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DROPABLE SHOCK TESTER

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FIG.1.

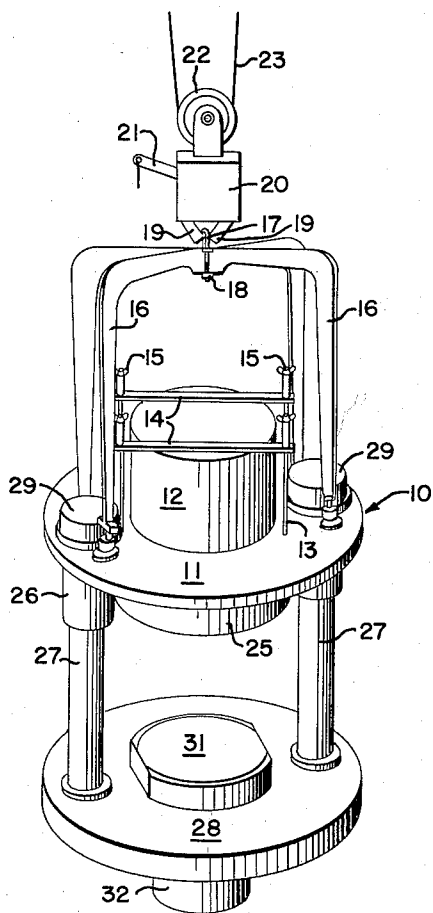


FIG.3.

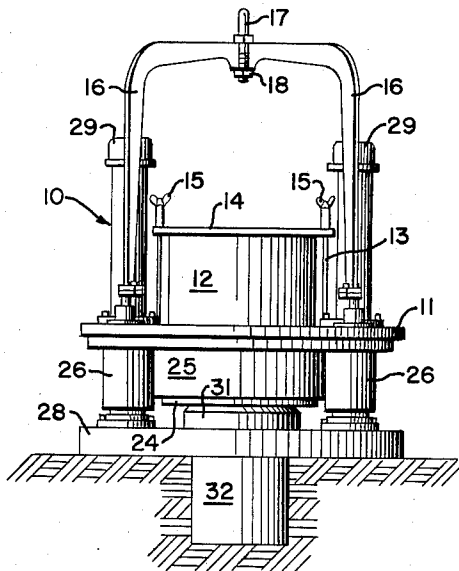
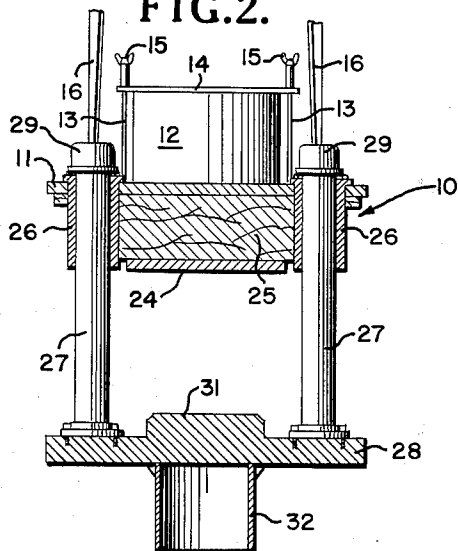


FIG.2.



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DROPABLE SHOCK TESTER

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9 Claims. (Cl. 73-12)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to shock testing devices and more particularly to a drop tester, the anvil of which is self-emplaced in a bed of sand or gravel when the anvil and carriage are dropped as a unit from an elevated position directly above the bed of sand, thereby to produce short duration, high-G impact.

In devices of this character heretofore devised it has been the usual practice to permanently emplace the base structure which stops the test carriage, a reinforced concrete structure usually being employed for this purpose, and only the test carriage with the object to be tested secured thereto is raised to an elevated position and dropped therefrom onto the anvil, the path of movement of the carriage during the descent thereof being controlled by a pair of guide members extending throughout the length of the travel of the carriage from the initial raised position to the point of impact with the anvil. Such devices have not been altogether satisfactory under all conditions of service by reason of the permanently emplaced drop tower and base structure required with this type of drop tester and the limitation to the height of the drop imposed by the tower structure and the immobility of the shock tower structure.

The instant device possesses all of the advantages of the prior art devices and none of the foregoing disadvantages.

In accordance with the present invention the anvil and carriage are lifted as a unit sufficiently to obtain a predetermined height of drop, the anvil being suspended from the carriage at a short distance therebelow during the lifting of these members to the drop position, and dropped as a unit onto a sand or gravel bed whereby the anvil comes to rest on the bed and almost immediately thereafter is struck by the carriage during continued downward movement thereof, the anvil and carriage being maintained in axial alignment at all times.

One of the objects of the present invention is to provide a new and improved drop tester.

Another of the objects is to provide a portable drop tester having means for emplacing the anvil in a sand or gravel pit upon impact therewith when the anvil and carriage are dropped from an initial raised position with respect thereto.

Another object is to provide a new and improved drop tester in which the carriage and anvil members are raised as a unit to a dropping position with the anvil suspended beneath the carriage and struck thereby as the anvil is embedded in a sand or gravel pit during a dropping operation.

A further object is to provide a drop tester having a carriage supporting an anvil when the carriage is raised to an elevated position in such manner that the carriage and anvil are maintained in axial alignment during the free fall of the carriage and anvil, and the anvil is struck by the carriage as the anvil becomes emplaced in a sand or gravel pit at the end of the fall.

Still other objects, advantages and improvements will become more clearly apparent from the following descrip-

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tion taken in connection with the accompanying drawings of which:

FIG. 1 is a view in perspective of the shock test device of the instant invention according to a preferred embodiment thereof;

FIG. 2 is a view in section and partially broken away of the device of FIG. 1; and

FIG. 3 is a view in elevation of the device at the completion of a cycle of operations thereof.

