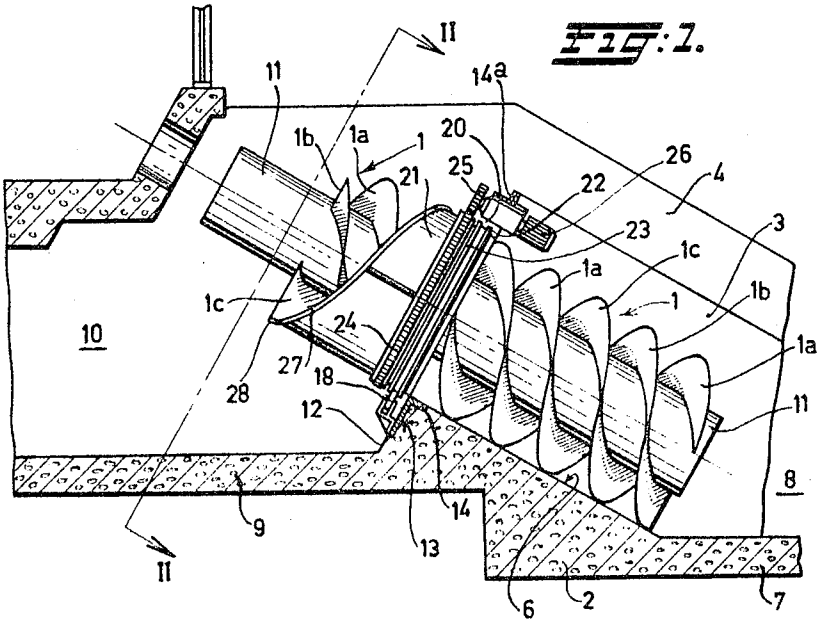
Sept. 2, 1969 A. JELLESMA 3,464,360

ARCHIMEDEAN SCREW PUMP

Filed Dec. 6, 1967

FIG. 1.



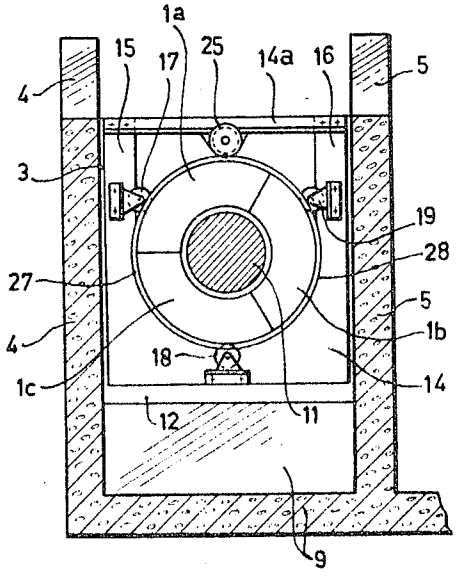


FIG. 2.

United States Patent Office 3,464,360 Patented Sept. 2, 1969

3,464,360

ARCHIMEDEAN SCREW PUMP

Anne Jellesma, Sneek, Netherlands, assignor to W. Hubert & Co. Machinefabriek N.V., Sneek, Netherlands

Filed Dec. 6, 1967, Ser. No. 688,453
Claims priority, application Netherlands, Dec. 12, 1966, 6617445
Int. Cl. F04d 3/02; B65g 33/00
U.S. Cl. 103—89 8 Claims

ABSTRACT OF THE DISCLOSURE

An Archimedean screw pump for conveying water or other liquid from a lower level to a higher level having a conveying screw arranged axially in an inclined channel, the upper part of said screw projecting beyond the inclined channel, a casing surrounding said upper part mounted freely rotatable about the screw in a bearing supported by the end face of said channel, the free edge of said casing opposite said bearing having a curved shape.

