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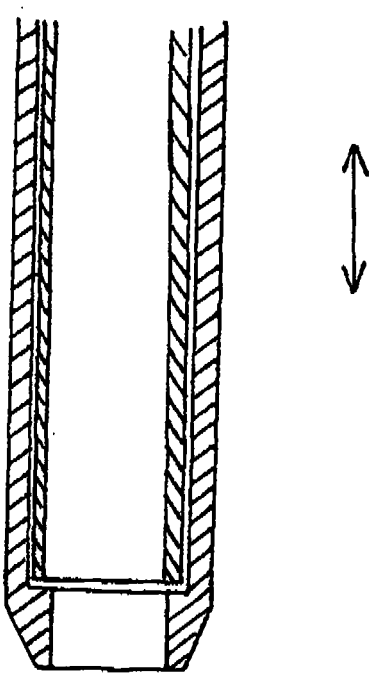
(54) Method and device for soil sampling

(57) The invention is concerned with a sampling method wherein a hollow body with a receiving opening at the lower side and a communicating receiving cavity within the body is downwardly inserted into the substrate of the ballast bed or track body of a railway and removed there from, wherein the hollow body partly or completely fills with the substrate and holds it. Preferably, the hollow body is present within a second body which are insert-edtogether where after the hollow body is removed and the emptied space within the second body is filled with fill material where after the second body is removed while leaving the fill material behind. Preferably a non-stirred sample is taken.



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Description

[0001] The invention is concerned with sampling a foundation of loose poured substrate, such as the ballast bed of a railway or the loose laid lower layer of a motor way.

[0002] A sample of a ballast bed is typically obtained by taking with a spade in the hand one or more digs ballast material and put it in a basket. The obtained sample is restricted to the top layer of loose poured, dust free and compared to sand particles substantially bigger debris, such as gravel or pieces of granite or such crushed stone or split stone, e.g. with a sieve size in the range of 22/40 or 30/63.

[0003] The object of the invention is a more reliable sampling, wherein sampling of a non-stirred sample or a sample from large depth also belongs to the possibilities.

[0004] The proposal is thus to insert a hollow body with a receiving opening at the lower side and a thereto connecting receiving cavity within the body, downwards into the ballast bed or track body and remove it there from, wherein the body is designed and/or the insertion or removal is carried out such that the hollow body at least partly fills with material from the ballast bed and takes that with it during removal.

[0005] This art as such is already known for years to obtain a sample of sand or sludge or such material of small granules. Application of this art to sampling of a track body for the first time offers the possibility to obtain a non-stirred sample that contains the lower parts of the top layer of crushed stone or such and the substrate layers of finer granule sizes, like sand, there below.

[0006] The hollow body can be a round or angled tube. Experiments have shown that the internal dimensions or diameter of the receiving opening measures preferably at least approximately 20 cm or at least approximately 25 cm. With smaller diameters it seems difficult or completely impossible to insert a tube with reasonable wall thickness and strength into the ballast bed.

[0007] With a view to particularly obtaining a non-stirred sample it is preferred that, in the direction perpendicular to the direction of penetration, the dimension (diameter) and shape of the receiving opening and the receiving cavity are substantially equal. The tube is e.g. substantially prismatic.

[0008] The hollow body is preferably driven by a penetrating force that has a varying strength. The hollow body is e.g. vibrated or rammed by a convenient driving means. During the first period of penetrating it is advantageous to select a strength and frequency of the force different from a subsequent period. From experiments with vibrating the tube into the ground it came out that it is advantageous to select a lower frequency and a stronger force to insert the body. Changing the strength and/or frequency of the penetrating force e.g. takes place at the time the tube has penetrated the ballast bed over some distance, e.g. about half way the thickness of the top layer of crushed stone or such (e.g. a depth of at least 10 cm).

[0009] The sampling is e.g. carried out over a depth of at least about 5 cm or at least about 75 cm, measured from the top of the substrate.

