RETAINING DAM PROVIDED WITH A WATERPROOF LINING

Filed Dec. 14, 1951
A retaining dam provided with a waterproof lining

Alfred Kretzschmar, Kulmbach, Germany

Application December 14, 1951, Serial No. 261,731

Claims priority, application Germany December 18, 1950

7 Claims. (Cl. 61—30)

When constructing reservoir embankments or retaining dams as required especially for producing water power, for flood protection, and for drinking water supply, which dams may have a height up to 100 meters, it is very difficult to effectively prevent the damned water from trickling through the dam. In the known dams for which concrete cores provided with linings consisting of layers of clay or the like are characteristic, leaks occur especially near the base of the retaining dam causing the water to penetrate into the dam in a continuously increasing degree. These leakages caused by the percolating water are very considerable and are still further enhanced by the fact that the mass of the retaining dam, consisting essentially of soil, is subject to natural movements. With increasing leakage, complicated caulking work becomes necessary. Besides, these constant repairs are very expensive.

It has been suggested to avoid these difficulties by omitting the insertion of concrete cores or similar armouring in the center of the dam and providing the retaining dam with a fluidproof coating at its water-side surface. However, such suggestions—which have not become known—do not help as the unavoidable pressure of the water masses has a component pushing the water-proof coating with the result that the coating becomes damaged and slides downwardly. These phenomena increase with the dimensions of the retaining dams.

The invention also stems from the idea to provide the water-side surface of the retaining dam with a fluid-proof coating. It, however, avoids the mentioned disadvantages in that the waterproof lining, according to the invention, is subdivided coffer-like to form individual fields, the dilimitations or enclosures of which are solidly anchored within the retaining dam. The dimensions of these fields are such that the pushing component arising within the individual fields must not suffice to cause the fluidproof coating to slide down within the field. In pursuance of the idea, according to the invention, the dimensions of the fields become smaller as the depth of the water increases, as the pressure exerted on the field is dependent on the water column pressing down upon the field.

For the purpose of further diminishing the danger that the bitumen layer slides down within the individual fields, according to another feature of the invention, care is taken that the uppermost bitumen layer of the individual fields is supported by a bitumen layer extending across the bitumen layer of the neighbouring field.

If a still increased adhesion between the bitumen layer and the retaining dam is desired, according to a further feature of the invention, within the individual fields formed by anchored enclosing beams a further subdivision is made by inserting concrete lists or ledges of a smaller height also coffer-like, said lists or ledges extending into the tightening bitumen layer from below.

The bitumen layer may be a simple or a double or a multiple one, in the last case a suitable filling material being inserted. The enclosing walls consist, according to the invention, of concrete beams, preferably armoured with strings of steel wire, the beams being inserted into the material of the retaining dam and anchored there by suitable armouring.

According to still a further feature of the invention the enclosing beams are arranged so as to join each other with their end faces. The unavoidable beams are suitably filled with fluidproof materials, such as bitumen or the like. Further, in many cases the enclosing beams may be anchored to each other by reinforcing metal for the purpose of attaining a stronger lateral stability.

For surely avoiding the penetration of water into the retaining dam also at the transitions from field to field, the bitumen layer of a field is supported by a further bitumen layer below the first mentioned one, said further bitumen layer overlapping the bitumen layer of the neighbouring field. By such overlapping a solid holding action is exerted on the neighbouring bitumen layer and thereby the danger of sliding is avoided.

One embodiment of the invention is shown in the drawing in which:

Figure 1 is a diagrammatic section through a dam; Figures 2, 3 and 4 are embodiments showing the development of the watertight lining of the dam; and Figure 5 is a partial top view on the box-like arrangement of the supporting beams.

The dam 1 shown in section has at 2 a watertight lining. The individual panels 3 are anchored by iron 5 to the limits or peripheral walls 4 within the dam. As can be noted from Figure 1, the individual panels are larger in the vicinity of the liquid level. They become smaller with increasing height of liquid. The box-like panels 3 are filled, as can be noted especially from Figure 2, with a layer of bitumen 6. However, two or more bitumen layers 6 and 8 can be provided as shown in Figure 3, between which a suitable filling material is interposed. As can be noted from Figures 2 and 3, the uppermost bitumen layers 7 and 8, respectively, of each panel rests on the bottom against a layer of bitumen and extends over the bitumen layer of the neighboring panel, due to which a watertight lining is obtained.

The peripheral walls for the individual panels can be made of concrete beams. For this purpose there are particularly well suited reinforced concrete beams.

As can be noted from Figures 1 to 4, beams 4, which form the peripheral walls of the individual compartments are firmly anchored by reinforcing iron 5 in the dam. Furthermore, as can be noted from Figure 5, the beams 4 are staggered. They butt one another. The gaps between the individual butting beams are to be filled in accordance with the present invention with packing material, for instance in the form of bitumen. Furthermore the peripheral beams 4 should be connected with one another by reinforcing iron or by similar anchoring means.

It is also within the scope of the present invention to provide within the peripheral beams 4 a further subdivision by the provision of straps (members) 10 of lesser height as can be noted from Figures 4 and 5; these then extend into the sealing bitumen layer 11 from the bottom.

What I claim is:

1. A retaining dam comprising a body of earth having a sloping face, partitioning members dividing said face into a plurality of polygonal fields, means anchoring said members to said body, and a layer of waterproof material covering each said field.

2. A dam as defined in claim 1, said fields diminishing in area as their distance from the top of the dam increases.

3. A dam as defined in claim 1, said waterproof material comprising bitumen.
4. A dam as defined in claim 1, each said layer of waterproof material overlapping an adjacent layer.

5. A dam as defined in claim 1, including further partitioning members subdividing at least some of said fields, said further partitioning members being seated in said body and extending into said waterproof layer from below.

6. A retaining dam comprising a body of earth having a sloping face, partitioning members dividing said face into a plurality of polygonal fields, means anchoring said members to said body, a layer of waterproof material covering each said field, a layer of filling material resting upon said waterproof layer, and a second waterproof layer covering said filling material.

7. A dam as defined in claim 6, said second waterproof layer overlapping the second waterproof layer of an adjacent field.

References Cited in the file of this patent

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