United States Patent [19]

Killmer et al.

[11] **3,710,579**

[45] **Jan. 16, 1973**

[54] PORTABLE COFFER DAM AND METHOD OF MAKING

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[22] Filed: **May 13, 1971**

[21] Appl. No.: **142,971**

[52] **U.S. Cl.** **61/46,** 61/34

[51] **Int. Cl.** **E02b 1/00**

[58] **Field of Search** ..... 61/46, 46.5, 34, 82, 41 R

[56] **References Cited**

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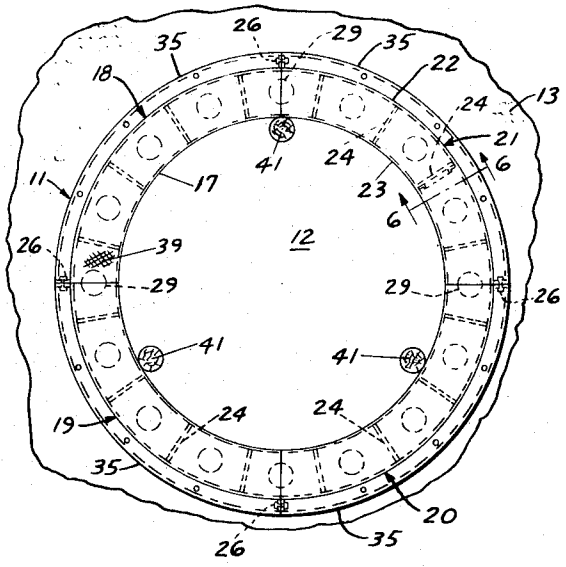
[57] **ABSTRACT**

A portable coffer dam consisting of a plurality of rings, each ring consisting of a plurality of sections, each section comprising a pair of side plates spaced by trusses, end plates, attaching means, plastic foam filling between the plates, ballast and a compressed air flotation element in the plastic foam, with exhaust and recompressing means on the flotation element, together with sealing means between the sections and rings.

The method consists of fabricating the ring sections, foaming them on land, floating them to the site and then assembling the sections into rings on the site, lowering the rings into stacked position by adjusting the flotation elements to form the coffer dam.

