FORM 25 (12) PATENT granted by (19)

AFRICAN REGIONAL INDUSTRIAL PROPERTY ORGANISATION (ARIPO)

AP31

(11) A

(21) Application Number: AP/P/86/00042

(22) Filing Date: 06.08.86

(24) (45) Date of Grant & Publication 03.12.88

(30) Priority Data:

(33) Country: FR

(31) Number: 85 12184

(32) Date: 06.08.85

(84) Designated States:

BW,GM,GH,KE,MW,SD,UG,ZM,ZW

(73) Applicant(s):

APPLICATIONS ET RECHERCHES ELETROTECHNIQUES AVANCEES A.R.E.A.

(72) Inventor(s):

RENE RIPOLL
VILLA NO.1 RESIDENCE LES MARGUERITES,
CHEMIN DES REVOIRES, LA TURBLE,
F-06320, CAP D'ALL,
MONACO

(74) Representative:

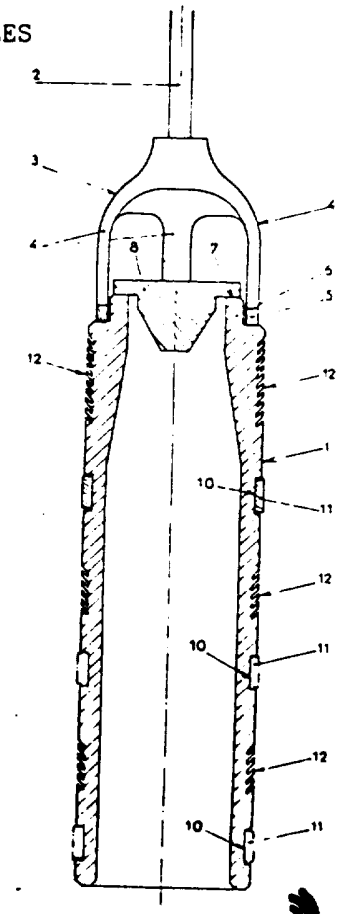
GEORGE SEIRLIS AND ASSOCIATES
P.O.BOX 3568
HARARE
ZIMBABWE

(51) International Patent Classification Int. Cl.[4] F04B21/00, 21/04: F16J 15/44

(54) Title: BOTTOM MECHANISM FOR VOLUMETRIC PUMP FOR DEEP BOREHOLES

(57) Abstract:

The object of the invention is a bottom mechanism for a volumetric pump for deep boreholes of the type comprising a surface mechanism which, by way of a control rod acts on a bottom mechanism forming a shuttle, mobile in a to-and-fro motion in a pumping tube communicating at its lower extremity, by way of a valve system, with a strainer, characterized in that it comprises a hollow cylinder open at its two extremities, the one of which is equipped with a valve system, the said cylinder being connected at its upper extremity to the said control rod, a play in the order of about 1 to 2 mm being provided between the cylinder and the pumping tube, but that, on the outer surface of the said cylinder and/or the inner surface of the said tube, at least one set of parallel circular notches is arranged, preferably inclined and having a shallow depth and narrow width.



(56) DOCUMENTS CITED: DE-2948346 US-3146725
DE-406055 US-2635554

AP31

BOTTOM MECHANISM FOR A VOLUMETRIC PUMP FOR DEEP BOREHOLES

The present invention relates to volumetric pumps used, in particular, for pumping water out of wells or deep boreholes.

This type of pump is well known and comprises a surface mechanism which by way of a control rod actuates a bottom mechanism which is arranged in a pumping tube and consists of a piston associated with a valve, this mechanism forming a shuttle which moves to and fro in the pumping tube and which, during every upward movement, pulls up a certain quantity of water, thus moving the head of water above the piston towards the surface.

The tightness of the pistons provided on most pumps of this type at present on the market is ensured mechanically by means of a leather part which rubs against the wall of the pumping tube in dependence on the water pressure resulting from the depth.

This causes friction which increases the stresses exerted on the control rod; this is a drawback, in particular for hand-operated pumps, and causes wear which is the greater, the deeper the borehole; this poses cost and maintenance problems which may become dissuasive, especially when such pumps are to be used in isolated places, the access to which is difficult and where no adequately qualified labour is available.

The object of the invention is to mitigate these drawbacks by proposing a new type of bottom mechanism which ensures greatly reduced friction and wear.

