July 18, 1967 P. E. BOXRUD 3,331,249

SOIL SAMPLING DEVICE AND MEANS FOR MOUNTING THE SAME ON A VEHICLE

Filed Jan. 4, 1965

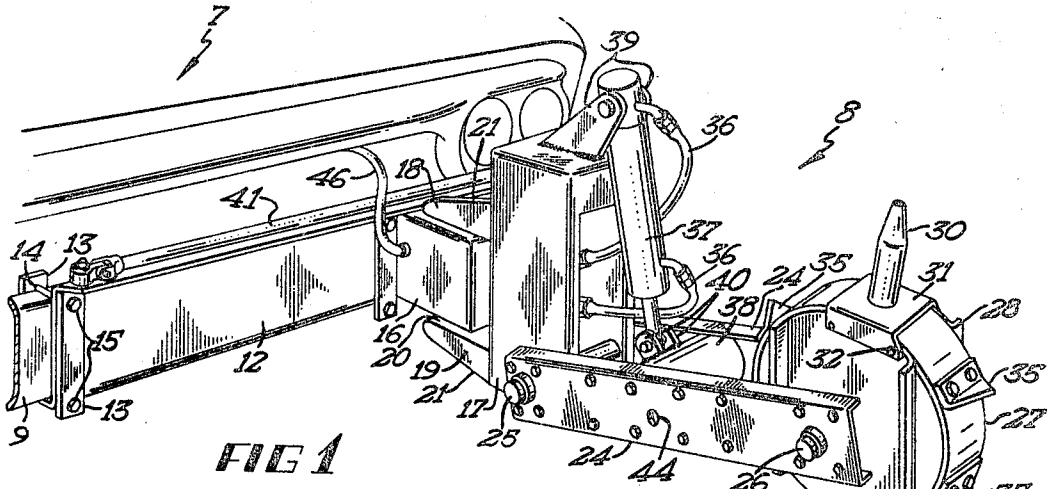


FIG 1

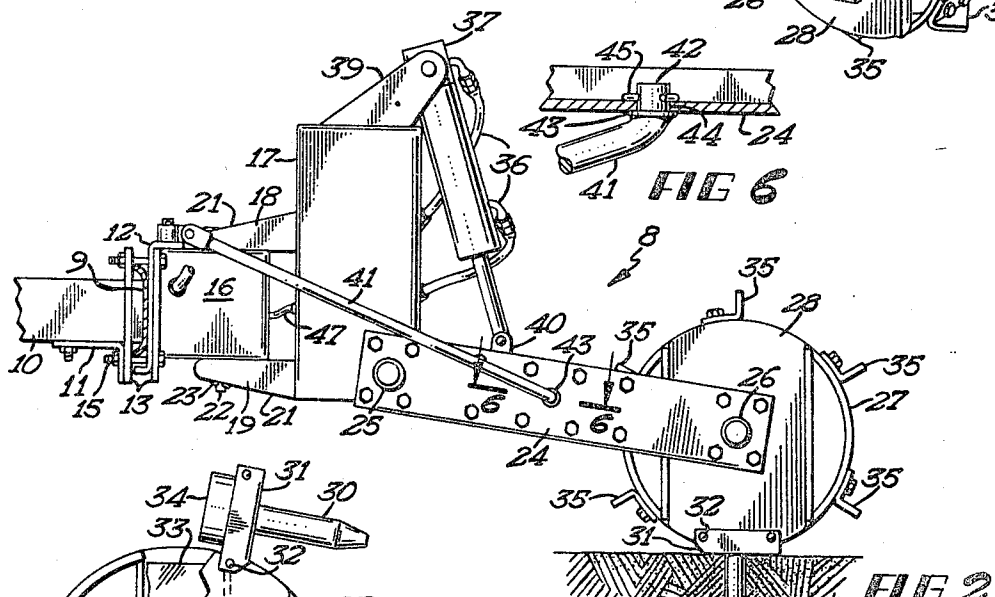


FIG 2

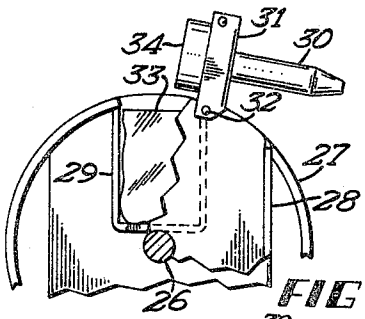


FIG 3

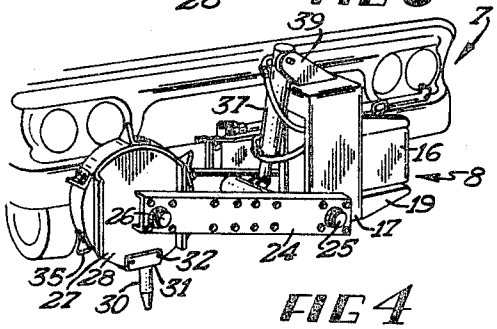


FIG 4

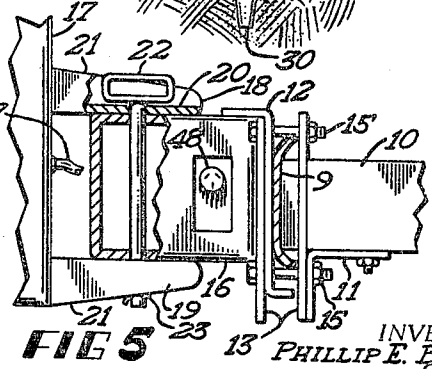


FIG 5

FIG 6

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SOIL SAMPLING DEVICE AND MEANS FOR MOUNTING THE SAME ON A VEHICLE

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6 Claims. (Cl. 73—421)

This invention relates broadly to soil sampling devices and is in the nature of an improvement of the device disclosed in a copending application for Letters Patent of the United States entitled, Soil Sampling Device, Ser. No. 390,139, filed in the United States Patent Office of date Aug. 17, 1964, now Patent No. 3,264,877.

The objects of this present invention over those disclosed and claimed in the above identified copending application are as follows:

An improved means for mounting the subject device preferably on the forward end portion of a powered vehicle having ground wheels, said mounting means affording still further means whereby the subject device may be selectively movable into and out of its normal operating position and foldable against the vehicle for over the road transport.

Another object of this invention is to provide a soil sampling device having an improved method of mounting its soil probe.

A further object of this invention is to provide a soil sampling device having stabilizing means to impart rigidity to said device when the same is in operation and capable of disengagement from said device when the same is in over the road transport.