This invention relates to an Archimedean screw pump for conveying water or other liquid from a lower level to a higher level and for discharging said liquid at said higher level, the discharging means of said screw pump adapted to be continuously adjustable in accordance with the fluctuations of the higher level so that the length of the path along which the liquid has to be conveyed will be not greater than strictly necessary in accordance with the momentary higher level. In known arrangements, the Archimedean screw pump is provided with a slide arranged in the upper portion of the channel of said pump surrounding the conveying screw, the upper end of said slide defining the continuously adjustable level at which the liquid conveyed upwards by the conveying screw is discharged. This construction is disadvantageous in that the slide together with its guidings forms a part of the construction projecting beyond the internal circumference of the channel passage so that the conveying screw helical blade has to be constructed with different circular cross-sections in its lower and its uppermost parts, respectively. Moreover it is rather difficult to arrange in an Archimedean screw pump a slide construction which in the long run will remain continuously adjustable, whereas the arrangement of means to adjust said slide automatically in accordance with the fluctuations of the higher level will cause extraordinary difficulties.

It is an object of the invention to provide an improved Archimedean screw pump substantially eliminating the disadvantage of the known arrangements. According to the invention there is provided an Archimedean screw pump arranged axially in an inclined channel, the upper part of the conveying screw of said pump projecting beyond the inclined channel, a casing surrounding said upper part mounted freely rotatable about the conveying screw in a bearing supported by the upper end face of said channel, the free edge of said casing opposite the bearing having a curved shape.

With a pump of the invention, the liquid flow can be discharged at different heights according to the momentary position of the casing surrounding the upper part of the screw of the Archimedean screw pump, said position being adjustable by rotating the casing in its bearing according to the fluctuations of the higher level to which the liquid has to be conveyed.

In one embodiment of the invention, the shape of the curved edge of the casing surrounding the upper part of the conveying screw is adapted to the greatest difference which can occur in the fluctuations of the higher level to

which the liquid has to be conveyed in that the development of the casing into a flat plane shows its bottom edge and its free edge as two straight lines, respectively, one line directed obliquely to the other, the extensions of both lines intersecting each other at an acute angle dependent on the greatest difference which can occur in the fluctuations of the higher level.

Another object of the invention is to provide driving means for the casing surrounding the upper part of the conveying screw, said driving means comprising an electromotor and a reduction device consisting of a gear box fixed to the end face and a rim of gear wheel arranged on the casing, the toothed wheel of the gear box engaging the rim of gear wheel.

Still another object of the invention is to provide the electromotor of the driving means with a controlling member consisting of a body floating in the liquid at the higher level and means connecting said floating body to the switch arrangement for the electromotor so that the electromotor is started periodically as soon as a fluctuation of the liquid in the higher level occurs, whereas the motor is switched off again as soon as the casing is rotated into the position in which the discharging point is adapted to the liquid in the higher level so that after said fluctuation said point is at the lowest level permissible.

The invention will be further described by way of example and with reference to the accompanying drawings, in which:

FIGURE 1 is a longitudinal view of an Archimedean screw pump of the invention, in part elevation, part section, however showing no driving means, and

FIGURE 2 is a section along line II—II in FIGURE 1.

The Archimedean screw pump comprises substantially a conveying screw **1** and an inclined channel in which said conveying screw **1** is arranged. Said channel consists of a concrete bottom portion **2** having a semicircular cross-section and two concrete side walls **4** and **5**. A metal cover **3** is arranged between the side walls **4** and **5** limiting the passage for conveying the liquid by means of the screw **1**. The side walls **4** and **5** also limit the basin **10** in which the liquid has to be discharged (see FIGURE 2). Obviously the channel can be constructed in a modified form using other materials than concrete.

The inclined bottom face **6** of the channel connects the upper face of the bottom **7** of the lower basin **8** to the upper face of the bottom **9** of the basin **10**. Of course the basins **8** and **10** can have any desired form. The screw **1** has three screw helical blades **1***a*, **1***b* and **1***c* and is of a type already known in the art, although other types of screws can be used also. To the upper end of the spindle **11** of the screw **1** are connected the driving means of known type comprising at the same time a bearing in which the upper end of the screw spindle **11** is rotatably supported, said means not being shown and described as it is not within the scope of the invention.