[0010] To hold the sample within the tube, the tube is preferably provided with holding means, e.g. a feature to selectively at least partly close the receiving opening, or retaining elements engaging the sample, such as barbs. The holding means are preferably designed to be extendable or differently activated and can therefore be provided with activating means or driving means or triggering means or biasing means such as a spring or elastic property. Thus the holding means can be activated only after the tube is inserted to the desired end depth in the under ground, such that they provide an obstruction as small as possible.

[0011] The tube is preferably easily detachable mounted to the driving arrangement, such that after a sample is obtained, the tube with the sample inside can easily be separated from the driving assembly. The sample then remains protected inside the tube and can be transported to the laboratory. For a next sampling a new tube can be put into the driving assembly.

[0012] A non-limiting and in the drawing (general and detail view) shown embodiment is as follows:

[0013] A frame is mounted to the typical four point lifting device of an agricultural towing vehicle, which frame is provided with a by hydraulic rams vertically up and down movable skid to which a driving head is mounted that, via a quick coupling, is coupled to a vertical thin walled steel cylindrical and at both ends open tube. The lower end of the tube provides the receiving opening and the internal part of the tube there above provides the receiving cavity.

[0014] At the lower end of the tube there is an enlargement, provided by a separate ring of larger radial dimension that is fixedly welded to the tube and extends coaxial from the tube. Against the inner wall of the ring a ring shaped inflation or expansion body is present, provided by a ring shaped hose of expandable material, e.g. rubber, which is connected to a pressurised fluid source. In non-loaded condition the hose keeps the axial extension of the receiving opening free.

[0015] To obtain a sample, the vehicle is positioned onto the track body such that the tube is present above the ballast bed, e.g. in the area between two succeeding sleepers between both rails of a track. The skid is present at a high level. The lower end of the tube is pressed onto the ground by the rams and simultaneously the driving head is made to vibrate, such that the tube is pressed into the ground while vibrating, while the skid simultaneously moves downward. The vibrating penetration is continued until the lower end of the tube projects approximately 1 meter below the lower side of the sleepers. Thus a non-stirred sample is obtained from both the top layer and the sand bed there below. Subsequently the hose is inflated by e.g. supplying pressurised water to it, such that said receiving opening restricts whereby the sample

is held within the tube while the tube is subsequently pulled upward from the ground by the hydraulic rams, during which the skid moves upward.

[0016] The drawing also shows a cross sectional side view of the sampling element in its operational position, in this example provided by two concentrically located tubes. The external tube is made of stronger material than the internal tube. The external tube is e.g. made of metal, such as steel, and the internal tube is made of polymer material. The internal tube is preferably translucent, such that the sample within it can be studied through the tube wall. Preferably a protecting element is present at the lower edge of the internal or external tube, to protect one or both during taking a sample. In this example this protecting element is provided by a projection at the outer tube below the inner tube, wherein said projection is part of a downward tapering or conical wall part, to lower the penetration drag.

[0017] The lower edge of the inner tube is preferably provided with the "core catcher" or similar element.

[0018] The inner tube is removably positioned within the outer tube. The tubes are simultaneously pressed down. Subsequently the inner tube with the sample inside is pulled up, while the external tube remains in its original location. After complete removal of the inner tube from the outer tube, the outer tube is filled with a convenient fill material, such as soil and/or gravel and only thereafter removed. Thus, no hole remains in the ballast bed after sampling.

[0019] The inner tube is preferably provided with one or more reinforcing elements, such as one or more e.g. diametrically opposing metal strips (not shown) extending over the complete or partial height of the tube wall. These reinforcing elements are preferably present at least at the upper end of the inner tube and are preferably designed to suspend the inner tube there from. Thus the inner tube can be gripped at said reinforcing elements.

[0020] Different embodiments also belong to the invention, e.g. the hose can be replaced by a so called "core-catcher", i.e. a ring of radially inward projecting flexible fingers or barbs which during downward movement of the tube are flexed away by the sample and during subsequent upward movement of the tube move back to their initial position and thus provide a restricting obstacle for the sample in the tube.

Claims

1. Sampling method wherein a hollow body with a receiving opening at the lower side and a communicating receiving cavity within the body is downwardly inserted into the substrate of the ballast bed or track body of a railway and removed there from, wherein the hollow body partly or completely fills with the substrate and holds it.