These and other objects of this invention will become apparent from the following specification and claims when taken in conjunction with the appended drawing which forms a part of this application and in which drawing, like characters indicate like parts throughout the several views.

To the above end, generally stated, the invention consists of the following devices and combination of devices, hereinafter described and defined in the claims.

Referring to the drawing:

FIG. 1 is a perspective view showing the invention in operable position mounted on the front end portion of a powered vehicle.

FIG. 2 is a side elevational view of the same, some parts of the said powered vehicle being fragmentarily shown.

FIG. 3 is a fragmentary view showing a portion of the soil drum some parts being broken away to illustrate a soil sample retaining chamber and its relationship to the soil probe mounted on said drum.

FIG. 4 is a view similar to FIG. 1 on a reduced scale showing the invention in an inoperable position and folded against the front end portion of a vehicle.

FIG. 5 is a side elevational view on an enlarged scale and partly in section of the mounting means, the invention and the vehicle being fragmentarily shown, and,

FIG. 6 is a detailed view partly in section fragmentarily illustrating the stabilizer bar secured to the invention taken on the line 6—6 of FIG. 2.

Referring now more in detail to the drawing, the numeral 7 will hereinafter refer to the powered vehicle broadly and the numeral 8 to the invention as an entirety.

The numeral 9 is directed to the conventional bumper secured to the front end portion of the vehicle 7 for the purpose of this application and the numeral 10 indicates the front end portion of the main frame of the powered vehicle 7. It will be understood that the right and left hand sides of the bumper 9 and the frame portions 10 will carry identical reference numerals.

