which extend transversally with respect to the displacement direction of the slides.

In figures 1, 2 and 3, the movable slides are indicated by reference 1, the scraper beams by reference 2 and the stony material by reference 3. The scraper beams 2, which are shown here schematically, have to be considered as a fixed component of a pontoon.

25 The stony material arrives onto the river bottom 4 and produces, depending on the dumping program, different thicknesses  $d^1$ ,  $d^2$ ,  $d^3$ .

The method according to the invention utilizes the different combinations which can be realized between the speed at which both the  
30 slides 1 and the pontoon with scraper beams 2 can be moved. By making

use of the direction wherein the pontoon and the slides move, very various dumping programs can be realized.

5 In order to focus the thought, it will be noticed that if the travelling speed of the pontoon is equal to 0, and the speed of the slides is positive but different from 0, the thickness  $d^1$  of the stony material dumped onto the bottom will be equal to the thickness  $d^1$  of the stony material situated on the slide. This situation is shown in figure 1.

10 If the pontoon and the slide are moved in the same direction, the thickness  $d^2$  of the dumped material will be smaller than the thickness  $d^1$  of the stony material on the slide. This situation is shown in figure 2. Of course, a larger surface of stony material will be formed on the bottom 3 of the river.

15 It is also possible to move the pontoon and the slides in opposite directions. In such a case, the dumped material thickness  $d^3$  will be larger than the thickness  $d^1$  of the stony material on the slide. This situation is shown in figure 3.

As already set forth in the preamble, a bottom consisting of dumping material can be realized both with a flat or with an inclined profile on to a bottom with irregular depths.

20 An example of such a situation is illustrated by the schematic representation according to figure 4.

Starting from an irregular bottom 5, a bottom 6 has to be created, which is flat and horizontal and the here discussed example.

25 The section with a thickness of dumping material  $d^1$  is obtained in principle by reproducing the situation according to figure 1.

A larger material thickness (equal to  $d^2$ ) is achieved in an analogous way by reproducing the situation according to figure 3. For a given surface, a maximum thickness of dumping material is created here.

30 Finally, in the section with a smaller depth (on the left hand side in figure 4), this desired thickness of dumping material will be

produced by applying a dumping program according to figure 2. Slide 1 and the pontoon are moved in the same direction ( $V^1 = V^2 \neq 0$ ) so that the layer of dumping material on the bottom is smaller than the layer of dumping material on the respective slide.

5                    According to figure 4, a flat and horizontal bottom 6 is created onto an irregular river bottom 5. It is clear that by applying the desired dumping program a bottom of dumping material having an obliquely inclined profile can be produced starting both from a flat or an irregular river bottom.

10                   Starting from a relief map made up in advance of the river bottom, all of these operations may be computer controlled whereby the use of pontoons can be optimized and this amongst others by utilizing positioning systems such as transmitting beacons or satellite connections. The positioning of a pontoon is done by usual means such  
15 as anchor winches, "shotless" screw propulsion of the floating structure and the like.

                    The position of the pontoon and its slides is processed electronically so that the steersman can follow the operations from the control-room and can execute the dumping program according to a bi-  
20 dimensional scheme.

**CLAIMS**

1. A method for covering a river bottom with stony material to form a bottom protection having an arbitrarily predetermined profile wherein use is made of a pontoon having open sections through which this material is dumped by means of scraper beams from slides moving above these open sections, characterized in that
- 5 a) after having drawn up the relief map of the river bottom the position of the pontoon with respect to a certain surface of the river bottom is determined and permanently checked by means of transmitting beacons or satellites ;
- 10 b) the speed at which the slides are moved is determined and if necessary adjusted in function of the inclined or flat profile of the river bottom which is to be obtained ;
- c) the pontoon is moved over its longitudinal axis in the direction wherein the slides are moved or in the opposite direction in function of the relief of the river bottom and/or of the inclined or flat profile of this bottom which is to be obtained ;
- 15 d) the position of the pontoon is adjusted in function of the flow velocity of the water ;
- 20 e) the speed at which the slide and pontoon are moved is adjusted in function of profile changes of the river bottom or of profile changes of the bottom protection to be formed.
2. Method according to claim 1, characterized in that use is made of an elongated pontoon.
- 25 3. Method according to claim 2, characterized in that the pontoon is positioned in such a manner that its longitudinal axis is situated above an elongated deepened portion of the river bottom, either parallel or at right angles thereto.
4. A method according to anyone of the claims 1-3, characterized in that the position of the pontoon above the place where
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stony material has to be dumped is determined taking one of more of the following parameters into account :

- a) the depth of the river ;
- b) the velocity of the flow at the moment of dumping ;
- 5 c) the nature, and for example the specific weight, of the stony material.

