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[54] **STREAM TABLE STUDY CENTER**

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[52] **U.S. Cl.** ..... **73/86,** 73/148, 73/432 SD

[51] **Int. Cl.** **G01m 10/00**

[58] **Field of Search** ..... 73/86, 148, 432 SD; 35/19 R, 10, 41, 42

[56] **References Cited**

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[57] **ABSTRACT**

A portable stream table for simulating the effect of waves on a land mass and for measuring and recording the resulting erosion of the land mass.

7 Claims, 3 Drawing Figures

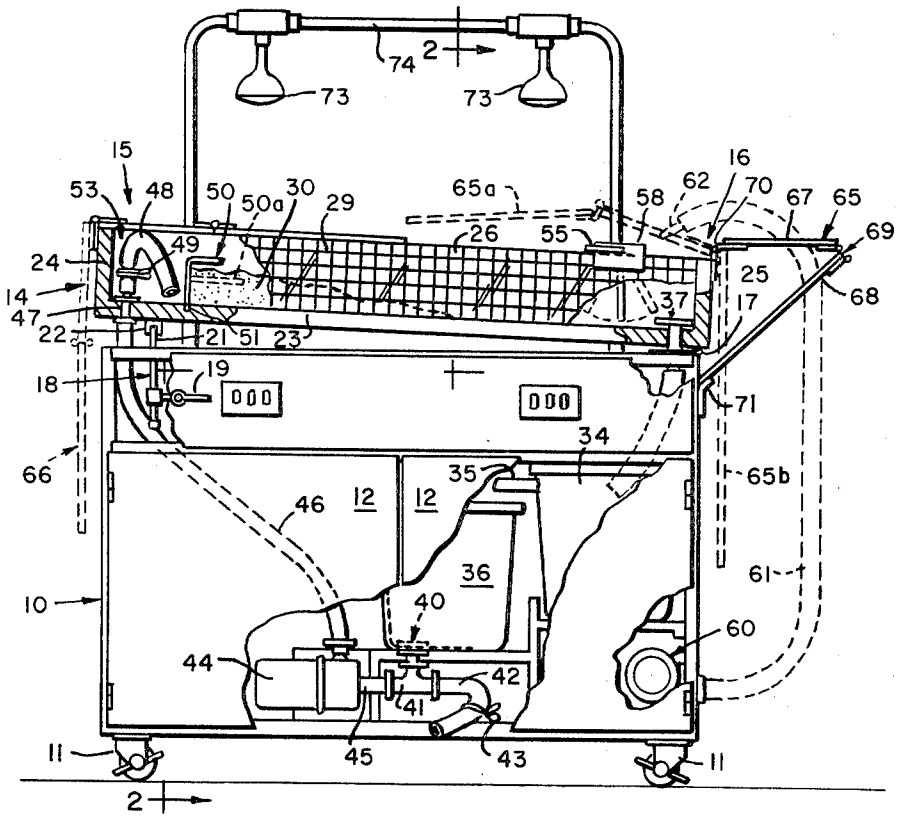


FIG. 1

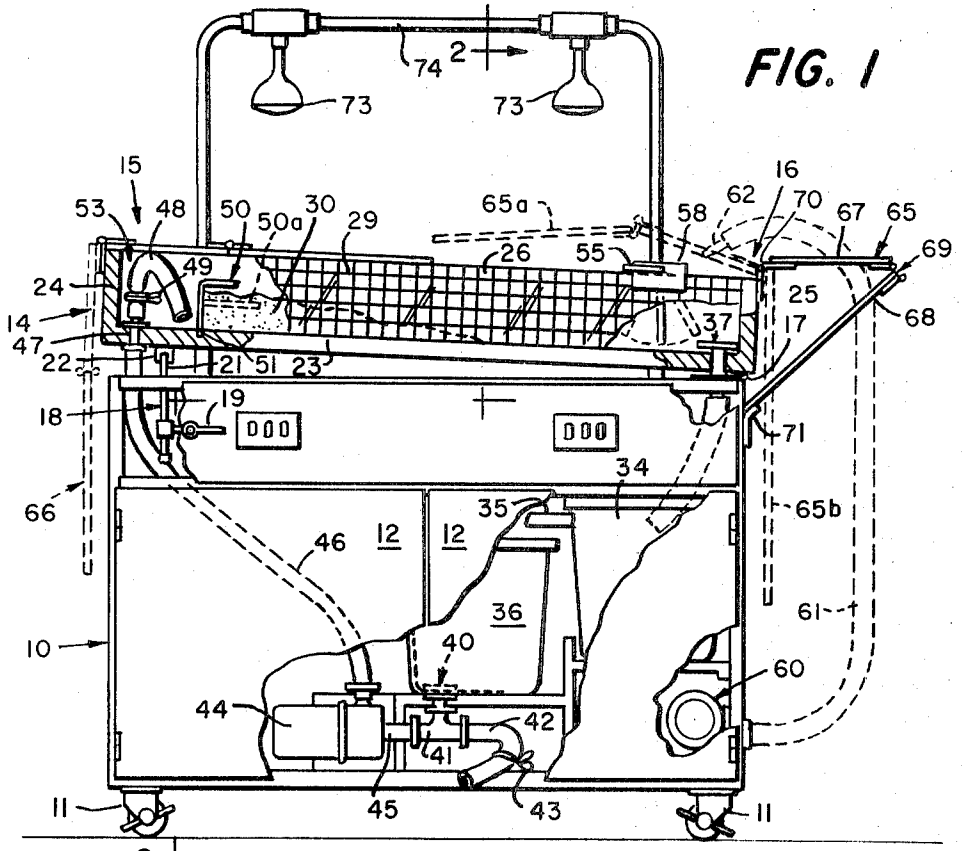


FIG. 2

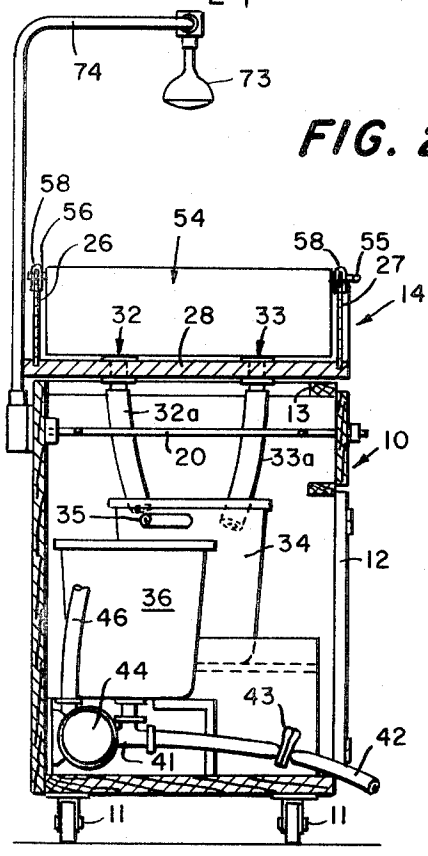
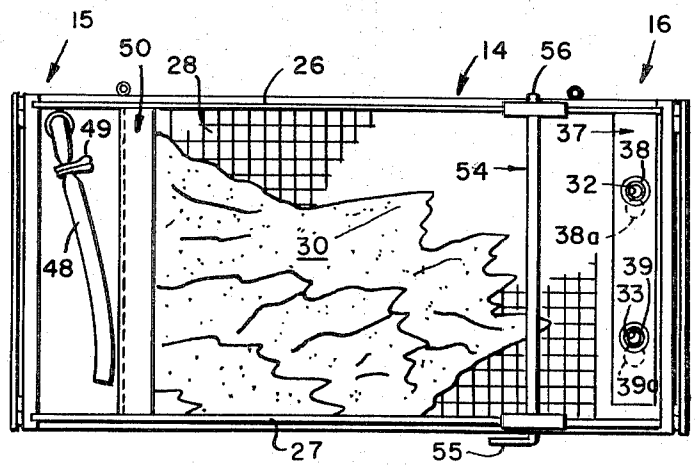


FIG. 3



STREAM TABLE STUDY CENTER

BACKGROUND AND SUMMARY

The present invention relates to a system for simulating the effect of waves on a land mass; and it is particularly useful in measuring and recording the resulting erosion of the land mass. Such a system may be used in a classroom or laboratory.