The subject invention is primarily mounted on the vehicle by utilizing the conventional front bumper 10 and

a transversely disposed angle bar 11 that is rigidly secured by bolts or welding the forward underside portion of the vehicle frame 10, and it will be understood that this angle bar 11, instead of being a single transversely disposed member that extends from one side of the vehicle frame 10 to the other, may be in the form of a pair of single angle brackets each of which is secured to the underside of said vehicle frame.

Cooperating with the angle bar 11 is a wide heavy Z bar or plate 12 of greater width than the vehicle bumper 9 with which it has engagement to thus provide a primary mounting plate for the entire assembly as will presently appear. This Z bar or plate 12 is rigidly held in assembled relation with the vehicle bumper 9 by means of a plurality of pairs of spaced cleats 13 having upper and lower aligned bores 14 positioned to receive relatively long nut-equipped bolts 15. These bores 14 are so positioned in the cleats 13 to transversely span the bumper 9 and with the bolts 15 extending through the bores 14 in the cleats 13 and through aligned bores for each bolt 15 in the Z bar mounting plate 12 the said plate is drawn into rigid tight fitting engagement with the bumper 9 when the nuts of the bolts 15 are drawn tight.

A still further element embodied in the primary mounting means for the invention comprises a heavy steel mounting box 16 of welded construction and rigidly secured to the Z bar or mounting plate 12 by welding the same thereto at the longitudinal center of said Z bar a plate 12. While this mounting box 16 is primarily intended as a support for bearing elements as will presently appear, it is well to note here that it also affords a mounting station for the electrical receptacle 48 energized from the vehicle 7 via the electric power line 46 for an independent hydraulic pump assembly. The numeral 47 indicatets the electric power line leading from said receptacle 48 to the hydraulic pump assembly as will presently appear.

Still further elements embodied in the means for mounting the invention 8 relative to the vehicle 7 includes a vertically disposed box type bearing 17 having upper and lower rearwardly projected arms 18 and 19 respectively. These arms 18 and 19 are in vertically spaced alignment to engage the upper and lower surfaces of the mounting box 16 and are provided with a base plate 20 and inclined side plates 21, each of said members 20 and 21 being secured to the main body portion of the box type bearing 17 by rigidly welding the same thereto. Pivotal engagement between the mounting box 16 and the bearing 17 about a vertical axis is accomplished by means of a heavy mounting pin 22 that extends through aligned bores in the base plates 20 and the upper and lower surfaces of the mounting box 16. Said pin being secured in such position when the invention is operable by means of a cotter pin 23. This box type bearing also serves as a housing for the elements of the independent hydraulic pump assembly.

As stated, the parts of the subject invention thus far described comprise broadly the means for detachably mounting the same on a powered vehicle 7.

The numeral 24 is directed to a pair of heavy mounting arms pivotally secured at their inner end portions to a heavy shaft 25 which is journaled in aligned bores in the lower forward portion of the box type bearing 17 on opposed sides thereof. The outer end portion of said mounting arms 24 being journaled in a further shaft 26 that extends through aligned bores in the outer end portion of the mounting arms 24. This shaft affords a means for mounting a drum-type wheel 27 for rotation about the horizontal axis of the shaft 26.

This drum-type wheel 27, as shown, is somewhat skeletonized comprising a pair of side plates 28 which afford means for mounting a chamber 29 which is in

communication at its outer end portion with a soil probe **30** which is pivotally mounted on the periphery of the wheel **27**.

This soil probe **30** is mounted on a plate **31** that is pivotally mounted on the peripheral rim of the wheel, see numeral **32**, and while not shown on the drawing, latch means is provided to prevent inadvertent opening of the plate **31** and its mounted soil probe.

The soil chamber **29** which is in communication with the soil probe **30** is closed except for its upper end portions which is normally closed by the plate **31**. This chamber **29** is constructed and arranged to receive and retain a soil sample bag **33** which is placed in said chamber with its mouth open. The under side of the plate **31** is provided with a depending annular skirt **34** that extends into the open mouth of the soil sample bag **33** when soil samples are being taken and deposited in said bag by the soil probe **30**.

