Dec. 26, 1933. A. NORDIN 1,941,183

DAM

Filed Nov. 15, 1932

FIG. 1.

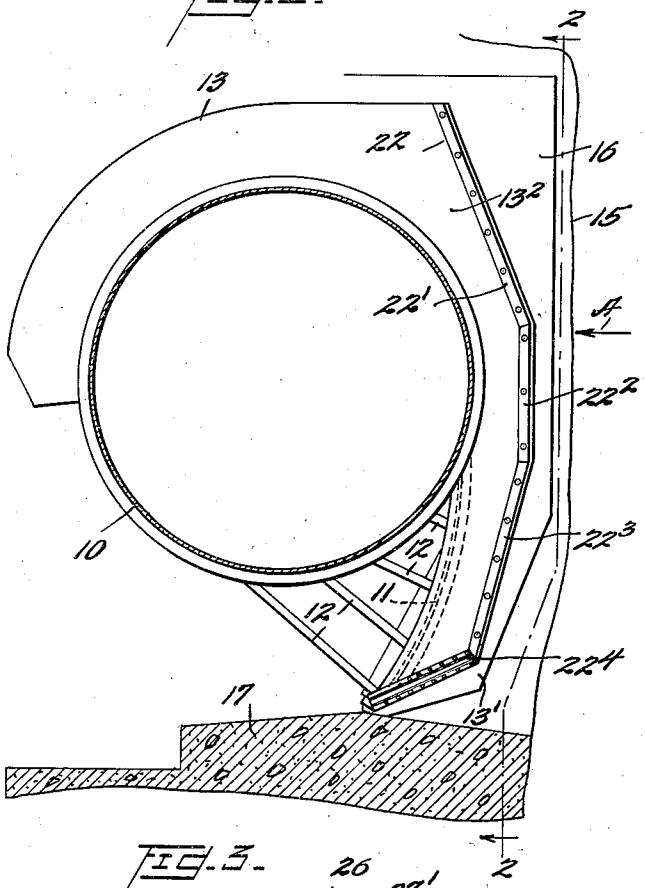


FIG. 2.

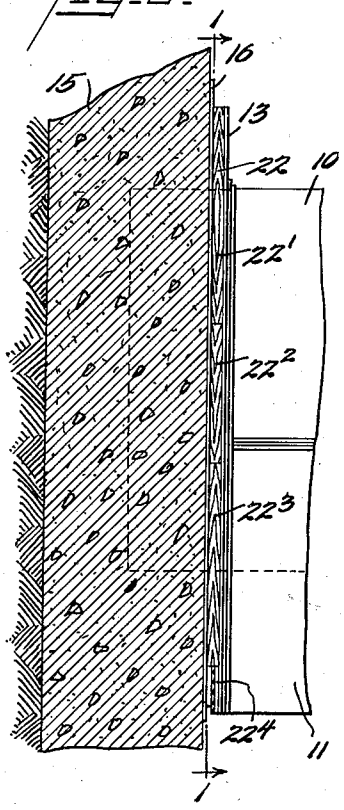


FIG. 3.

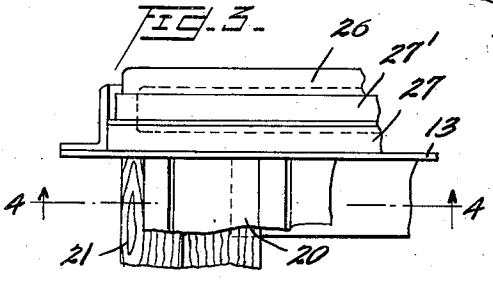


FIG. 5.