It has been suggested that the effects of erosion on a land mass may be studied by placing the land mass in a large container with a flat bottom, together with water, and inducing wave motion in the water by means of a hand-operated paddle. The resulting erosion of the land with continued wave motion is then observed visually.

The present invention constitutes an improvement over elementary apparatus of the type described above. Certain types of land, such as hard packed clay, erode over a very long time, and it becomes impractical to study erosion of this type of land with a hand-actuated mechanism because of the long periods of time involved. Further, it is known that waves which are mechanically induced as with a paddle, do not have the same characteristics as wind-induced waves, and they are therefore likely to produce different effects on a land mass.

The present system includes a generally rectangular tub which is pivotally connected at one end to a cabinet mounted on casters. Thus, the entire system is portable and self-contained. A dam is provided at one end of the tub, together with beams for filling the dam with water. The other end of the tub is provided with a drain system with an adjustable slide for metering the outflow of water. The hinge connection of the tub is at the drain end so that the dam end of the tub may be raised and water overflowing the dam will pass over the land mass and thence be drained into a first bucket housed within the cabinet.

A second bucket is provided in the cabinet for catching overflow water from the first bucket—whereby sand or earth is separated from the water in the first bucket, and only water is fed into the second bucket. A recirculating pump takes water from the second bucket and pumps it back into the dam.

The cabinet also houses a fan for generating a flow of air which is coupled by means of a flexible hose to the top of the tub for simulating wind-induced wave motion on the body of water.

The sides of the tub are made of a transparent material, such as safety glass, and the bottom as well as the sides of the tub are marked with a metric grid so that a three-dimensional measurement may easily be made of the effects of erosion on the land mass under study.

Incandescent lamps are provided over the tub, and they perform a dual function. That is, they both illuminate the study area, and if left on, they may be used to speed up the drying of the land mass so that the effects of intermittent surface water flow followed by periods of drying out may be simulated.

Other features and advantages of the present invention will be apparent to persons skilled in the art from the following detailed description of a preferred embodiment accompanied by the attached drawing wherein identical reference numerals will refer to like parts in their various views.

THE DRAWING

FIG. **1** is a side elevational view of a portable study center constructed according to the present invention with portions of the tub and cabinet broken away;

FIG. **2** is a vertical cross sectional view taken through the sight line **2—2** of FIG. **1**; and

FIG. **3** is a plan view of the system of FIG. **1.**

DETAILED DESCRIPTION

Referring then to the drawing, reference numeral **10** generally designates a cabinet which is equipped with lockable forecasters **11** and a pair of front doors **12** which may be opened to gain access into the interior. The central upper portion of the cabinet **10** is open, as at **13** in FIG. **2.** Covering the opening **13** and located above the cabinet **10** is a tub generally designated by reference numeral **14.** The tub **14** has a water inlet **15** and a drain end **16.** The drain end **16** of the tub **14** is connected by means of hinges, one of which is shown in FIG. **1** and designated **17,** to the top of the cabinet **10.** At the water inlet end of the tub **15,** there is provided a mechanism generally designated by reference numeral **18** for raising that end of the tub about the hinges **17.** The height-adjusting mechanism **18** includes a handle **19** connected to a horizontal rod **20** which, in turn, is connected to vertical rods **21** pivotally attached to the bottom of the tub **14** by means of flanges, one of which is shown in FIG. **1** and designated **22.**

The tub **14** includes a flat bottom **23,** first and second shorter upright sides **24** and **25,** and first and second elongated side panels **26** and **27.** Preferably, the bottom **23** and shorter sides **24** and **25** are integrally formed, as by molding, into a single piece of opaque plastic. On the upper surface of the bottom **23,** a metric grid is provided as at **28** in FIG. **3.** The grid **28** may be inscribed into the plastic or it may be printed on it. The longer sides **26** and **27** are preferably of a transparent material, such as safety glass with grid lines **29** silk-screened thereon. The combination of grids on the bottom and sides of the tub, together with the transparent sides **26** and **27** has been found to greatly facilitate measuring and recording of movements of the land mass (generally designated by reference numeral **30** in FIG. **3**), particularly over longer periods of time.