Referring now to the drawings on which like numerals of reference are employed to designate like or similar parts throughout the several views and more particularly to FIG. 1 thereof for a more complete understanding of the invention, there is shown thereon in perspective a self-emplacable drop tester designated generally by the numeral 10 and comprising a carriage 11 supporting an object 12 to be tested. The object is firmly secured to the carriage by a plurality of rods 13 having clamping bars 14 slideably carried thereby and secured in tight clamping engagement with the upper surface of the test object 12 by a plurality of wing nuts 15. A pair of bifurcated bridle or support members 16 are secured to the carriage 11 in any suitable manner and provided with a U-bolt 17 clamped thereto as by nut 18 for engagement by a pair of jaws 19 carried by the release mechanism 20 which may be of any well known type suitable for the purpose. The jaws may be unlocked in any well known manner as by a pull applied to the line attached to the release lever 21. The mechanism 20 is provided with a pulley 22 engaging a cable 23 extending to a device, such for example, as a derrick, hoist, elevator or the like for hoisting the drop tester to a predetermined elevation.

The lower portion of the carriage 11 is provided with an impact member 24 such, for example, as a phenolic plate secured thereto, a pad 25 composed of wood, preferably laminated, being clamped between the impact member and the lower surface of the carriage plate in any suitable manner.

The carriage plate has also secured thereto in diametric spaced relation a pair of sleeve members 26 wherein which is slideably disposed a pair of tubular guides 27 secured to an anvil 28 and provided with stop members 29 at the upper end portions thereof for abutting the upper ends of the sleeve members 26 whereby the anvil is suspended therefrom when the carriage is in a raised position. The stop members 29 may conveniently be pipe caps threaded on the pipes or guide members 27.

The anvil 28 may comprise a raised portion 31 for transmitting a shock impulse by way of impact member 24 and pad 25 to the carriage 11 and the test object clamped thereto. The lower portion of the anvil is provided with a cylindrical member 32 for engagement with the material with which the shock bed is composed in a manner to prevent tilting of the device from the vertical line of travel as the anvil comes to rest thereon.

From the foregoing it will be understood that, unlike conventional drop testers where only the test carriage is raised and dropped, the self-emplacable tester of the present invention is raised and dropped as a unit with the carriage separated from the base by a suitable distance, for example, fourteen inches. The base emplaces itself in sand, gravel, or loose dirt, as the case may be, under its own inertia, and a few milliseconds later the carriage collides with it, producing shock.

Whereas the invention has been described with particular reference to a specific example thereof which gives satisfactory results, it is not so limited as it will be apparent to others, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, in the appended claims to cover all such changes and modifications.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A drop shock tester comprising an anvil, a hollow cylindrical stabilizing member secured to the lower surface of said anvil with the axis thereof normal thereto, a pair of guide members secured to said anvil and having stop members on the upper end portions thereof, a carriage slideably carried by said guide members and moveable from engagement with said stop members into contact with said anvil as the tester is dropped and the anvil strikes a target area, means for supporting a load on said carriage, and means including a bridle secured to said carriage for raising the carriage and anvil to an elevated position prior to a dropping operation.

2. A drop shock tester comprising a carriage, means on said carriage for clamping a load thereto, an anvil having a pair of guides secured thereto, a pair of sleeve bearing members on said carriage within which said guides are disposed for sliding movement therein, stop members on said guides for limiting the degree of slideable movement of the guides within said sleeve members whereby the anvil is suspended by the carriage as the carriage is raised to a raised position prior to a dropping operation, and means secured to said carriage for raising the carriage and anvil to said raised position as a hoisting force is applied thereto whereby the carriage and anvil are dropped as a unit as the hoisting force is suddenly removed, the carriage striking the anvil as the anvil is embedded within the earth following a dropping operation.

3. A shock tester according to claim 2 including a rigid cylindrical member secured to a central portion of the anvil and projecting downwardly therefrom when the anvil is raised to said raised position for stabilizing the tester as the anvil strikes the surface of the ground whereby the tester comes to rest in a vertical position.

4. A shock tester according to claim 3 in which a pad composed of wood is secured to the underside of said carriage for absorbing a portion of the shock transmitted thereto by said anvil.

5. A shock tester according to claim 4 in which the lower surface of the wooden pad is capped by a phenolic plate at the lower surface thereof for impingement with the anvil as the carriage is suddenly brought to rest at the completion of a dropping operation.

6. A drop-shock tester comprising a carriage, means secured to said carriage for raising the carriage to an elevated position from which the carriage is to be dropped, an anvil member suspended from the said carriage in alignment therewith and hoistable by the carriage to a height slightly less than the height of the carriage in such manner that the carriage strikes the anvil member immediately following impact of the anvil member with the ground as the carriage and anvil member are dropped, a pair of guide members having stops thereon for suspending said anvil member beneath the carriage, said guide members being secured to the anvil member and slideable within and supported by said carriage in a manner to maintain the carriage and anvil member in a mutually aligned relation during a dropping operation.

7. A shock tester according to claim 6 including means on said anvil member for maintaining the tester in a vertical position after the anvil member has struck the surface of the ground.

8. A shock tester according to claim 7 in which the means for raising said carriage to the raised position includes a pair of bifurcated supports having the end portions thereof secured to the carriage and the central portions mutually intersecting and secured by a U-bolt to which the hoisting force is applied.

9. A shock tester according to claim 8 in which the guide means are secured to said anvil member in diametric spaced relation.

References Cited in the file of this patent

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