United States Patent

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[73] Assignee **The United States of America as represented by the Secretary of Agriculture**

[54] **MECHANICAL SOIL SAMPLER**
9 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **173/24,** 73/425.2, 173/45, 173/46, 214/353
[51] **Int. Cl.** **G01n 1/08**
[50] **Field of Search** ..... 73/423 R, 421 R, 425.2; 173/24, 19; 172/21, 22, 32, 276; 214/78, 353

[56] **References Cited**

UNITED STATES PATENTS

1,716,661	6/1929	Pappas	173/24 X
2,236,562	4/1941	Brandes	172/22
3,224,512	12/1965	Alexander	173/19

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ABSTRACT: Apparatus and method for collecting subsamples of surface soil. The apparatus is a wheeled device having a spring-loaded, hinged lever provided with a cam following roller and digger foot, an adjustable spring and bumper block, a cam mounted on a wheel axle and a holder for a sample collection container having a baffle with opening and adjustable cover plate. The cam rotates with the axle and a cam lobe intermittently engages the cam follower whereupon the lever is pressed downward and the digger foot is forced into the soil. When the cam lobe disengages from the follower a spring pulls the lever rapidly upward until it strikes the bumper block. The resultant impact causes the soil sample on the digger foot to be thrown upward and forward into the sample collection container.