At the drain end **16** of the tub **14,** there are provided first and second drains **32** and **33,** each of which is equipped with a flexible hose extending beneath the bottom **28** of the tub **15** (and designated respectively **32*a*** and **33*a*** in FIG. **2**). The conduits **32*a*** and **33*a*** drain into a first bucket **34** housed within the cabinet end and provided with an overflow to **35.** A second bucket **36** is positioned within the cabinet **10** so as to collect water overflowing from the first or separation bucket **34.** That is, any earth, silt or sand that may drain from the tub **14** will fall to the bottom of the first bucket **34,** so that only clear water will be collected in the bucket **36.**

The draining of water from the tub **14** is metered by means of a plate generally designated **37** and provided with two apertures **38** and **39** which are aligned with the drains **32** and **33** in the tub when the metering plate **37** is in the position shown in FIG. **3**—i.e., abutting the side wall **26** of the tub **14.** The metering plate may be moved lengthwise to partially or fully cover the drains and thereby minimize water flow from the tub. The stoppage position of the apertures in the metering plate

37 are shown by the dashed circles **38***a* and **39***a* respectively.

The bottom of the bucket **36** is provided with a drain **40** which feeds into a tee **41.** One end of the tee **41** is connected to a flexible drain conduit **42** provided with a hose clamp **43** so that the contents of the bucket **36** may be drained and discharged, if desired. The other end of the tee **41** is coupled to a recirculating pump **44** by means of a conduit **45.** The output of a pump **44** is coupled by means of a flexible conduit **46** to a fitting **47** in the bottom **23** of the tub **14.** The top of the fitting **47** is provided with a flexible hose **48** fitted with a hose clamp **49** for recirculating water into the inlet end **15** of the tub **14.**

A plate **50** having a cross section (as seen in FIG. **1**) in the shape of an L, is press fitted into a transverse groove **51** formed in the bottom **23** of the tub **14.** The groove **51** formed in the bottom **23** of the tub **14.** The groove **51** is located inwardly of the end wall **24** so as to form a trough **53** at the source end **15.** Inlet water is stored in the trough **53,** and the plate **50** serves as a dam for simulating ground overflow of water over the land mass **30.** As indicated by the dashed showing of **50***a*, the plate **50** may be inverted so that its shorter side forms the dam wall, thereby reducing the height of the dam relative to the bottom **23** of the tub **14.** In either case, the groove **51** holds the dam.

Ordinarily, the land mass **30** is in the position shown—that is, immediately downstream of the dam **50**; and the body of water (if wave motion is desired) is located toward the drain end **16.** Adjacent the drain end **16** there is located a hand-actuated paddle generally designated **54** and, as can be seen best in FIG. **2,** extending transversely of the tub **14** almost its entire width. The paddle **54** is moved by means of a handle **55** which is connected to a shaft **56** mounted to the side walls **26, 27** of the tub **14** by means of clips **58.** As has been mentioned, the simulation of waves by means of a mechanically operated paddle has been found to have a different effect than that which occurs naturally. In order to simulate more closely the natural effect of waves, an air blower generally designated **60** in FIG. **1** is housed within the cabinet **10,** and it feeds a flexible hose **61** which may be placed over the top of the tub **14** adjacent the drain end **16.** The discharge end of the hose **61** is provided with a nozzle **62,** and the discharging air, when directed onto the body of water in the tub simulates a steady wind over the surface of the water.