The drum-type wheel supports the forward end portion of the device when the same is operable and to facilitate rotation of the wheel **27** as the same is rotated by movement of the powered vehicle **7** there is provided a plurality of circumferentially spaced pointed lugs **35** having ground engagement. These lugs **35** overcome the inherent tendency of the wheel to possibly slip under certain soil conditions and thus permit the soil probe **30** to enter the ground at regular intermittently spaced intervals to the soil samples via the probe **30** and deposit the same in the soil sample bag **33**. When the soil sample bag is filled as the result of travel over a given parcel of land, the said bag is removed and marked to indicate the origin of its contained samples and a new bag is thus placed in the chamber as the device is moved still further over the given land parcel to be sampled. This process has been well covered in the preamble to the specification of my copending application above identified.

In a device of the kind described herein, it is highly important to selectively be able to move the soil probe **30** into and out of ground engagement on any given parcel of land. To accomplish this, I provide a double acting hydraulic unit including the pump. Other than the ram itself, identified by the numeral **37**, and certain fragmentary showings of the hydraulic connection **36'**, no further specific reference is made herein to the hydraulic system for the lack of inventive concept except as follows. As previously stated, the hydraulic pump and its associated elements are contained within the mounting box **16** and the ram **37** itself is interposed between the upper end of the box type bearing **17** and a relatively heavy shaft **38** extending between the mounting arms **24** substantially rearwardly of the longitudinal center thereof.

The upper end portion of the ram **37** comprising the cylinder is pivotally secured to a pair of upstanding forwardly projecting ears **39** and the lower end portion thereof comprising the piston rod is pivotally secured to a pair of ears **40** rigidly secured to the shaft **38** extending between the arms **24** at the transverse center of said shaft. It will be understood that the hydraulic ram **37** is operable by means of the usual and conventional controls, not shown, to raise or lower the entire working unit into and out of ground engagement. It is important to note that for the soil probe to function properly and take a satisfactory soil sample, it is necessary for the unit to be in complete ground engagement at such time. This is also important from the standpoint of the traction lugs **35** wherein these lugs must achieve complete ground engagement to insure proper rotation of the wheel **27** to position the soil probe **30** into ground engagement at regular spaced intervals. Cooperating with the hydraulic ram **37** to facilitate such necessary and positive ground engagement I provide a relatively heavy, pivotally mounted stabilizer bar **41**. This stabilizer bar is pivotally mounted at its rear end portion on an upstanding stud **42** which is rigidly secured to the upper horizontally disposed surface of the Z bar or plate **12** at a point rearwardly of the pivotal mounting of the unit proper and is secured at its forward end portion, see numeral **43**, in a bore **44** in at least one of the pivotally mounted arms **24** and secured in this operable position by means of a cotter pin **45**.

It will be obvious that with the stabilizer bar **41** in operable downwardly inclined position as best seen in FIG. 2, the weight of the vehicle **7** acting on the stabilizer bar will eliminate any possibility of the probe unit riding out of the ground and failing to penetrate the same to obtain good sample cores of earth.

It is still important to note that with the stabilizer bar inoperable, and pivotally moved into longitudinal alignment with the Z bar or plate **12** and so retained there by any one of numerous conventional means, not shown, the entire unit forwardly of its mounting pin **22**, may be swung into longitudinal folded engagement with the mounting elements on the bumper **9** and secured in such position while the vehicle is in over the road transit. This position is best seen in FIG. 4 of the drawing and while not illustrated, some conventional latch means will be provided to lock the unit in this folded position.

While there are herein disclosed but a limited number of embodiments of the structure, process, and product of the invention herein presented, it is possible to produce still other embodiments without departing from the inventive concept herein disclosed, and it is desired, therefore, that only such limitations be imposed on the appended claims as are stated herein or required by the prior art.

