

PATENT SPECIFICATION

(11)

1 600 939

1 600 939

- (21) Application No. 22261/78 (22) Filed 25 May 1978 (19)
 (31) Convention Application No. 52/113761 (32) Filed 20 Sep. 1977 in
 (33) Japan (JP)
 (44) Complete Specification Published 21 Oct. 1981
 (51) INT. CL.³ E02B 3/10
 (52) Index at Acceptance
 E1H 750 D



(54) INFLATABLE DAM WITH AIR PRESSURE RELIEF ARRANGEMENT

(71) We, SUMITOMO ELECTRIC INDUSTRIES LTD., a Japanese Company of No. 15, Kitahama 5-chome, Higashi-ku, Osaka-shi, Osaka, Japan do hereby declare this invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:-

This invention relates to a pneumatically inflatable flexible envelope or wall type dam, and more particularly to a flexible envelope or wall type dam with an air pressure relief arrangement.

Figure 1 shows a conventional, flexible envelope type dam. Referring to Figure 1, shown at 7 is a flexible envelope coated with rubber, which when pneumatically inflated forms a dam, as disclosed, for example, in Japanese Patent Publication Nos. Sho-40-11702 and Sho-44-2371, at 9 a concrete dam foundation member which is installed on the water bed, at 8 side wall portions of the foundation member 9, at 12 an internal-pressure-detecting pipe extending from the bottom of the envelope in the horizontal direction, at 4 an internal-pressure-detecting-pressure guage, at 11 an air-charging-and-discharging pipe extending from the bottom of the envelope in the horizontal direction, at 13 an air charging pipe, at 1 an air supply valve, at 6 a blower adapted to charge air into the envelope 7, at 14 a branch pipe, at 3 a water-seal tube or tub, at 5 water stored in the water-seal tube, at 2 an air discharging valve, at 10 an operation chamber, and at 15 a horizontal portion of the air-charging-and-discharging pipe.

When internal air pressure of the envelope 7 exceeds an allowable predetermined pressure, an excess of air is discharged through the branch pipe 14 connected to the air-charging-and-discharging pipe 11, which opening is submerged in the

water in tube 3. The head (H) of water at the opening corresponds to the allowable predetermined pressure, thereby maintaining the pressure in the envelope 7 at a pressure level not higher than the predetermined pressure.

However when a dam of this type is used for a long period of time in its inflated condition, air in the envelope is cooled by the dammed water and then condensed, with the result that water droplets collect in the air-charging-and-discharging pipe 11 as drain water. For the satisfactory operation of the pressure relief pipe 14, should the drain water fill the horizontal portion 15 of the air-charging-and-discharging pipe 11, it is necessary that this quantity of drain water is lifted through the vertical portion 16 of the air-charging-and-discharging pipe 11 by the air pressure in the envelope.

In general, the length of the horizontal portion of the air-charging-and-discharging pipe 11 is greater than the length H' of the vertical portion 16 thereof, and the length H' is larger than H. As a result, when the pressure relief arrangement becomes operative, the internal air pressure in the envelope 7 is likely to be built up to a level not lower than the allowable design pressure as the drain water is forced up pipe portion 16 into the water-seal tube 3.

In addition, drain water may become trapped in the pipe 12, as well, and should be drained through a valve, not shown, additionally provided, or else the air-pressure gauge 4 would fail to operate normally.

It is therefore an object of this invention to overcome the above-mentioned drawbacks and to provide an inflatable dam having an improved pressure relief arrangement.

According to the present invention, there is provided an inflatable dam comprising a flexible, closed envelope attached to a

50

55

60

65

70

75

80

85

90

(10)

foundation member which, in use, is arranged in the transverse direction of a river to form a dam when inflated, an air inlet and discharge pipe having one end feeding into a bottom portion of said envelope and having its other end provided with a branch pipe, an open end of the branch pipe being submerged in water at a predetermined head corresponding to the air pressure in the envelope when the dam is inflated, and an air pressure detecting pipe having one end leading from a side portion of said envelope and having its other end connected to a generally vertical portion of said branch pipe.

The invention will now be described, by way of example, with reference to Figure 2 of the accompanying drawings, in which is shown a transverse cross-sectional elevation of a dam of the present invention.

Referring to Figure 2, wherein like parts and components are designated by the same reference numerals as those shown in Figure 1, an air pressure detecting pipe 12 leads from a relatively upper side portion of an envelope 7, which portion mates with a slope of a concrete foundation member 9, with the other end of the pipe 12 connecting to a vertical portion 16 of the air inlet and discharge pipe 11. It is however to be understood, that the vertical portion 16 of the air pipe 11 should not necessarily be exactly upright or vertical, but may be at an angle thereto, so that the term 'vertical' in this case, should be construed in the broad sense.

In general, there is no probability that the dam inflated with air is completely filled with condensed water contained in the air. Accordingly, with the dam of the above arrangement, there is no possibility that drain water can fill the air pressure detecting pipe 12, because of its location. In addition, even if the horizontal portion 15 of the air inlet and discharging pipe 11 where to be filled with drain water, excess air pressure may be relieved through the water-seal tube 3 via the pipe 12.

Accordingly, the dam avoids the aforementioned two shortcomings encountered with dams of the conventional type, that is firstly that the air pressure relief arrangement incorporating water-seal tube 3 operates at an air pressure in the envelope 7, which exceeds the design pressure, and secondly that the air pressure gauge 4 may not operate normally.

Meanwhile, the pipe 12 and the air inlet and discharging pipe 11 extend horizontally as in the case of conventional dams, (for the purpose of preventing the accumulation of drain water halfway in the pipes).