Articulated cover panels are provided at each end of the tub **14** for covering the same when the study center is not in use. The articulated panel for the drain end **16** is generally designated by reference numeral **65,** and the one for the inlet end is generally designated **66** in FIG. **1.** Since each of these cover panels is similar, only the panel **65** need be discussed in further detail. The articulated panel **65** includes first and second panel sections **67** and **68** which are joined together by means of a pair of double-pivot hinges **69.** The panel **67** is connected to the end wall **25** of the tub **14** by means of a second pair of hinges **70.** A lip **71** is connected to the end upright wall of the cabinet **10** so that the articulated panel **65** may be placed in the position shown in solid in FIG. **1** wherein the outer panel section **68** serves as a brace, and the inner panel section **67** forms a horizontal counter surface. In covering position, the panels are extended as shown in dashed line at **65***a* in FIG. **1** for covering the open top of the tub **14.** A third position for the articulated panel **65** is shown at **65***b* in FIG. **1** wherein the panel sections hang straight down. The articulated panel **66** may similarly have three use positions, although only two are shown in the illustrated embodiment.

Two overhead lamps designated **73** are supported by means of a conduit **74** over the tub **14.** The lamps **73** may be heat lamps so as to serve a dual function—namely, to illuminate the land mass under study and, secondly, in order to dry out the land mass more rapidly.

The stream table study center of the present invention has substantial versatility in use, accommodating the study of different types of soil or land as well as different types of wave motion and over-land water flow. Further, different environmental conditions can be simulated by means of the heat lamps **73,** and a continuous recirculation of water is possible without the need to attach the apparatus to an exterior water source. That is, the unit is self-contained.

Having thus disclosed a preferred embodiment, persons skilled in the art will be able to modify certain of the structure that has been illustrated and to substitute equivalent elements for those which have been described while continuing to practice the invention; and it is, therefore, intended that all such modifications and substitutions be covered as they are embraced within the spirit and scope of the appended claims.

I claim:

1. Apparatus comprising: a tub for holding a land mass and water and including a bottom and first and second pairs of opposing side walls, at least one pair of said side walls being transparent, a measuring grid including a first plurality of equally spaced lines on at least one of said transparent side walls extending parallel to said bottom and a second plurality of equally spaced lines on said one side generally perpendicular to said first lines and intersecting therewith, said bottom being marked with a similar grid for measuring land movement, said tub defining a drain end and a water inlet end; drain means in the drain end of said tub for metering the outflow of water therefrom; water separation means receiving the drain water from said tub for separating the water from particulate matter; pump means communicating with said water separation means for recirculating the separated water into said tub at the water inlet end thereof.

2. The system of claim **1** further comprising a dam including a plate formed in the shape of an L for fitting into a groove transversely formed in said bottom of said tub adjacent the water inlet end thereof and spaced from an opposing side wall to form a trough for receiving and storing the inlet water from said recirculating pump, said tub adapted to hold said land mass immediately downstream of said trough whereby water passing over said dam will pass over the surface of said land mass to said drain end of said tub; and means for selectively tilting the water inlet end of said tub upwardly relative to the drain end thereof.

3. The system of claim **2** further comprising an open-top cabinet for housing said water separation means in said pump; and means for hingedly mounting the drain end of said tub to said cabinet.

4. The system of claim **2** further comprising a source of air including a fan and a flexible hose provided with a nozzle at its discharge end for simulating wind over the body of water held to the drain end of said tub.

5. The apparatus of claim 2 further comprising an open-top cabinet; means for hingedly connecting the drain end of said tub to said cabinet to cover the open top thereof; means for selectively raising the water inlet end of said tub relative to the drain end thereof by reaction with said cabinet; and caster means mounted beneath said cabinet whereby said entire unit is mobile.

6. The system of claim 1 further comprising heat lamp means mounted above said tub for lighting the study area of said tub and for selectively heating said land mass over a period of time.

7. The system of claim 5 further comprising a pair of articulated panels connected respectively to the water inlet end and the drain end of said tub for covering said tub when it is not in use, said articulated panels being selectively movable to a use position uncovering said tub, at least one of said panels being selectively positionable in the third position to form a horizontal shelf adjacent the drain end of said tub.

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