To this end, the invention proposes a bottom mechanism for volumetric pumps for deep boreholes, of the type comprising a surface mechanism which by way of a control rod acts on a bottom mechanism forming a shuttle which moves to and fro in a pumping tube, the bottom end of which tube communicates, by way of a valve system, with a strainer, characterized in that it consists of a hollow

../..

cylinder open at both ends, one end being fitted with a valve system, which cylinder is at its top end connected to the said control rod, a play of about 1 to 2 mm being provided between the cylinder and the pumping tube, but the outer surface of the said cylinder and/or the inner surface of the said tube being provided with at least one set of parallel circular notches, preferably inclined and having a small depth and width.

Such an arrangement ensures a good tightness by limiting leaks in dependence on the depth, and reduces in a remarkable manner the friction between the cylinder and the pumping tube. It, furthermore, has a never-failing robustness and does not require any maintenance.

Other characteristics and advantages will become apparent from the following description of an embodiment of the device according to the invention, which description is given solely by way of example and with reference to the attached drawing, wherein:

- Figure 1 represents a vertical axial view of a pumping tube equipped with a shuttle according to the invention, and
- Figure 2 is an enlarged sectional view of notches provided in the outer surface of the cylinder of the shuttle.

In Figure 1 the reference numeral 1 represents a bottom mechanism shuttle of a volumetric pump for wells or deep boreholes, according to the invention.

This shuttle 1 consists of a hollow cylinder of stainless steel or another material that has undergone a suitable anti-corrosion treatment or is not susceptible to being corroded by water.

This cylinder is open at both ends, the top end bein; connected to the bottom end of the control rod 2 of the pump.

Tne rod 2 is advantageously made of carbon fibres and is connected to the cylinder by a connection 3 in the form of a tulip with three branches 4 connected by a collar 5 screwed onto the outer face of a cylindrical extension 6

of the shuttle 1, the outer edge of which forms an annular seat 7 for a valve 8 which closes off the end of the shuttle. The valve 8 can move freely in the space present between the branches 4 of the connection 3, whilst at the same time it is held captive therein.

The shuttle 1 moves to and fro in a cylindrical pumping tube, part of which is indicated by the reference numeral 9 in Figure 2.

The outside diameter of the cylinder 1 is, for example, 70 mm, whereas the inside diameter of the tube 9 is about 72 to 74 mm.

The height (or length) of the shuttle is, for example, 240 mm and its stroke in the tube 9 is 150 mm for a pump which is operated by hand by means of a handle.

The outside wall of the shuttle 1 is provided, near its ends as well as in the central part, with a circular groove 10 of a small depth, which serves to hold an anti-friction guide 11 in the form of, for example, a thin strip of nylon, which protrudes slightly from the said grooves 10 and encircles the shuttle.

In the outer surface of the cylinder 1, near the top end of the shuttle, as well as between the grooves 10, notches 12 are provided, grouped in sets. The notches 12 are circular, parallel, have the same section and are independent of one another.

They have, for example, as shown in Figure 2, parallel flanks, spaced about 1 mm apart and inclined 45° to the axis of the shuttle 1, the notches being turned upwards.

The base of the notches is flat and the average depth, measured in the median plane of the notches is about 1,5 mm.

The notches 12 are grouped in sets of, for example, five or ten, and the distance between two consecutive notches is such that on a generatrix of the cylinder 1 the distance d separating two notches is roughly equal to the opening e of the notch, and is about 1 mm.

Because of the hydrostatic and hydrodynamic phenomena which prevail in the zone of the notches 12, during the upward movement of the shuttle, counter-pressures occur in these zones, between the shuttle 1 and the pumping tube 9, which pressures are evenly distributed around the shuttle, ensuring a very good tightness, i.e. effectively preventing the water lifted by the shuttle from flowing downwards to underneath it, and reducing to a remarkable extent the friction between the shuttle and the tube.

The guides 11 are relatively floating and do not produce a sliding contact between the shuttle and tube.

All elements of the shuttle 1 suffer practically no wear and, therefore, do not require regular maintenance or repairs, except under exceptional circumstances.

The robustness, the effectiveness and the absence of maintenance of pumps equipped in this manner thus form quite remarkable characteristics of these pumps.

The inside wall of the pumping tube 9, in the path of the shuttle 1, may also be provided with notches of the same type as those provided in the shuttle, and also turned upwards. It is also possible to only provide notches in the pumping tube, the outside wall of the shuttle being smooth.

It is also possible to slightly vary several physical characteristics of the notches, such as the number, distribution, depth, width, shape, section, space between notches, inclination, as well as the play between the shuttle and the pumping tube, without going beyond the framework of the invention, insofar as one brings into play the same hydrostatic and hydrodynamic phenomena with a view to obtaining the same technical effects in respect of the tightness and the suppressing of friction.