What I claim is:

1. A soil sampling device for taking intermittently spaced samples of soil from a given land area, comprising in combination, a powered vehicle on which the soil sampling device is mounted whereby the same is moved over said land area to probe the soil and take intermittently spaced soil samples therefrom, rigid stationary mounting means on said vehicle and movable mounting means pivotally secured to the first noted mounting means whereby said soil sampling device is detachably and pivotally mounted on the said powered vehicle, secondary independent unitary power means mounted on the movable mounting means whereby said movable means and its mounted associated elements are raised and lowered into and out of ground engagement, a pair of forwardly disposed laterally spaced arms pivotally secured and supported at their respective inner end portions to the said movable mounting means and a wheel mounted on a horizontally disposed shaft journalled in the outer end portion of said forwardly disposed arms whereby the same are forwardly supported, ground engaging means mounted at the transverse center of the peripheral rim of said wheel whereby positive rotation is imparted thereto by the engagement of the said ground engaging means with the ground, a soil gathering chamber mounted on the wheel and at least one tubular soil probe pivotally mounted on the rim of said wheel and in communication with the soil gathering chamber whereby as said soil samples are taken from the ground by the soil probe the same are progressively deposited in the soil chamber as each rotation of the said probe forces the last taken sample into the said chamber via the tubular probe.

2. The structure of claim **1** wherein the soil chamber is provided with a removable liner dimensioned to substantially the same size and capacity as the interior of the said chamber.

3. The structure of claim **1** wherein the soil probe is formed integral with a base plate in the form of a segment of the rim of the wheel, said base plate and its mounted soil probe being pivotally mounted on the rim of the wheel and locked in a normally closed position against inadvertent opening, said base plate being releasably locked to afford means whereby the removable liner of the soil chamber may be inserted and removed.

4. The structure of claim 1 further including an annular skirt formed integral with the underside of the said base plate and dimensioned to surround the opening in the base of the soil probe and extends into the open mouth of the liner of the soil chamber thereby maintaining an open unobstructed passageway through the tubular soil probe and into the said liner for the said soil samples and to prevent collapsing of said liner in soil gathering position.

5. A soil sampling device for taking intermittently spaced samples of soil from a given land area comprising in combination, a powered vehicle having a frame and a bumper on which the soil sampling device is detachably and pivotally mounted, rigid stationary mounting means on said vehicle comprising a bracket mounted rigidly on said frame rearwardly of the bumper, a mounting plate forwardly of said bumper in abutting engagement therewith and a plurality of nut equipped bolts cooperating with inner and outer cleats, said nut equipped bolts extending through aligned bores in said cleats and the mounting plate whereby when said nut equipped bolts are tightened, the said mounting plate is drawn tight into engagement with the face of said bumper, a mounting box affording a stationary bearing rigidly secured to the mounting plate at the longitudinal center thereof, and a heavy box type bearing having upper and lower pairs of rearwardly laterally spaced projecting arms formed integral with a base plate and having rearwardly inclined side members, said laterally spaced arms being vertically spaced wherein the respective base plates of each thereof engage the upper and lower surfaces of the box type bearing and aligned bores in the said base plates and the box type bearing to receive a heavy pivot pin to thus hold the rigid mounting members on the vehicle frame and the movable mounting means in assembled relation and free to swing about the vertical axis of the said pivot pin, a pair of heavy laterally spaced forwardly and downwardly inclined arms pivotally journaled at their respective rear end portions in the lower forward portion of the box type

bearing for upwardly and downwardly swinging movements about a horizontal axis and a wheel mounted on the forward end portion of said arms for rotation about a horizontal axis, a stabilizer bar pivotally mounted at its rear end portion on the rigid stationary mounting plate and having detachable engagement at its forward end portion with one of said arms, said stabilizer bar affording means whereby the said device is rigidly held in operable position when the same is in engagement with said arm and conversely permits the device to be folded in longitudinal alignment with the bumper of the vehicle when the same is detached from said arm and a double acting hydraulic ram having connection to a source of power mounted between the box type bearing and the said arms adjacent the rear end portions thereof, the upper cylinder end portion of said ram being pivotally mounted between a pair of transversely spaced ears formed integral with the upper surface of the box type bearing, and the lower piston rod end thereof being pivotally mounted between a pair of upstanding ears formed integral with a shaft extending between said arms adjacent the rear end portion thereof.

6. The structure of claim 5 wherein the box type bearing affords a housing for the power means whereby the hydraulic ram is actuated.

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