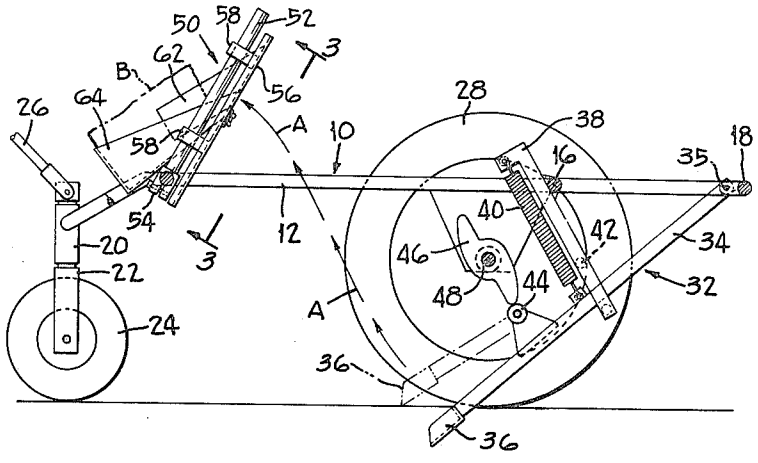


Fig. 1

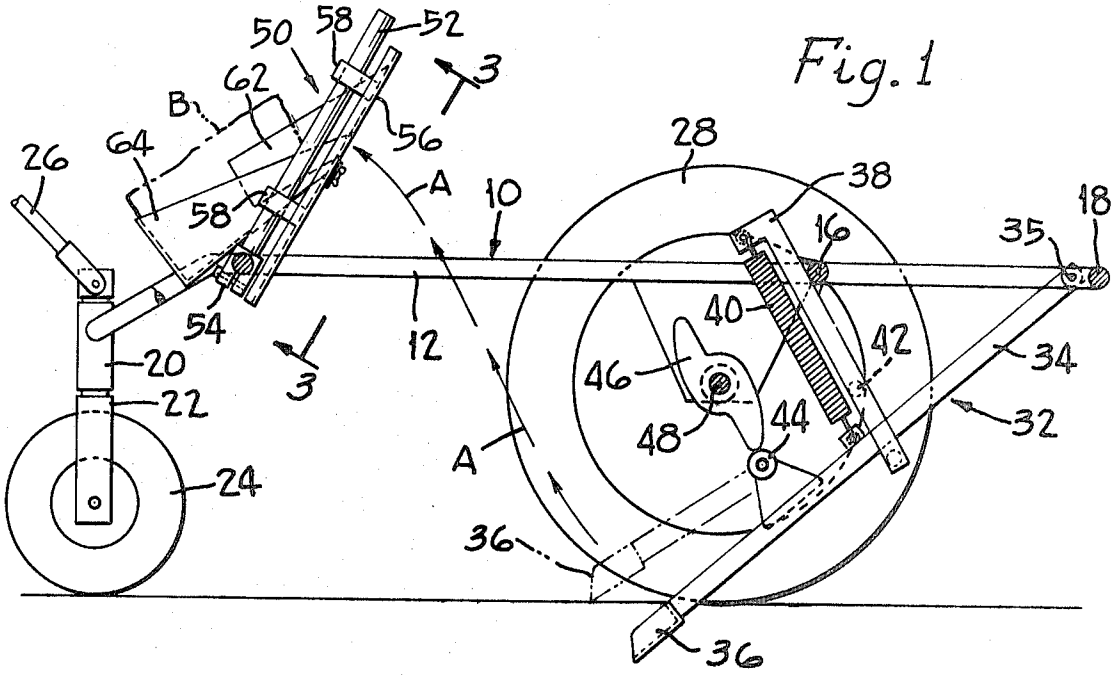


Fig. 2

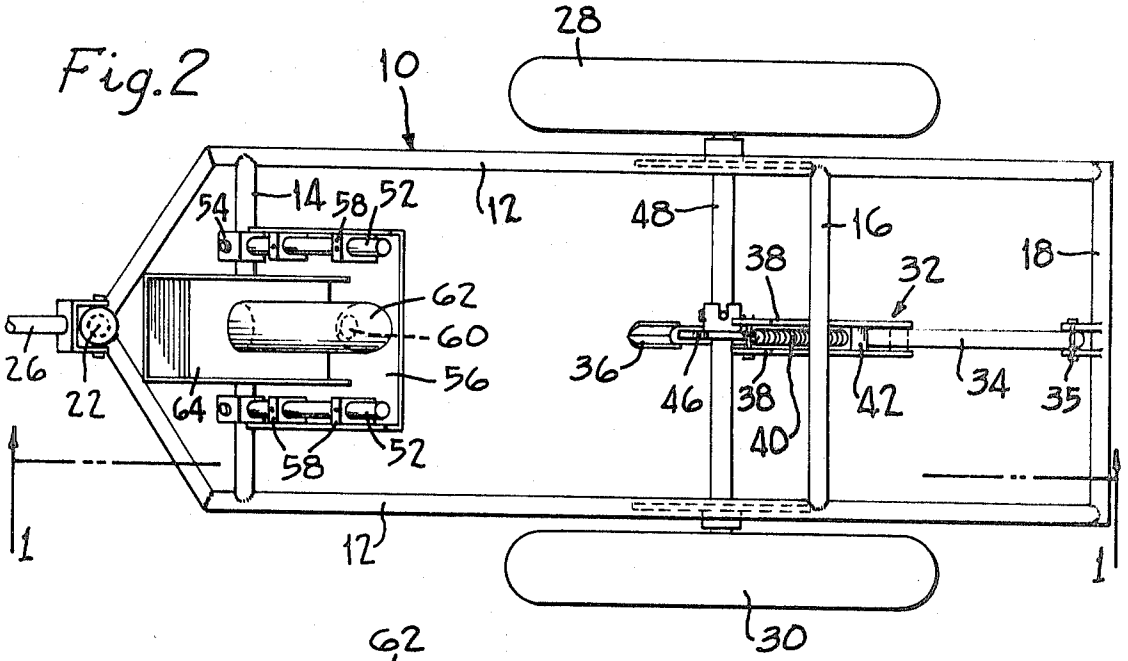
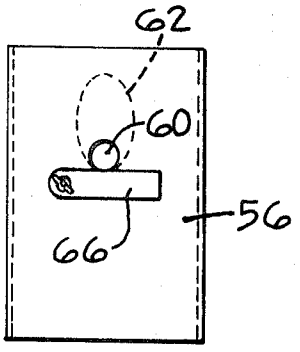


Fig. 3



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MECHANICAL SOIL SAMPLER

A nonexclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes is hereby granted to the Government of the United States of America.

The invention relates to an apparatus and method of collecting consecutive subsamples of surface soil to provide a composite sample which is representative of soil from any designated area. More particularly, it relates to an apparatus and method for effectively and efficiently determining the degree of soil infestation by insects or the amount of other substances in the soil.

Prior to the present invention, a composite sample representative of the soil from a designated area was collected by manually digging samples with a trowel or other suitable tool. Samples were taken by a predetermined pattern such as at each step (pace) until a composite sample of desired weight was obtained. Such a process is slow, costly, and laborious and requires much physical labor.