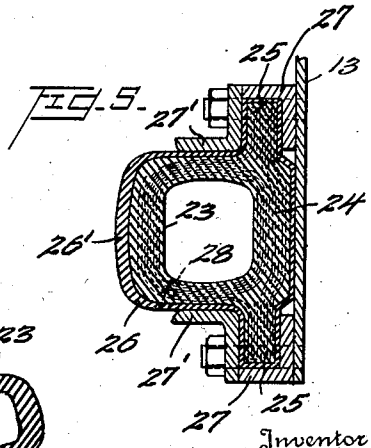
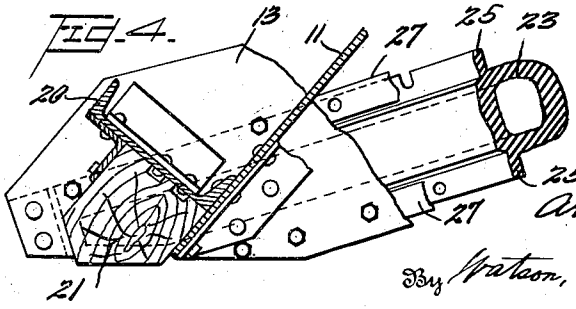


FIG. 4.



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UNITED STATES PATENT OFFICE

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DAM

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Serial No. 642,798

9 Claims. (Cl. 61—22)

This invention relates to dams and particularly to water sealing means for preventing the flow or escape of water between the ends of the gate structure of the dam and the lateral abutments between which the gate structure is positioned.

In designing dams of modern type and working out the problems incident to the control of floods, projects for irrigation, and the like, it is the tendency to require movable gate structures of considerable length, thus making necessary the use of steel in order that the gate structure may be able to withstand the great pressure which the impounded water exerts against the same when the gate structure is in its lowered position. It naturally follows that the water sealing means interposed between the ends of the gate structure and the lateral abutments of the dam must be of such nature as to permit longitudinal expansion and contraction of the gate structure itself without permitting water leakage and without resulting in strain or breakage of the gate structure proper. It will be appreciated that an elongated gate which is fabricated of steel will change considerably in length from season to season, contracting with decrease in temperature and expanding with increase in temperature.

Roller gates having end shields are frequently made of relatively great length, and the present invention contemplates a lateral sealing means which is particularly suitable for use in connection with gates of this type where it is required that the sealing means be interposed between the end shields and the stationary abutments. The end shields of a water gate of the drum or roller type are fabricated of plates which extend in an upstream direction at the ends of the gate structure, and, due to the way in which these end shields are supported, certain portions of them may flex due to axial pressure while other portions are substantially inflexible. In carrying out the invention, I apply to the outer sides of each of these end shields an elongated continuous sealing strip, that portion which is secured to the flexible portion of the end shield being preferably formed of wood or other inflexible or inelastic material while that portion which is attached to the non-yieldable portion of the end shield is formed of elastic or resilient material such as rubber. While the gate structure is in lowered or water impounding position, therefore, it may freely expand and contract without breaking the seal between its ends and the abutments and without straining any portions of the gate, the flexible portion of the end shield bending slightly as the gate changes in length and the inflexible portion thereof compressing the resilient sealing strip or allowing the same to expand, as the case may be.

The invention is thus particularly suitable for application to gate structures of the roller or drum type having end shields, but it will be appreciated that the invention is in nowise limited to application to any specific type of gate structure but may be utilized wherever it is found that a gate structure has an end, a portion of which is horizontally yieldable under pressure and a portion of which is substantially non-yieldable. Likewise the resilient portion of the sealing strip may be independently employed in connection with gate structures of other types, it having various novel features which render it particularly suitable and efficient.

One embodiment of the invention is illustrated in the accompanying drawing and will be hereinafter described in detail, this embodiment being set forth by way of example.

In the drawing:

Figure 1 is a transverse section through a dam gate structure of the roller or drum type, this section being taken on line 1—1 of Figure 2;

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a plan view of a portion of a lower corner of the gate structure;

Figure 4 is a section on line 4—4 of Figure 3; and

Figure 5 is a transverse section through the resilient portion of the sealing strip.

The gate structure comprises essentially a cylindrical, elongated, and horizontally disposed steel drum 10, an apron 11 affixed to this drum and braced from the drum by means of struts 12, and two ends shields, one of which is indicated at 13, this end shield being formed of metallic plates attached to the drum 10 and apron 11 and having a portion extending in an upstream direction, the direction of water flow being indicated by the arrow A in Figure 1. One of the lateral abutments of the dam is indicated at 15, this abutment having a face plate 16 parallel to the adjacent end shield 13 of the gate. The sill of the dam structure is indicated at 17.