Finally, the dimensions of the shuttle (diameter and length) may vary widely depending on the depth from which water is to be drawn up, in particular in the case of hand-operated pumps, if one want to ensure that a reasonable force of, for example, about ten kg, has to be applied to the handle.

[illegible] AS ERTAINED
[illegible] THE SAME IS
[illegible] OF CLAIMS.

C L A I M S

1. Bottom mechanism for volumetric pumps for deep boreholes, of the type comprising a surface mechanism which by way of a control rod (2) acts on a bottom mechanism forming a shuttle (1) which moves to and fro in a pumping tube (9), the bottom end of which tube communicates, by way of a valve system, with a strainer, characterized in that it consists of a hollow cylinder (1) open at both ends, one end being fitted with a valve system (8), which cylinder is at its top end connected to the said control rod (2), a play of about 1 to 2 mm being provided between the cylinder and the pumping tube, but the outer surface of the said cylinder and/or the inner surface of the said tube being provided with at least one set of parallel circular notches (12), preferably inclined and having a small depth and width.

2. Bottom mechanism according to claim 1, characterized in that the notches are inclined about 45° on the axis of the shuttle (1) or of the pumping tube (9), and are turned upwards.

3. Bottom mechanism according to claim 1 or 2, characterized in that the section of the notches (12) is rectangular, and the physical parameters are as follows: width, depth, distance between two consecutive notches of a same set, amount to one millimetre.

4. Bottom mechanism according to any one of the claims 1 to 3, characterized in that the play between the shuttle (1) and the pumping tube (2) is 1 to 2 mm.

DATED this 6th day of August 1986.

PATENT AGENT

APPLICATIONS ET RECHERCHES ELETROTECHNIQUES AVANCEES A.R.E.A.
"BOTTOM MECHANISM FOR VOLUMETRIC PUMP FOR DEEP DRILL-HOLES."