7 Claims, 8 Drawing Figures



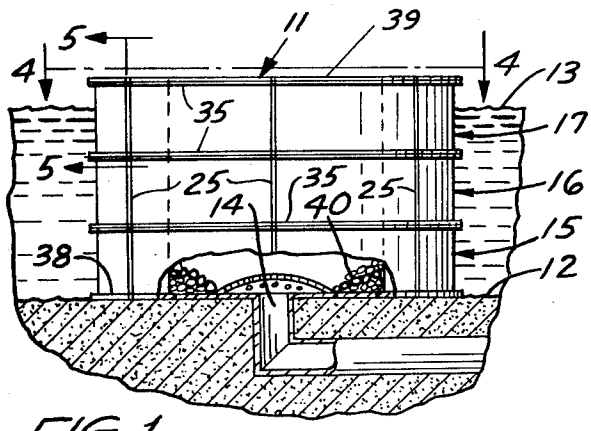


FIG. 1

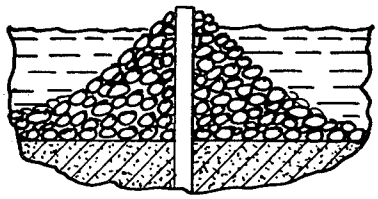


FIG. 2

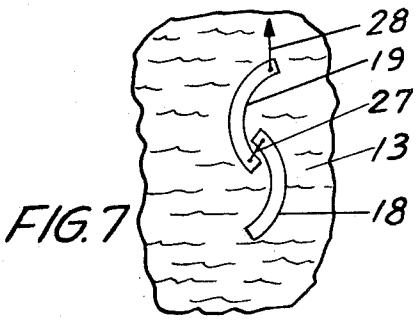


FIG. 7

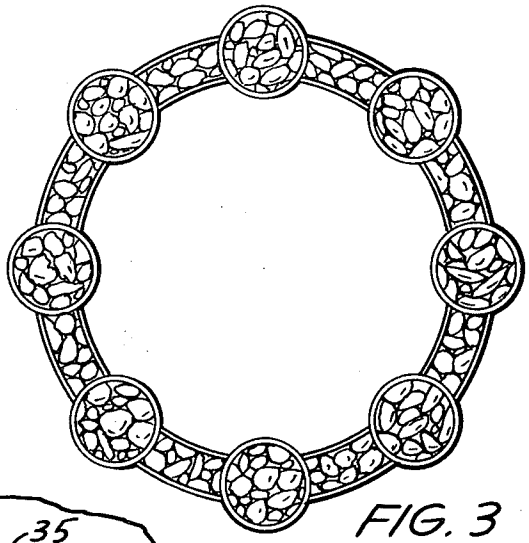


FIG. 3

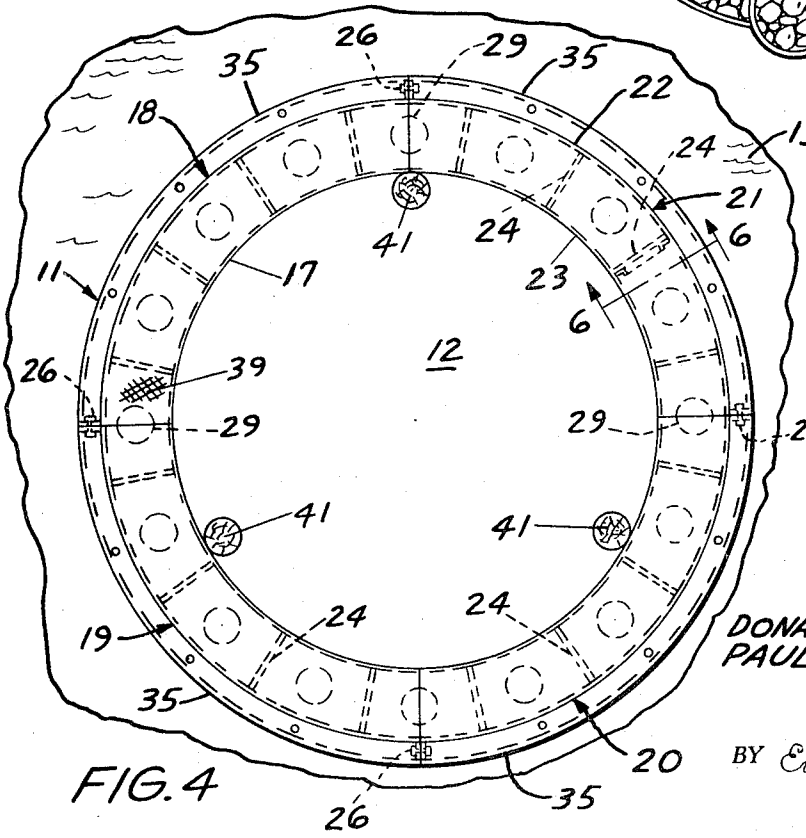


FIG. 4

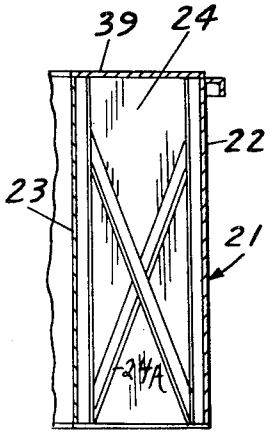


FIG. 6

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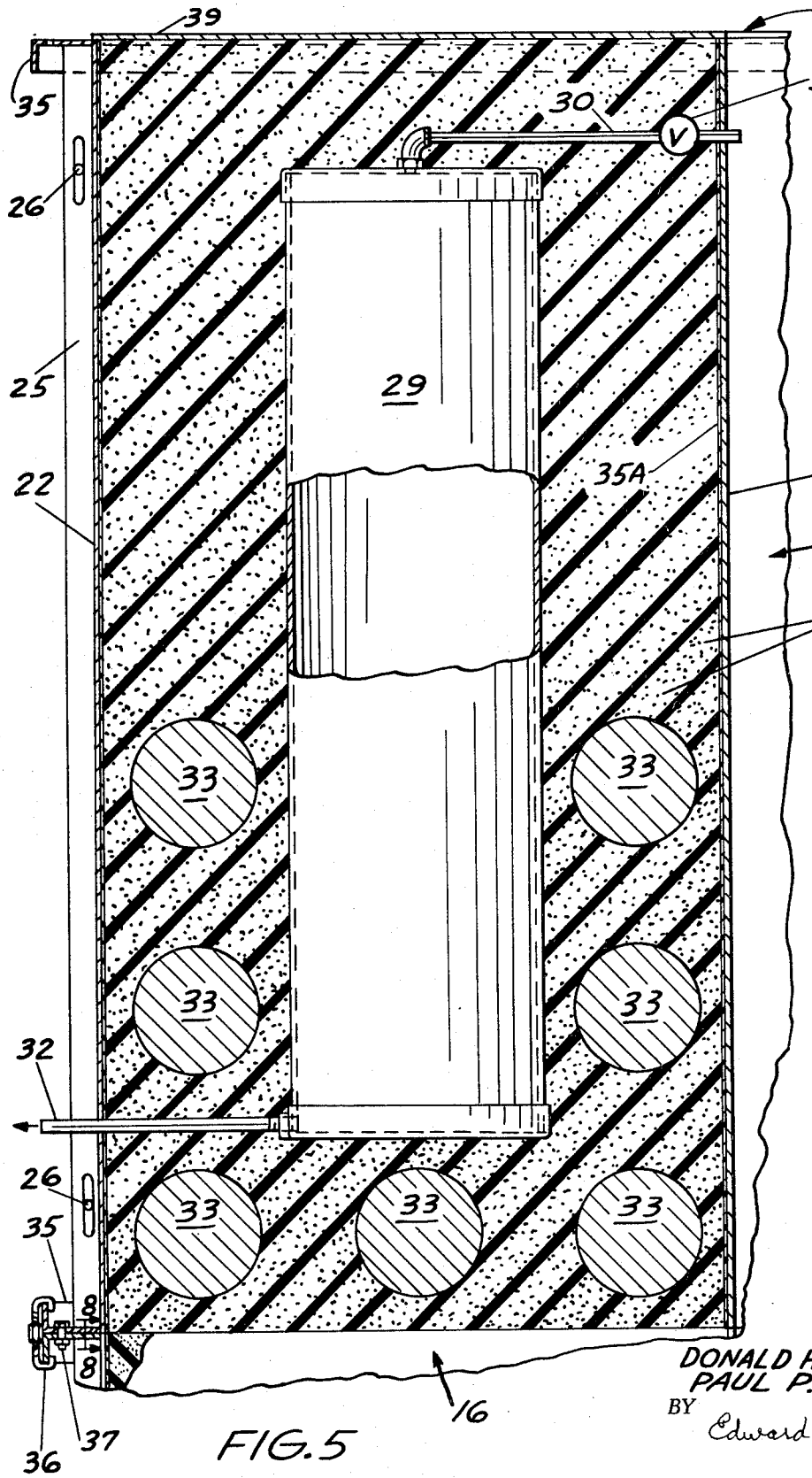

FIG. 5

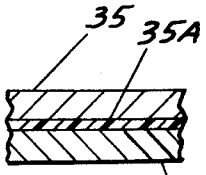

FIG. 8

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PORTABLE COFFER DAM AND METHOD OF MAKING

Heretofore it has been the practice to construct coffer dams by one or the other of the following methods: 1. An island is first built on the bed of a lake, or a river, by dumping rocks, clay and the like to a greater depth than the water level and then drilling a shaft through the island. 2. The second method is to drive rows of steel pilings into the bed of the lake or stream in circular configuration, and fill the space between the rows with rocks, etc.

Both of these methods involve enormous cost in time and material, and result in the total destruction of all forms of marine life in a wide area. Further than that, the stone and filling material has to be entirely removed or allowed to remain there to be a hazard to navigation and a permanent detriment to the ecology.

It is therefore an object of this invention to obviate the foregoing difficulties.

It is a further object of the invention to fabricate the coffer dam parts on dry land, float the parts to the site and erect the dam on the site.

Another object of the invention is to provide a coffer dam, which may quickly and economically be constructed on the site, without the attendant problems of open water construction.

Another object of the invention is to provide a coffer dam, which may quickly be erected on the site, without prolonged interference with navigation.

Another object of the invention is to provide a coffer dam for a water intake, which may be easily and quickly removed from the site, when it has served its purpose, so that the water intake can be used almost immediately upon its completion.

Another object of the invention is to provide a coffer dam, which may be constructed on site, without the necessity of first creating a large island and fill in, which after the removal of the coffer dam must, itself, be removed or leveled off over a wide area.

Another object of the invention is to provide a coffer dam, which may quickly be erected on site, with little or no disruption of marine life beyond the immediate area of the dam itself.

Another object of the invention is to provide a coffer dam, which may be economically installed and removed, thereby obviating the necessity of recovering stone, or clay, or other filling, and without the necessity of removing sheet pilings and the like, all of which is time consuming, costly, and difficult of performance.

