EXCAVATOR BUCKET WITH ELECTROMAGNETIC FIELD WEAKENING TEETH

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ABSTRACT
An excavator bucket including soil-breaking teeth mounted on the wall of the bucket, the teeth being in the form of electrodes electrically insulated from one another and electrically connected to a high-frequency generator so that each pair of adjacent teeth forms a capacitor adapted to produce an electromagnetic field reducing the mechanical strength of frozen soil, owing to dielectric heating thereof, whereby effective progress of these soil-breaking teeth into the soil is promoted. The present invention permits earth-moving jobs to be carried out under conditions of season-long and several years' long freezing of soil, using for this purpose commonly known single-bucket excavators.

3 Claims, 3 Drawing Figures
EXCAVATOR BUCKET WITH ELECTROMAGNETIC FIELD WEAKENING TEETH

BACKGROUND OF THE INVENTION

The invention relates to the work-performing members of earth-moving machines adapted to operate in frozen soil, for example, to excavator buckets having soil-breaking teeth.

Excavators with buckets of this kind are widely known. However, these excavators show poor efficiency when they are operated for excavation of frozen soil, whereby it is necessary to loosen the soil in advance of excavation, e.g., by using explosive or by thawing the soil either by burning a fuel thereon or by employing steam.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide for excavation of frozen soil by a single-bucket excavator obviating the necessity of thawing the soil in advance by one of the above-mentioned methods.

The essence of the invention is in that the soil-breaking teeth mounted on the wall of the bucket are, in accordance with the present invention, in the form of electrodes electrically insulated from one another and electrically connected to a high-frequency generator so that adjacent ones of the teeth form capacitors adapted to produce an electromagnetic field capable of weakening the frozen soil, the pairs of the adjacent ones of the soil-breaking teeth being connected, respectively, to two phases of the high-frequency generator, symmetrically with respect to the body of the bucket, each soil-breaking tooth being mounted in a dielectric carrier supported by the bucket.

The action of the electromagnetic field upon the frozen soil, brought about by the soil-breaking teeth of the bucket, results in the mechanical strength of the soil being reduced to a value ensuring effective progress of the teeth. In this way it becomes possible to do away with the labour-consuming operations of preparation of the frozen soil either by loosening or by thawing; moreover, continuity of the excavation process is provided for.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further described in connection with the appended drawings, wherein:

FIG. 1 is a view of the wall of a bucket, having mounted thereon soil-breaking teeth in accordance with the invention.

FIG. 2 is an enlarged view of one of the teeth and of the attachment thereof to the bucket, in accordance with the invention;

FIG. 3 is an equivalent diagram of electric connection of the teeth, in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in particular to the appended drawings, the herein disclosed bucket includes four soil-breaking teeth 1, 2, 3 and 4 (FIG. 1) mounted on the wall 5 of the bucket, the teeth being also electrodes electrically insulated from one another and from the body 5' of the bucket, each soil breaking tooth (showed generally under numeral 6 in FIG. 2) being compression-fit within a carrier 7 mounted on the bucket. The carrier is made of a highly strong dielectric material capable of withstanding great mechanical loads. This dielectric carrier 7 has a cylindrical opening 8 made therethrough, for the passage of a current conductor 9 electrically connected to a high-frequency generator 9' operating with one of the adopted frequencies of a high-frequency range, as for example, 13.5; 27.1, or 40.6 Mc/s. The high-frequency generator 9' is a generator which is employed in industry, for the purpose of high-frequency drying of wood, moist material, the heating of dielectric powders, and the like. Such generators having an output capacity within the range of 10 to 100 kw are well known in the art and, thus, do not required further clarification. However a detailed description of the construction of a high-frequency generator may be found, for example, in a book entitled "Heating dielectrics and semiconductors by using high-frequency currents" (in Russian), by A. V. Netushil et al., "Gosenergoizdat" Publishing House, 1959. (not shown in FIG. 2).

One of possible patterns of connection of the teeth 1, 2, 3 and 4 (FIG. 1) to the high-frequency generator 9 is illustrated in the equivalent connection diagram illustrated in FIG. 3 and displaying a serial-parallel combination of capacitors 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and resistors 21, 22, 23, 24. The capacitors 10, 11, 12, 13 correspond, respectively, to the capacitance of the teeth 1, 2, 3, 4 in respect of the body 5' of the bucket, while the capacitors 14, 15, 16 are those corresponding to the capacitance of the adjacent pairs of these soil-breaking teeth 1, 2, 3 and 4 (FIG. 1). The series combinations of the capacitors 17, 18, 19, and 20 shown in FIG. 3 and of the resistors 21, 22, 23 and 24 are meant to depict the influence of the frozen soil with which the teeth 1, 2, 3 and 4 of the bucket are in contact in operation, the combinations being connected to the two phases of the high-frequency generator 9' symmetrically in respect of the body 5' of the bucket with the help of two cables 25 and 26.

With the above connection of the soil-breaking teeth 1, 2, 3 and 4 to the high-frequency generator 9', the adjacent pairs of the teeth 1, 2, 3 and 4 produce an electromagnetic field between and in front of themselves. This electromagnetic field is employed for weakening the frozen soil.

The herein disclosed bucket operates, as follows. When the soil-breaking teeth 1, 2, 3 and 4 engage the frozen soil, the electromagnetic field produced thereby reduces the mechanical strength of the frozen soil, owing to dielectric heating of the latter, so that effective progress of the soil-breaking teeth 1, 2, 3 and 4 into the soil occurs.

The present invention enables excavation jobs to be performed under the conditions of season-long and several years' long freezing of soil, using a commonly known single-bucket excavator for the purpose.

What we claim is:

1. An excavator bucket, comprising a body, a plurality of ground-breaking teeth mounted spatially adjacent to one another on said body, each one of said teeth being in the form of electrodes electrically insulated one from the other, a high-frequency generator operatively coupled to said electrodes, each adjacent pair of said ground-breaking teeth thus forming capacitors capable of producing an electromagnetic field whereby when the teeth are brought into contact with frozen ground and the like the electromagnetic field weakens.
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3. An excavator bucket as claimed in claim 1, wherein each tooth of said ground-breaking teeth is mounted in a dielectric carrier supported by the body of said bucket, each adjacent pair of said ground-breaking teeth being adapted to form between and in front of themselves an electromagnetic field whereby when the teeth are brought into contact with frozen ground the electromagnetic field weakens the ground and allows unimpeded progress of the bucket therethrough.

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