The inclined bottom face **6** of the channel merges along a declining face **12** into the upper face of the bottom **9** of the basin **10**. Secured by means of anchors (not shown to the concrete of the bottom **2** is an angle shaped steel bar **13** which partly covers the face **12**. The bar **13** supports a U-shaped metal frame **14** forming the end ring for the channel. The flat flanges **15** and **16** of the metal frame **14** are connected at their upper edges by means of a cross-bar **14***a*. The end ring **14** supports three roller bearings **17**, **18** and **19** (see FIGURE 2). The roller bearings **17**, **18** and **19** are arranged at angles of 120° along a circle so spaced from the center of said circle that each of said roller bearings engages exactly a groove **20** formed between two circular flanges **22** and **23** ar-

ranged on a metal casing **21**, surrounding the upper part of the screw **1** projecting beyond the channel. Consequently, the metal casing **21** is supported rotatably by the roller bearings **17**, **18** and **19**, the casing **21** having an internal diameter adapted to fit the casing freely about the upper part of a screw **1**. Moreover a rim of gear wheel **24** is arranged on said metal casing **21**, whereas an electromotor **26** provided with a reduction gear is fixed to the cross-bar **14***a* of the frame **14**. The output shaft of said reduction gear carries a toothed wheel **25** engaging the rim of gear wheel **24**.

The free edge **27** of the metal casing **21** opposite its bearing is preferably curved so that when said casing **21** is developed into a flat plane its bottom edge and its free edge **27** are two straight lines one directed obliquely to the other, the extensions of both lines intersecting each other at an acute angle dependant on the greatest difference which can occur in the fluctuations of the higher level. Essential for the invention is that the position of the discharging point **28** above the bottom **9** of the basin **10** can be adapted gradually to the fluctuations of the higher level by slowly rotating the casing **21**. Obviously the electromotor **26** can be started and switched off in many ways, however, a regulating arangement (not shown) provided with a member floating in the liquid in the basin **10** can be used advantageously. This float has to start the electromotor as soon as a fluctuation of the higher level occurs, switching off the electromotor as soon as the casing **21** is rotated into a new position in which the discharging point lies no higher above the bottom **9** of the basin **10** as strictly necessary. However, it is also possible to use other and very simple manually operated driving means for the rotation and adjustment of the casing **21**.

What is claimed is:

1. A screw pump comprising a body defining upper and lower levels and an inclined channel between said levels, a screw member rotatably supported in said channel for conveying liquid from the lower level to the upper level, said screw member including an upper portion extending above said upper level, and discharge means at said upper portion of the screw member for receiving the liquid from the lower level and discharging the liquid at the upper level, said discharge means comprising a casing rotatably supported on said body and encircling said upper portion of the screw member so as to be relatively rotatable with respect to the screw member, said casing having a free edge from which the liquid overflows to the upper level, said free edge being inclined with respect to the axis of rotation of said casing, and means to rotate said casing to vary the elevation at which the liquid is discharged from the casing to said upper level.

2. A pump as claimed in claim **1**, wherein said means to rotate said casing comprises drive means supported by said body and engaging said casing to turn the latter and vary the elevation at which the liquid is discharged from the casing to said upper level.

3. A pump as claimed in claim **1** wherein said free edge of the casing is curved.

4. A pump as claimed in claim **1** wherein said casing when developed in a plane, has a straight bottom edge, said free edge being constituted by two straight lines intersecting one another at an angle and respectively inclined with regard to said bottom edge at an acute angle.

5. A pump as claimed in claim **1** comprising bearing means on said body rotatably supporting said screw, said casing being rotatably mounted on said bearing means.

6. A pump as claimed in claim **2** wherein said drive means comprises a drive motor, reduction means coupled to said motor, and a gear wheel fixed to said casing and in driving relation with said reduction means.

7. A pump as claimed in claim **6** wherein said channel has an end face, said motor and reduction means being supported at said end face.

8. A pump as claimed in claim **7** wherein said drive motor is electrically driven and is adapted for being controlled by a member floating in the liquid in said upper level such that the motor is started and stopped to vary the position of the free edge of the casing in accordance with the fluctuation of the level of said liquid in said upper level whereby the overflow point of the liquid from the casing can be maintained at a minimum distance from the surface of the liquid in said upper level.

References Cited

UNITED STATES PATENTS

1,085,949	2/1914	Snyder	103—91
3,279,592	10/1966	Kerkviet	198—215
3,349,894	10/1967	Allen et al.	198—215

FOREIGN PATENTS

965,444	7/1964	Great Britain.

HENRY F. RADUAZO, Primary Examiner

U.S. Cl. X.R.

103—91; 198—215