June 28, 1960 F. BERTHET ET AL 2,942,427

DEVICE FOR EFFECTING THE DRIVING AND FACILITATING THE EXTRACTION OF PILES

Filed Nov. 18, 1955

Fig. 1

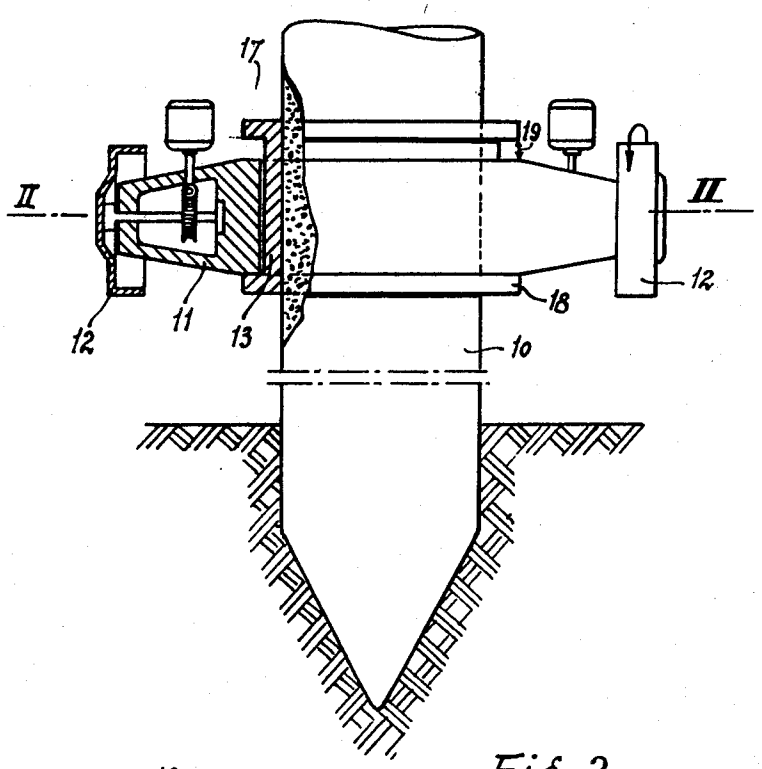
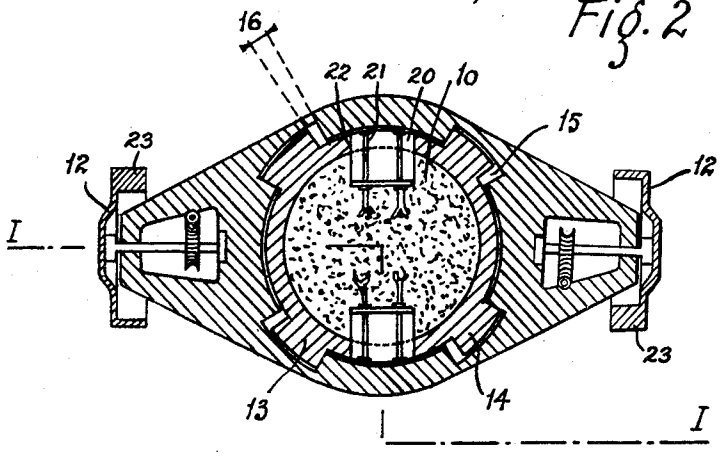


Fig. 2



INVENTORS

FRANCOIS BERTHET &
JACQUES DESVAUX
BY Irwin S. Thompson
ATTY.

United States Patent Office 2,942,427
Patented June 28, 1960

2,942,427

DEVICE FOR EFFECTING THE DRIVING AND FACILITATING THE EXTRACTION OF PILES

François Berthet, 16 Rue Voltaire, Houilles, France, and Jacques Desvaux, 11 Square Alboni, Paris, France

Filed Nov. 18, 1955, Ser. No. 547,720

Claims priority, application France Nov. 20, 1954

4 Claims. (Cl. 61—73)

In order to effect or to facilitate the driving into the ground or extraction of members used in building construction, exploration of soils or in other fields, such as piles, sheet-piling, tubes, etc.—which will hereafter be designated by the generic term "piles"—it has been proposed to impress alternating impulses on the pile by means of a device adapted to generate the said impulses and which is rigidly fixed to the pile, that is to say directly fixed to the pile without other supporting or transmission equipment. The alternating impulses may be directed along the axis of the pile, perpendicular to the said axis, or again both at right-angles to the axis and in line with the said axis.