An object of the present invention is to provide an apparatus for collecting soil samples.

Another object is to provide an apparatus for collecting soil samples in which the size and the frequency of collecting each subsample can be varied.

Still another object is to provide an apparatus for collecting soil samples that can be manually or power drawn.

A further object of this invention is to provide an improved and efficient method of collecting soil samples and one in which the pattern and frequency of collecting each subsample can be varied.

According to this invention, the foregoing objects are accomplished by a wheeled apparatus having a spring-loaded, hinged lever provided with a cam-following roller and a digger foot, an adjustable spring and bumper block, a cam mounted on a ground wheel axle and a holder for a sample collection container having a baffle with opening and adjustable coverplate. Interchangeable cams are used depending on the pattern of subsampling desired. The baffle is mounted in such a manner that it can be adjusted vertically, laterally, or angularly to position and align its opening to receive soil subsamples.

Although the apparatus described is a three-wheeled device, three wheels are not essential to its operation. The apparatus can be built and operated using only one wheel. In such a case the wheel would be provided with an axle and a stabilizing bar or other device to keep the apparatus on an even keel.

The apparatus will now be described in reference to the following figures wherein:

FIG. 1 is a sectional view of the apparatus as seen on line 1—1 of FIG. 2.

FIG. 2 is a top plan view.

FIG. 3 is a fragmentary view taken on line 3—3 of FIG. 1.

In the preferred embodiment the apparatus comprises a rigid support member such as substantially rectangular frame 10 having side members 12 and crossmembers 14, 16 and 18. The front ends of side members 12 are drawn together and welded or otherwise secured to sleeve bearing 20 in which is journaled bifurcated post 22 supporting the single steering wheel 24. A tow bar 26 is pivotally secured to the upper end of post 22. Toward the rear of the machine are the main bearing wheels 28 and 30 which also provide the energy for the digging mechanism generally designated at 32.

The digging mechanism is comprised of an arm or elongated hinged lever 34 pivotally mounted at 35 to crossmember 18 and having at its free end a scoop or digger foot 36. As will be apparent from the drawings (FIGS. 1 and 2), the lever is pivoted to rotate in a vertical plane. Arm 34 passes between a pair of parallel guide members such as the two brackets 38 welded to crossmember 16. Brackets 38 support a strong tension spring 40 which is fastened to arm 34 biasing it upwards toward bumper block 42 also secured between brackets 38. Arm 34 is also provided with cam follower 44 which engages the lobe(s) of cam 46 removably secured to axle 48. Wheels 28 and 30 are also secured to axle 48.

As the apparatus is pulled over the ground the rotation of wheels 28 and 30 rotates cam 46 in a vertical plane thus periodically forcing arm 34 downward into digging position arm 34. When cam follower 44 drops off a lobe of cam 46 the bias of spring 40 rapidly pulls up arm 34 until it strikes bumper block 42. The impact resulting from arm 34 striking block 42 causes the soil sample in digger foot 36 to be thrown upward and forward in the path indicated by arrows A. Located in the path of the thrown samples is a collecting station generally designated 50 which is adjustably supported on two posts 52 which in turn are adjustably secured to crossmember 14. Clamp blocks 54 on the bottom of posts 52 permit angular and lateral adjustment of the collecting station assembly. Baffle plate 56 which is vertically adjustable is slidably supported on posts 52 by blocks 58.

Baffle plate 56 is a generally flat sheet having an aperture 60 toward which the soil sample is thrown. This is best seen in FIG. 3. In front of plate 56 is sample conducting tube 62 and sample bag supporting tray 64. Both tube 62 and tray 64 are secured to plate 56. Although each soil sample thrown by digger mechanism 32 is generally of the same magnitude, the actual soil sample collected on each throw is regulated by shutter 66 which is provided to adjust the size of aperture 60.

Cam 46 is removable so that a cam with one, three, four or more lobes can be substituted in its place. In addition, the spacing between lobes can be equal or unequal. In this way the number and frequency of subsamples taken from any particular area can be varied according to a predetermined pattern. The interchanging of cams is done by removing wheel 30, withdrawing axle 48 from the bearing adjacent said wheel, releasing and sliding the cam off the axle and replacing it with another cam.