Another object of the invention is to provide a coffer dam, which may be used and removed from the site, without the necessity of leaving behind a surplus of scrap material, which would become a hazard to navigation and a detriment to ecology of the area.

Another object of the invention is to provide a coffer dam, the sections of which are fabricated in part with a high density urethane foam as one of the main structural materials, which foam may be applied to the sections while on dry land.

Another object of the invention is to effect economy of manufacture, greater strength and maneuverability by the use of urethane foam.

Another object of the invention is to provide a coffer dam, which is constructed of floatable sections which may be used and reused at different sites.

Another object of the invention is to provide a coffer dam, which is constructed of separate, plastic foam charged, rings, which are foamed into rings with means to seal all joints between sections and rings.

Another object of the invention is to provide a coffer dam, which is constructed of sections, each of which is provided with a flotation element, having valving for controlling the release and intake of air and the rate of descent during installation.

Another object of the invention is to provide a coffer dam, which is constructed of sections, each of which is provided with a compressed air flotation element, which may alternately be filled with air or water.

Another object of the invention is to provide a coffer dam, which is constructed of sections, with flotation means therein, which can be regulated and controlled to increase, or decrease, draft during transportation from site to site.

Another object of the invention is to provide the means and method for constructing a coffer dam, which are not affected by high winds or heavy seas.

Another object of the invention is to provide a coffer dam, which may be constructed, on site, with little or no pumping necessary to maintain a dry working area.

The foregoing and other objects and advantages of the invention will become more apparent as the description proceeds, reference being made from time to time to the accompanying drawing, forming part of the within disclosure, in which drawing:

FIG. 1 is an elevational view, partly in section, illustrating a coffer dam embodying the invention, employed in connection with a water intake system, such as used by cities and municipalities.

FIG. 2 is a fragmentary detail, in section, illustrating one of the present methods of constructing a water intake by first building an island of stone and then sinking a shaft through the center of the island.

FIG. 3 is a top plan view of a coffer dam built by another common method, wherein steel casements and piling are driven into the water bed and then filled with rocks.

FIG. 4 is an enlarged, top plan, view of the structure shown in FIG. 1.

FIG. 5 is an enlarged vertical section taken substantially on the line 5—5 of FIG. 1.

FIG. 6 is a section taken on the line 6—6 of FIG. 4.

FIG. 7 is an end view of a pair of ring sections fastened together, and being transported, by flotation, from the land construction site to the site where the coffer dam is to be erected.

FIG. 8 is a section taken substantially on the line 8—8 of FIG. 5, and illustrating the flexible plastic gasket and sealing material.

Referring now more particularly to the drawings, it will be understood that in the embodiment herein disclosed, the reference character 11 indicates, in general, the coffer dam which has been constructed on the bottom 12, of a lake 13, to provide a water intake 14 for a municipal water supply.

In FIG. 2, we illustrate one of the presently known methods of making a water intake, by forming an island of rocks and sinking a shaft through the center of the island.

In FIG. 3, we illustrate the method of making a coffer dam by the use of steel casements and sheet piling and filling the voids with rocks.

Referring to FIG. 1, which is the embodiment of our invention, the coffer dam 11 consists of three rings 15, 16, and 17, each of which is constructed of sections as hereinafter described. In the embodiment shown in FIG. 1, only three rings are required to build the coffer dam 11, from the lake level 12 to the desired height above the level of water 13. In some applications, it will be necessary to use a greater number of rings where the depth of water is greater.

Each ring 15, 16, and 17 consists of a plurality of arcuate sections 18, 19, 20, and 21. In this application, only four arcuate sections are required to make up a ring of sufficient diameter to meet the requirements of the water intake 14 (FIG. 1). Although we illustrate in FIG. 4 the use of arcuate sections to make a round coffer dam, it will be understood that the sections could also be made straight, so that a rectangular, or other geometrical figure, in cross section, coffer dam, could be constructed. In any event, each section would be constructed as hereinafter described.

Each ring section 18, 19, 20, and 21 consists of an outside plate 22, and inside plate 23, which are spaced from one another by means of members 24 and 24A. Each plate is also provided with a flange 25, so that the sections may be joined together, as at 26, by bolts, or other suitable means. The sections 18, 19, 20, and 21 are preferably fabricated on dry land, so that they may be floated from the land site to the coffer dam site, as shown in FIG. 7, wherein two of the sections are secured together as at 27, and are towed in the direction of the arrow by a towing cable 28.