The present invention has for its object improvements in this method of driving or extraction of piles, enabling different effects to be obtained with the same equipment, these effects being readily adaptable to the varied requirements of the work to be carried out.

These improvements consist in permitting, between the impulse generator and the pile or the attachment band to which the pile is coupled, a sufficient play so as to transform the impulses into percussions or directed shocks.

By this means, it is possible by blocking the play, to apply to the pile the alternating, directed and balanced impulses produced by the impulse generator in the known manner. By freeing the play, without changing the generation of the impulses, the latter, or some of them, are transformed into percussions, the action on the pile taking place in the form of jerks or shocks which are applied to it in alternating actions or in one single desired direction.

In general, the impulse generator is coupled to the pile by a band fixed to the pile or to an appropriate extension of the pile. In accordance with the invention, the coupling of the impulse generator with the band is effected while making provision for suitable amounts of play in the direction or directions in which it is desired to direct the percussions.

In particular, when the impulse generator is arranged to produce alternating impulses, along the axis of the pile and at right angles to that axis, play is provided between the impulse generator and the band in order to permit of relative movement of these members laterally along the axis of the pile and/or in rotation at right angles to that axis. The amounts of this play are limited by means of suitable abutments which restrict the amplitude of the desired movements. With an impulse generator equipped with out-of-balance fly-wheels (U.S. Patent No. 2,743,585, British Patent 687,603), the magnitude of the movements of the equipment in each direction is in theory independent of the speed of rotation of the fly-wheels. It depends on the ratio of the masses of the out-of-balance weights to the inertia of the whole mass to be set in movement. This fact readily permits of the determination of the play to be formed between the pile and the impulse generator in order to obtain the best efficiency of the desired percussions or shocks.

By arranging the abutments, it is possible to obtain at will, percussions along the axis of the pile, at right angles to the axis of the pile, or in both directions at the same time.

The improvements in accordance with the invention may also be combined with those described in the U.S. Patent 2,743,585 of which the instant application is a continuation-in-part (British patent application No. 30,636/55, filed on October 26, 1955), these improvements enabling, with the same impulse generator without-out-of-balance fly-wheels, to vary the ratio within the desired limits of the impulses directed along the axis of the pile and the intensity of the impulses at right angles to that axis. By the combined use of the means described in the patent application referred to above and the provision for play in accordance with the present application, percussion effects are obtained along the axis of the pile and/or at right angles to that axis, having definite strengths and in any pre-determined relation.

The improvements in accordance with the invention find very useful applications in certain cases of driving or of extraction of piles. They are of special advantage when used for driving sheet-piling. In this case, the transformation of the alternating impulses along the axis of the pile to percussions directed in the driving direction is very effective and partly avoids the necessity for the work lost in lifting the whole assembly under the effect of the said alternating impulses. In other cases, and especially when the lateral friction forces are small enough not to require any alternating movement of the pile, the transformation of the alternating pulses into unidirectional percussions gives a good efficiency.

These improvements are also and mainly advantageous in the extraction of piles. In fact, at the beginning of this operation, it may be necessary on the one hand to employ large momentary forces in the upward direction only, which is better obtained from the use of percussions than of alternating impulses. On the other hand, it is often desirable when raising piles to eliminate the work applied to impulses directed downwards, which work is partly wasted.

In this case, the effect of gravity on the impulse-generating device is compensated for by a suitable elastic tensile force.

The invention may be applied not only in the case of vertical piles, but also for inclined, or even horizontal piles. In this case, the action of gravity is replaced, if and when necessary, by the action of elastic jacks or similar members.

The attached drawings show, by way of example and without any implied limitation, one form of embodiment of the improvements in accordance with the invention.

Fig. 1 is an elevational view, with parts in section, of a pile having the device of the present invention thereon.

Fig. 2 is a view in transverse cross-section taken along the line II—II of Fig. 1.