Extending longitudinally of the apron and at its lower edge is a substantial channel member 20 and a wooden beam 21 which comprises a bottom seal for the gate and which is adapted to rest against the sill 17 when the gate is in lowered position. The structure of the lower end of the shield is, therefore, of great rigidity in a longi-

tudinal direction, and, as a matter of fact, so is the entire gate structure including the apron 11 and the drum 10, the gate being axially rigid in all parts thereof and subject only to variations in length incident to variations in temperature. The end shield 13 is, however, not so attached to the gate structure proper that it may not laterally flex, and, as a matter of fact, the major portion of the end shield may flex somewhat if subjected to pressure axially of the gate. The lower portion, however, indicated generally by the reference numeral 13', which is a V-shaped portion, the outer edge of which approaches the apron 11 in a downward direction, is relatively inflexible as compared with the upper portion, indicated generally at 13^2, due to the fact that it is considerably narrower and is rigidly secured to the apron along one edge.

To effectively seal the space between the end shield 13 and the face plate 16 of the adjacent abutment, I provide an elongated continuous sealing strip which follows closely the upstream edge of the end shield, this strip being indicated generally at 22. Due to the fact that it is not straight, it is preferably formed in sections indicated at 22', 22^2, 22^3, and 22^4, the first three sections being of wood and adequately secured to the end shield 13 by bolts or the like while the lowermost section 22^4 is formed of resilient material, preferably rubber. In Figures 3, 4, and 5 the details of this lower section 22^4 are more clearly illustrated. It comprises essentially an elongated tube having an inner portion 23 fabricated of relatively soft and resilient rubber reinforced with layers of fabric 24 and having lateral flanges 25. This hollow resilient tube is completely encased in a wear-resisting sheath of harder rubber, indicated at 26, vulcanized or bonded to the core of softer rubber. The sheath 26 of harder rubber protects the interior against excessive wear, being provided especially with a thickened portion 26' which is adapted to have sliding engagement with the metallic plate 16 secured to the abutment 15 when the gate is raised and lowered.

The oppositely projecting flanges 25 extend within grooves formed in the parallel continuous metallic members 27 which are in turn secured to the end shield 13. Each of these members 27 not only comprises means for housing and retaining one of the flanges 25 of the sealing strip but has a flange or portion 27' which constitutes a lateral bracing or supporting means for the sealing strip, preventing excessive deformation of the strip while the dam is being raised or lowered and the tread surface of the strip is frictionally dragging over the surface of plate 16. Flanges 27' also support the sealing strip against lateral pressure due to the impounded water. If desired, apertures such as indicated at 28 (in dotted lines) may be provided on the upstream side of the sealing strip so that water under pressure may enter the hollow interior of the resilient strip and cause it to tightly engage plate 16. The ends of the resilient sealing strip are closed, as indicated in dotted lines in Figure 4.

A sealing means such as just described is of great simplicity and will not become ineffective under any ordinary condition of operation. It is durable and inexpensive. Should the rubber portion of the sealing strip at any time show signs of deterioration, it is a comparatively simple matter to replace it with a new one when the gate is raised. The flexibility of the end shield is taken advantage of so far as it is possible to do so, and, where the end shield is so firmly supported that it may not laterally flex, the ordinary wooden sealing strip is replaced by a section which is resilient. With a strip of the type just described in use, an effective water seal between the end of the dam and the abutment is provided, and at the same time the gate structure is safeguarded against injury by reason of longitudinal expansion. As has been hereinbefore pointed out, the resilient portion of the sealing strip may be used with other dams and may be mounted either upon the gate structure or upon the abutment, as seems most desirable.