2. Method according to claim 1, wherein the hollow body is present within a second body that are together inserted where after the hollow body is removed and the emptied space within the second body is filled with fill material where after the second body is removed while leaving the fill material behind, and/or is carried out such that a substantially non-stirred sample is taken.

3. Method according to claim 1 or 2, wherein the sample is taken over a depth of at least approximately 50 cm, e.g. including the lower parts of the top layer and layers of the finer particle size, such as sand, there below.

4. Method according to claim 1, 2 or 3, wherein during insertion the hollow body is inserted by a driving means with a strongly fluctuating force.

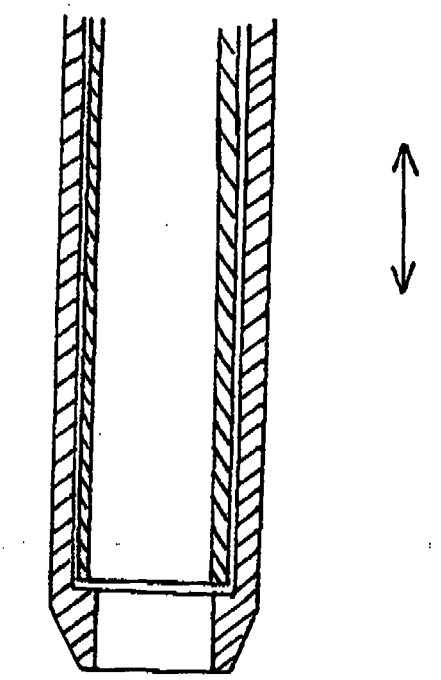
5. Method according to claim 4, wherein initially, e.g. until a starting depth, another force and/or frequency during penetration is applied.

6. Sampling device with a hollow body with a receiving opening with a diameter of at least approximately 20 or 25 cm at the lower side and a receiving cavity connecting thereto.

7. Device according to claim 6, comprising a round or angled tube and/or an easily removable, with the hollow body coupling driving device.

8. Device according to claim 6 or 7, comprising holding or retaining means, such as an inflatable or expansion body, e.g. selectively operable by operation means, to hold the sample within the hollow body, which retaining means are preferably present near the receiving opening.

9. Device according to claim 6, 7 or 8, comprising a frame with guiding means with which the hollow body and/or driving means are displacably mounted relative to the frame.



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EUROPEAN SEARCH REPORT

Application Number
EP 06 07 5691

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 6 505 693 B1 (LOOIJEN PETER N ET AL) 14 January 2003 (2003-01-14) * the whole document * -----	1,3-7,9 2,8	INV. E02D1/04
X	US 3 298 450 A (SATO HISAMATSU) 17 January 1967 (1967-01-17) * the whole document * -----	1,3-9	
Y	US 3 530 947 A (GEORGE J. GENDRON) 29 September 1970 (1970-09-29) * figures 1-5 * -----	2	
Y	DE 24 35 884 A1 (UPRAWLENIE GEOLOGII SOWETA MINISTROW TURKMENSKOJ SSR, ASCHCHABAD) 5 February 1976 (1976-02-05) * page 11; figure 1 * -----	8	

TECHNICAL FIELDS SEARCHED (IPC)

E02D
E21B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 August 2006	Nilsson, L

CATEGORY OF CITED DOCUMENTS

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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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02-08-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6505693 B1	14-01-2003	DE 69904497 D1	23-01-2003
		DE 69904497 T2	30-10-2003
		EP 1117875 A1	25-07-2001
		JP 2002520522 T	09-07-2002
		NL 1009662 C2	18-01-2000
		WO 0004238 A1	27-01-2000
		NO 20010181 A	11-01-2001
US 3298450 A	17-01-1967	NONE	
US 3530947 A	29-09-1970	AR 195857 A1	15-11-1973
		DE 1957997 A1	30-07-1970
		GB 1268279 A	29-03-1972
		GB 1268278 A	29-03-1972
		JP 50030362 B	30-09-1975
		NL 6917839 A	29-05-1970
DE 2435884 A1	05-02-1976	NONE	

EPO FORM P0459

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