In order to proceed to drive the pile **10**, the impulse-generator device is fixed on the said pile. The former is, in the example shown, of the simple type, as described in the U.S. Patent No. 2,743,585 (British Patent No. 687,-603), referred to above, and is composed of a frame **11** on which are mounted fly-wheels **12** with oppositely-acting out-of-balance weights **23**. The unbalancing weights **23** are disposed in-phase with each other, that is to say, they reach their uppermost and lowermost vertical positions simultaneously. It is understood, however, that any other arrangement may be provided to constitute the impulse-generator. The impulse-generator **11—12** is coupled to the pile by a fixing band **13**, the latter being fixed to the pile **10** by any ordinary means: mechanical or hydraulic clamping collars or like arrangements. In Figure 2, the fixing means is constituted by blocks **20** mounted on rods

21 sealed in the pile 10 and passed in a cavity 22 in band 13.

In accordance with the invention, the band 13 is provided with external axially extending ribs 14 which are housed inside grooves 15 formed in the frame 11. The ribs 14 do not entirely occupy the grooves 15. On the contrary, there is formed between them a play 16 which enables the frame 11 to move in rotation about the pile.

This play 16 permits the impulse-generator 11—12 to oscillate with respect to the band 13, the sides of the grooves 15 acting as abutments to limit the amplitude of such rotational movements. It will be understood that the movement of the impulse-generator 11—12 is only transmitted to the band 13 and to the pile 10 when the faces of the grooves 15 and the ribs 14 come into contact, and is then transmitted in the form of a shock or percussion. Due to this fact, the alternating impulses of the generator 11—12 are transformed into shock movements which act as percussions on the pile 10.

In order to transform into percussions the impulses applied in the direction of the axis of the pile, the fixing band 13 is longer than the height of the frame 11 and it is provided at its two extremities with abutments or stop-members 17 and 18. There thus exists between the frame 11 and the stops 17 and 18 a longitudinal play 19. This play is provided so as to obtain either percussions directed solely downwards or percussions directed solely upwards, with elastic tensile force acting against the effect of gravity (the amount of play exceeding the theoretical oscillating travel of the device) or again percussions or shocks in both directions (the play then being fixed less than the theoretical oscillation travel).

It is seen that, by these means, it is possible to create at will any percussion, uni-directional or not, with a very simple mounting. It will of course be understood that by blocking-up the play 16 and 19, operation by alternating impulses may again be obtained.

What we claim is:

1. Apparatus for driving piles and the like, comprising a support adapted to be rigidly fixed on the pile, the said support being constituted by a sleeve having abutment members in the form of outwardly extending elements at its extremities, a movable frame concentric with the said support, the said frame carrying a plurality of eccentrically-weighted fly-wheels with the weights arranged to act in phase, means for driving the said fly-wheels in opposite synchronous rotation, the said fly-wheels being mounted in pairs coaxially on the axes perpendicular to the axis of the pile and impressing on the frame simultaneously translation impulses in the direction of its axis and rotational impulses at right angles to the said axis, the said frame having a height less than the distance apart of said abutment members, and internal grooves in which are housed axially extending ribs on said support, said grooves being wider than said ribs.

2. Apparatus for driving piles and the like, comprising a support, means for rigidly securing said support to the pile, a frame, means mounting said frame on said support for limited relative movement, abutment means on said frame and support, said frame carrying a plurality of eccentrically-weighted flywheels mounted for rotation about an axis perpendicular to the axis of the pile, the weights of said flywheels being in-phase, and means for driving said flywheels in opposite synchronous rotation whereby said flywheels apply to the frame alternative impulses at least in the direction of the axis of the pile and said frame applies shocks to said support through said abutment means.

3. The apparatus of claim 2, said support comprising a sleeve and said abutment means comprising outwardly extending members at the extremities of said sleeve, said frame being of a height less than the space between said abutment means where it engages said support.

4. The apparatus of claim 2, said support comprising a sleeve having external axially-extending ribs and said frame having grooves housing said ribs with a play therebetween.

References Cited in the file of this patent

UNITED STATES PATENTS

2,629,985	McDowell	Mar. 3, 1953
2,743,585	Berthet et al.	May 1, 1956
2,830,442	Hochstrasser	Apr. 15, 1958

FOREIGN PATENTS

387,473	Great Britain	Feb. 9, 1933
510,064	Great Britain	July 26, 1939
726,660	Germany	Oct. 17, 1942
1,075,051	France	Apr. 7, 1954