Not only does the novel sealing means disclosed function to permit expansion and contraction of the gate due to changes in temperature, but it compensates for any slight manufacturing inaccuracies, or inaccuracies in the placement of the abutments, which result in the ends of the gate being either unexpectedly close to or distant from, the associated abutment, when the gate is installed. The rubber sealing member shown in the drawing has both ends closed, being watertight except for the apertures 28, but this member may have one or both ends open in the event that it is not desired to utilize the pressure of the impounded water to augment its water sealing effect.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. An elongated gate for a dam adapted to be moved vertically relatively to an abutment at its end, said gate having an end shield projecting therefrom on the upstream side and rigidly connected to the gate along the line of contact therebetween, a portion of said end shield being flexible relatively to the gate and the remainder being substantially inflexible, and an elongated sealing member secured to said end shield along the upstream edge thereof and upon the outer side so as to be engageable with the abutment, that portion of said member which is secured to the substantially inflexible portion of the shield being resilient, to permit longitudinal expansion of the gate without damage to the gate or shield.

2. An elongated gate for a dam adapted to be moved vertically relatively to an abutment at its end, said gate having an end shield rigidly secured thereto along the line of contact therebetween and projecting therefrom on its upstream side, a portion of said end shield being flexible relatively to the gate and the remainder being substantially inflexible, and an elongated continuous sealing member secured to said end shield along the upstream edge thereof and upon the outer side so as to be engageable with the abutment, that portion of said member which is secured to the substantially inflexible portion of the shield being in the form of a wooden strip and that portion of said member which is secured to the substantially inflexible portion of the shield being formed of resilient material, whereby endwise expansion of the gate may occur without damage to the gate or end shield, such expansion resulting in flexure of the flexible portion of the end shield and compression of the resilient material affixed to the relatively inflexible portion of the end shield.

3. The combination with the horizontally disposed vertically movable gate structure of a dam having horizontally yieldable and horizontally non-yieldable portions at its end, and an abutment having a vertical face, of sealing means between the end of the gate structure and face

of the abutment, said means comprising an elongated continuous sealing strip secured in part to the horizontally yieldable and in part to the horizontally non-yieldable portions of the gate structure, that portion of the strip which is attached to the non-yieldable part of the gate structure being resilient and that portion attached to the horizontally yieldable part of the gate structure being non-resilient.

4. A sealing member for movable gates for dams comprising an elongated hollow tubular member of relatively soft rubber and a wear-resisting outer portion of harder rubber.

5. A sealing member for movable gates for dams comprising an elongated strip of relatively soft rubber and a protective casing therefor of relatively hard rubber.

6. In a dam gate structure, in combination, a gate element, an elongated resilient member having opposed flanges, elongated parallel separately formed securing devices attached to the gate element, said devices having mutually facing grooves into which said flanges extend and are retained, and means for separately attaching said devices to said gate element.

7. The combination set forth in claim 6 in which said devices are provided with flanges for supporting said member against lateral deflection.

8. An elongated gate for a dam which is adapted to be moved vertically relatively to an abutment at the end thereof, said gate having an end shield of irregular shape projecting therefrom on the upstream side, which shield is disposed in a plane normal to the longitudinal axis of the gate and parallel to the adjacent face of the abutment, said shield being rigidly connected to the gate along the line of contact between the shield and gate and the shortest distances between the gate and the upstream edge of the shield varying at different points along said line of contact, and an elongated sealing member secured to said end shield along the upstream edge thereof and upon the outer side, said member comprising a non-resilient portion and a resilient portion which may be compressed between the shield and adjacent abutment when the gate expands longitudinally.

9. In combination, a vertically movable gate having an end shield projecting therefrom on the upstream side, said shield being rigidly connected to the gate along the line of contact between shield and gate, an abutment positioned at the end of the gate, and an elongated sealing member secured to said end shield along the upstream edge and upon the outer side, said member closing the gap between the end shield and abutment against the passage of water therebetween when the gate is in closed position, a section of said sealing member comprising an elongated hollow tube of resilient material having its ends closed and having an aperture in the wall thereof on the upstream side to permit water to enter its interior and to exert a force therein tending to press the outer surface of the tube tightly against the abutment, whereby a perfect seal is realized notwithstanding variations in the gap between end shield and abutment due to longitudinal expansion and contraction of the gate.

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