In order to provide buoyancy for the sections 18, 19, 20, and 21, we insert in each section, one or more compressed air tanks 29, (FIG. 5) each tank being provided with an air inlet 30, having a solenoid valve 31, and a water intake and exhaust 32, whereby we can control the amount of buoyancy and rate of descent of the rings as they are being finally assembled into the dam. Each section (FIG. 5), is also provided with suitable ballast 33, in the form of steel balls, heavy iron chains, or other type of ballast, The interior of each section is finally foamed in place, with a high density, poly urethane resin 34, which adds great structural strength to the sections, and because of its buoyancy permits the sections to be floated from the land site to the coffer dam site for erection. The poly urethane foam 34 is preferably shot into each section in the form of a liquid, which includes the components of the urethane system, blowing agents, catalysts, fire retardants, activators, etc., all of which are conventional materials used to make the poly urethane foam 34.

Before the sections are foamed in all of the interior surfaces, flanges, etc., are sprayed with polyester of epoxy resin to form a seal to prevent loss of foam during foaming operation and to provide gaskets and sealing elements between the parts.

As shown in FIG. 5, each section is also provided with an angular flange 35, so that the stacked rings may be secured together by means of clamps 36, bolts 37 or other suitable means. As shown in FIG. 1, the coffer dam 11 is provided at the bottom with a base plate 38 and at the top with a head plate 39, which is preferably provided with a roughened surface, so that workmen may safely walk about on top.

The top ring 17 may have an opening therein so that ballast such as filings, pig iron and the like may be added after the ring is placed in position. This gives high mass as the top ring floats high enough out of the water to clear previous rings.

After the ring sections are formed, as hereinabove described, they may be filled with compressed air and floated from the land site to the site of the dam, they are secured together to form rings. The first ring 15 is lowered into place, by exhausting part, or all, of the compressed air from the tanks 29, allowing water to enter the tanks through the intakes 32, until the ring descends to ground level. The next ring 16 (FIG. 1) is then fabricated and lowered into position on top of the ring is, ring 17 is arranged in a like manner so that the top of the ring 17 extends well above the water level 13. As previously stated, each section and each ring is provided with a sealant 35A between the contacting parts, so that the coffer dam 11 is made water tight.

After the water intake 14 has been constructed, the intake is preferably surrounded by rocks 40, and the water inlet is ready for use.

When the coffer dam 11 has served its purpose, it may be disassembled into the multiple sections. The air tanks, are again filled with compressed air so that the sections can be floated to another site and reused, leaving behind only the water intake and the few rocks necessary, and without leaving any refuse, such as an island of stones, steel sheeting, and the like, used in other methods and with a minimum of permanent ecological impairment.

In order to help guide the rings 15, 16, and 17 into proper vertical alignment, we may provide piles 41, which can easily be removed after they have served their purpose.

It is believed that the operation of the device is obvious from the foregoing description.

Having described our invention, what we claim and desire to secure by Letters Patent is:

1. A coffer dam consisting of a plurality of rings stacked one upon another, each ring comprising a plurality of sections, each section having an inside plate and an outside plate secured together in spaced relation, the space between said plates being filled with a rigid poly urethane plastic foam, means to secure said sections together to form a hollow ring and means to secure said rings together to form the dam.

2. The structure of claim 1, in which each said section, in addition to said foam, is provided with ballast, and a compressed air chamber having intake and exhaust passageways, there being a solenoid valve in at least one of said passageways.

3. The structure of claim 1, in which the plates of each said section are provided with flanges along each edge, whereby said sections and said rings may be connected to one another.

4. The structure of claim 3, in which the inside face of each section and each flange is sprayed with a flexible poly urethane plastic foam.

5. The structure of claim 1, in which the upper ring of said stack of rings is partly above water lever, there being a base plate beneath said stack and a head plate on the top of said stack, said head plate having a non-slip surface for permitting walking thereon.

6. The method of constructing a coffer dam which consists of the steps of fabricating, on dry land, pairs of spaced, flanged, plates into sections, spraying the in-

sides of said sections and said flanges with a flexible plastic material, providing each section with ballast and a compressed air chamber, filling said sections with rigid polyurethane plastic foam, floating said sections to the coffer dam site, assembling said sections into ring like members in the water and then stacking said ring like members in the water to form the dam.

7. The method of claim 6, in which the steps of assembling the the sections into rings and the stacking of the rings is accomplished by floatation, utilizing the inherent buoyancy of the plastic foam, and the compression and decompression of the air chambers.

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