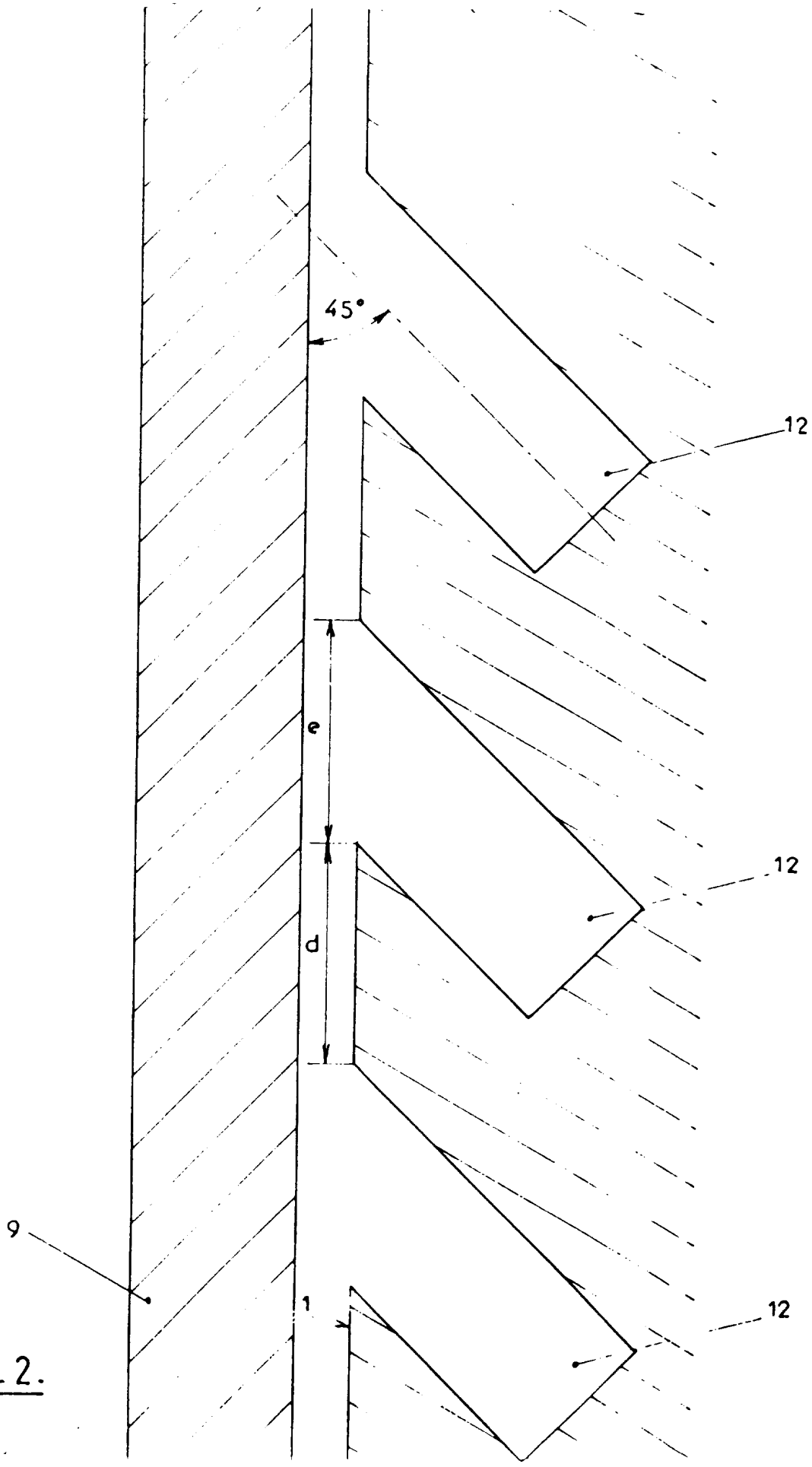


FIG. 2.

APPLICATIONS ET RECHERCHES ELETROTECHNIQUES AVANCEES A.R.E.A.
"BOTTOM MECHANISM FOR VOLUMETRIC PUMP FOR DEEP DRILL-HOLES".

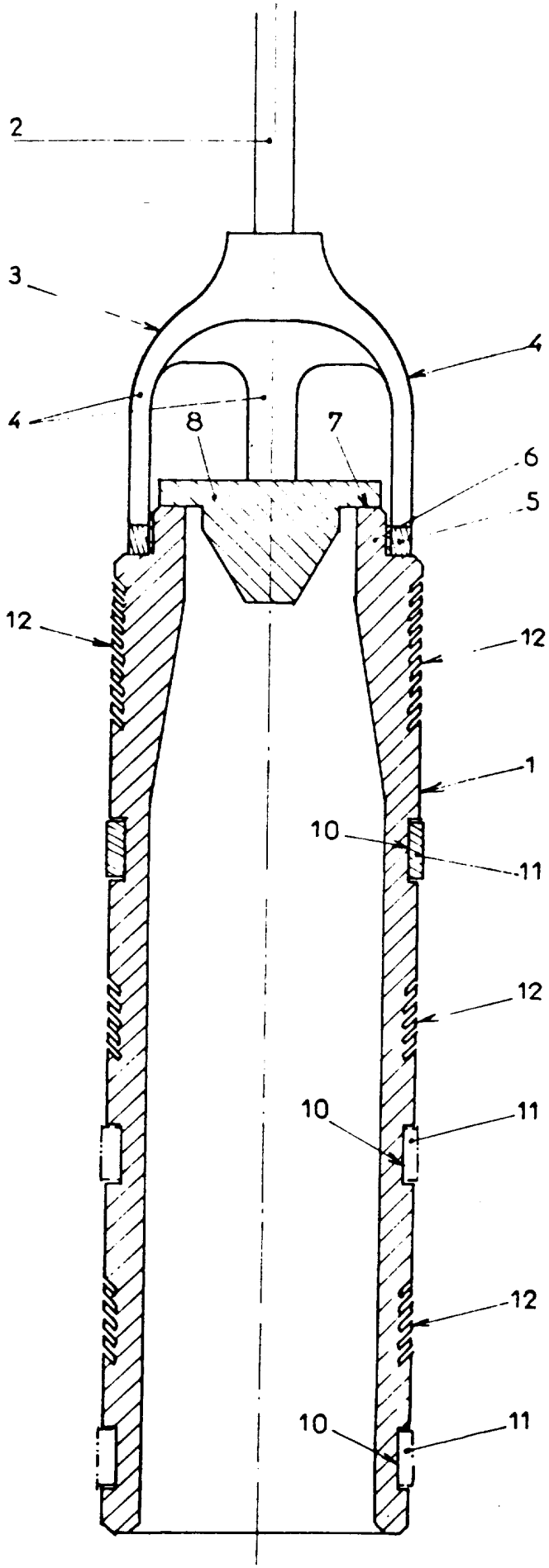


FIG.1.