From a functional standpoint, the position of the ends of the pipe 11 and 12 at the dam side is not severely restricted by the

positions of the openings of the pipes 11 and 12 at the operation chamber side. However, it is preferable to extend these pipes horizontally or downwardly at an angle towards the operation chamber 10 so as easily to discharge drain water contained therein.

WHAT WE CLAIM IS:-

1. An inflatable dam comprising a flexible, closed envelope attached to a foundation member which, in use, is arranged in transverse direction of a river to form a dam when inflated, an air inlet and discharge pipe having one end feeding into a bottom portion of said envelope and having its other end provided with a branch pipe, an open end of the branch pipe being submerged in water at a predetermined head corresponding to the air pressure in the envelope when the dam is inflated, and an air pressure detecting pipe having one end leading from a side portion of said envelope and having its other end connected to a generally vertical portion of said branch pipe.

2. A dam as claimed in claim 1, wherein said one end of said air pressure detecting pipe opens at an upper part of said side portion of said envelope.

3. A dam as claimed in claim 2, wherein said air inlet and discharge pipe and said air pressure detecting pipe extend horizontally away from the dam envelope.

4. A dam as claimed in claim 1 or claim 2, wherein said air inlet and discharge pipe and said air pressure detecting pipe are downwardly directed away from the dam envelope.

5. A dam as claimed in anyone of claims 1 to 4, further comprising an operation chamber housing said other end of said air inlet and discharge pipe, said branch pipe, and said water in which said open end of the branch pipe is submerged.

6. A dam as claimed in any one of claims 1 to 5, further comprising an air discharge valve provided at said other end of said air inlet and discharge pipe.

7. An inflatable dam substantially as hereinbefore described, with reference to, and as shown in Figure 2 of the accompanying drawings.

MARKS & CLERK,

Alpha Tower,

ATV Centre,

Birmingham B1 1TT.

Agents for the Applicants.

(10)
2



1 600 939

2

foundation member which, in use, is arranged in the transverse direction of a river to form a dam when inflated, an air inlet and discharge pipe having one end feeding into a bottom portion of said envelope and having its other end provided with a branch pipe, an open end of the branch pipe being submerged in water at a predetermined head corresponding to the air pressure in the envelope when the dam is inflated, and an air pressure detecting pipe having one end leading from a side portion of said envelope and having its other end connected to a generally vertical portion of said branch pipe.

The invention will now be described, by way of example, with reference to Figure 2 of the accompanying drawings, in which is shown a transverse cross-sectional elevation of a dam of the present invention.

Referring to Figure 2, wherein like parts and components are designated by the same reference numerals as those shown in Figure 1, an air pressure-detecting pipe 12 leads from a relatively upper side portion of an envelope 7, which portion mates with a slope of a concrete foundation member 9, with the other end of the pipe 12 connecting to a vertical portion 16 of the air inlet and discharge pipe 11. It is however to be understood, that the vertical portion 16 of the airpipe 11 should not necessarily be exactly upright or vertical, but may be at an angle thereto, so that the term 'vertical' in this case, should be construed in the broad sense.

In general, there is no probability that the dam inflated with air is completely filled with condensed water contained in the air. Accordingly, with the dam of the above arrangement, there is no possibility that drain water can fill the air-pressure-detecting pipe 12, because of its location. In addition, even if the horizontal portion 15 of the air-inlet-and-discharging pipe 11 where to be filled with drain water, excess air pressure may be relieved through the water-seal tube 3 via the pipe 12.

Accordingly, the dam avoids the aforementioned two shortcomings encountered with dams of the conventional type, that is firstly that the air pressure relief arrangement incorporating water-seal tube 3 operates at an air pressure in the envelope 7, which exceeds the design pressure, and secondly that the air pressure gauge 4 may not operate normally.

Meanwhile, the pipe 12 and the air-inlet-and-discharging pipe 11 extend horizontally as in the case of conventional dams, (for the purpose of preventing the accumulation of drain water halfway in the pipes).

From a functional standpoint, the position of the ends of the pipe 11 and 12 at the dam side is not severely restricted by the

positions of the openings of the pipes 11 and 12 at the operation chamber side. However, it is preferable to extend these pipes horizontally or downwardly at an angle towards the operation chamber 10 so as easily to discharge drain water contained therein.

WHAT WE CLAIM IS:-

1. An inflatable dam comprising a flexible, closed envelope attached to a foundation member which, in use, is arranged in transverse direction of a river to form a dam when inflated, an air inlet and discharge pipe having one end feeding into a bottom portion of said envelope and having its other end provided with a branch pipe, an open end of the branch pipe being submerged in water at a predetermined head corresponding to the air pressure in the envelope when the dam is inflated, and an air pressure detecting pipe having one end leading from a side portion of said envelope and having its other end connected to a generally vertical portion of said branch pipe.

2. A dam as claimed in claim 1, wherein said one end of said air pressure detecting pipe opens at an upper part of said side portion of said envelope.

3. A dam as claimed in claim 2, wherein said air inlet and discharge pipe and said air pressure detecting pipe extend horizontally away from the dam envelope.

4. A dam as claimed in claim 1 or claim 2, wherein said air inlet and discharge pipe and said air pressure detecting pipe are downwardly directed away from the dam envelope.

5. A dam as claimed in anyone of claims 1 to 4, further comprising an operation chamber housing said other end of said air inlet and discharge pipe, said branch pipe, and said water in which said open end of the branch pipe is submerged.

6. A dam as claimed in any one of claims 1 to 5, further comprising an air discharge valve provided at said other end of said air inlet and discharge pipe.

7. An inflatable dam substantially as hereinbefore described, with reference to, and as shown in Figure 2 of the accompanying drawings.

MARKS & CLERK,

Alpha Tower,

ATV Centre,

Birmingham B1 1TT.

Agents for the Applicants.

Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1981.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.