Although the apparatus of this invention as described is a three-wheeled device, it will be obvious to one skilled in the art that a one-wheeled device could easily be constructed. One would need only a ground wheel with an axle, framework for the digging mechanism, and a stabilizing mechanism to keep the apparatus on an even keel.

We claim:

1. Apparatus for collecting samples of surface soil comprising:

a. a towable rigid support member having a forward end and a rear end;

b. an axle rotatably mounted on said rigid support member;

c. at least one ground wheel secured to the axle to cause said axle to rotate as said wheel is rolled along the ground;

d. an elongated lever extending in a generally forward and downward direction, said lever being pivotably mounted by one end thereof on the rigid support member rearward of the axle to pivot in a vertical plane and being provided at the other end with soil-digging means, said lever being of sufficient length to cause said soil-digging means to penetrate the surface of the soil;

e. a pair of elongated parallel guide members mounted on the rigid support member, said guide members including therebetween said elongated lever;

f. a lobed cam secured to the axle to rotate therewith in a vertical plane;

g. a cam follower secured to the lever and so located as to lie in the plane of rotation of the lobed cam;

h. a tension spring extending parallel to said pair of guide members, said spring having one end thereof secured to the lever and the other end secured to the ends of the pair of the guide members remote from the lever, said spring urging the cam follower into contact with the lobed cam;

i. bumper means secured between said parallel guide members to limit the angle through which the lever can pivot, said bumper means being so positioned as to provide a sudden stop to the upward motion of the lever when the cam follower loses contact with a lobe of the cam; and

j. soil-collecting means mounted on the rigid support member forward of the ground wheel and the soil-digging means, said soil-collecting means being adjustable angularly, laterally, and vertically whereby to receive a sample of soil dug by said digging means and thrown therefrom by the impact of the elongated lever against the bumper means when a lobe of the cam rotates out of contact with the cam follower.

2. The apparatus of claim 1 in which the cam has two lobes.

3. The apparatus of claim 1 in which the cam has three lobes.

4. The apparatus of claim 1 in which the cam has four lobes.

5. Apparatus for collecting samples of surface soil comprising:

a. towable rigid support means having side members and forward, intermediate, and rear crossmembers;

b. an axle rotatably mounted between said side members;

c. at least one ground wheel secured to the axle to cause said axle to rotate as said wheel is rolled along the ground;

d. an elongated lever pivotably secured by one end thereof to a rear crossmember of the rigid support means to rotate in a vertical plane and extending in a generally forward and downward direction, the other end of said lever being provided with soil-digging means capable of removing a sample of soil, said lever being of sufficient length to cause said soil-digging means to penetrate the surface of the soil;

e. a pair of elongated parallel guide members mounted near their upper ends to an intermediate crossmember on the rigid support means, said guide members extending in a generally downward and rearward direction and being of sufficient length to include the elongated lever therebetween at their lower ends;

f. a lobed cam secured to the axle to rotate therewith in a vertical plane;

g. a cam follower secured to the lever and so located as to lie in the plane of rotation of the lobed cam;

h. a tension spring extending parallel to said pair of guide members, said spring having one end thereof secured to the lever and the other end secured to the upper ends of the parallel guide members, said spring urging the cam follower into contact with the lobed cam;

i. bumper means secured between said parallel guide members; and

j. soil-collecting means mounted on a crossmember of the rigid support means forward of the ground wheel and the soil-digging means, said soil-collecting means being adjustable angularly, laterally, and vertically whereby to receive a sample of soil dug by said digging means and thrown therefrom by the impact of the lever against the bumper means when a lobe of the cam rotates out of contact with the cam follower.

6. The apparatus of claim 5 in which the cam has two lobes.

7. The apparatus of claim 5 in which the cam has three lobes.

8. The apparatus of claim 5 in which the cam has four lobes.

9. The apparatus of claim 5 in which the soil-collecting means mounted on a forward crossmember of the rigid support means comprises:

a. two posts, each pivotally and slidably connected to said forward crossmember;

b. a baffle plate between and slidably connected to said posts, said plate having an adjustably sized aperture for regulating the passage through the baffle plate of samples of surface soil thrown from the soil-digging means on the lever;

c. a sample conducting tube, one end of which is secured to the side of the baffle plate opposite the soil-digging means; and

d. means for accumulating soil passing through the aforesaid conducting tube.

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