Dec. 29, 1970 K. AFFELD 3,551,078

PUMP FOR CONVEYING FLUIDS

Filed April 28, 1968 2 Sheets-Sheet 1

FIG.1

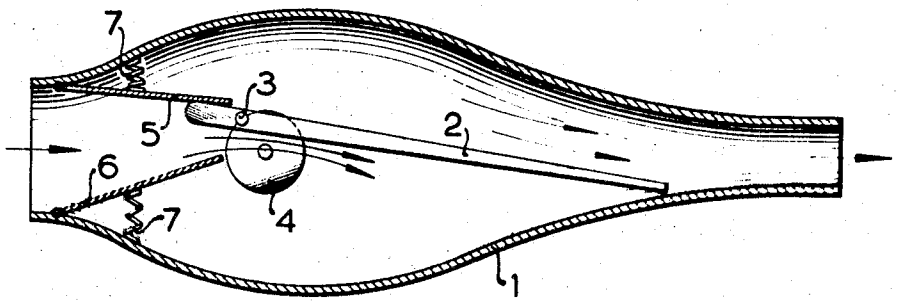

FIG.2

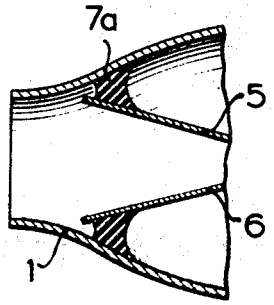

FIG.2a

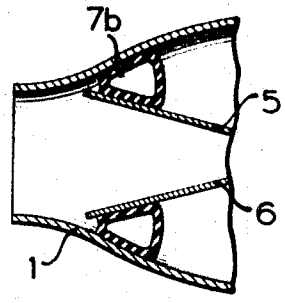

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FIG. 3

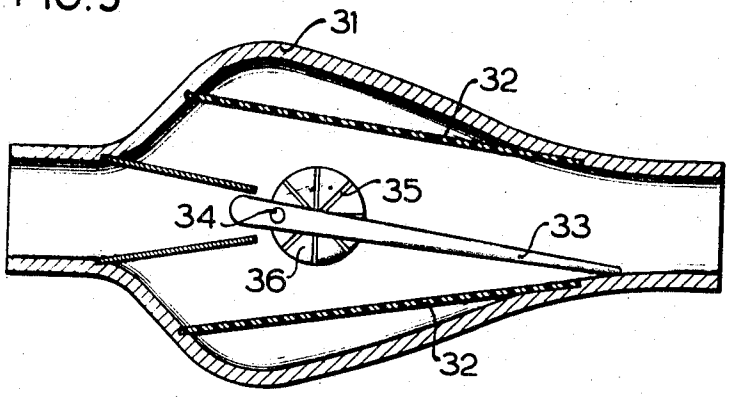
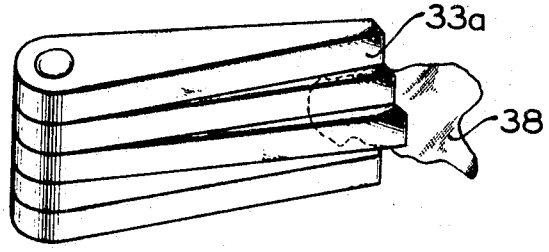


FIG. 4



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PUMP FOR CONVEYING FLUIDS

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ABSTRACT OF THE DISCLOSURE

An oscillating area constructed as a rigid plate is arranged in a casing of a pump for conveying fluids, particularly for conveying sewage water. At its front edge this plate is pivotally adjacent to a driving device. The connection point between said plate and the driving device is preferably movable on a circular path. In order to avoid a partial return flow of the conveyed fluid, valve flaps are movably mounted at the pump casing and by suitable means are pressed against the front edge of said plate. Means are also provided enabling very dirty sewage water containing, for example, large foreign substances to be conveyed without difficulties.

This invention relates to a pump for conveying fluids by means of one or more oscillating areas.

It is known in prior art to provide a pump device with oscillating areas for transporting liquids. In this device, usually elastic areas are provided which are reciprocated by a wave-like motion imparted to the entire area. However, the problem of the drive of this pump device was not yet solved satisfactorily, because expensive driving gears are necessary. Furthermore it was found that the use of elastic areas has not provided a satisfactory result. More particularly, these pumps are not suitable for conveying very dirty sewage waters because of the great danger of obstruction.

Accordingly, it is an object of the present invention to provide a pump device comprising oscillating areas, wherein the power transmission from a driving device to the oscillating area to be driven is effected without difficulties and wherein there is no danger of obstruction when using the device in sewage water pipes and the like.

Another object of the present invention is to attain a higher degree of efficiency than has been possible with existing pumps working with oscillating areas.

Other objects of the present invention will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found advisable to provide a rigid plate which at one end is pivotally attached to a driving device. This plate can oscillate between two walls of the pump casing and is provided with means preventing the fluid from flowing freely around the front edge of the plate.

Furthermore, in accordance with the present invention the pump casing is provided with movably mounted valve flaps which, by means of spring elements, are pressed with their free ends against the front edge of the plate. Instead of conventional steel springs and the like effective between the casing and the valve flaps, rubber blocks may be used which have the advantage that they will not be damaged by fluids with a strong corroding effect. It is also possible to replace the springs by air-filled chambers the walls of which consist of elastic material. In order to provide a damping of the working procedure, it is advantageous to use valve flaps of elastically yielding material or to coat them with a damping material, such as rubber or the like.

The driving conditions are particularly simple if the connection point of the plate with the driving device is moving on a circular path. Then only the simple arrangement of a crank shaft is necessary. For conveying very dirty sewage waters, means can be provided to avoid obstructions and mechanical damages to the pump. The swinging movements of the plate can be limited by elastically yielding casing walls. For example, elastically yielding and prestressed diaphragms, which may be made of rubber or the like, can be arranged at the casing walls in the working area of the plate.

It is of special advantage to construct the conveyor plate so that it will yield transversely to the flowing direction. This is achieved by dividing the conveyor plate into finger-like reciprocally swingable laminae. The side of the conveyor plate against which the fluid is flowing can be rounded off to avoid that foreign substances carried along with the fluid will be caught.

Furthermore, it is advantageous to provide the driving disc of the conveyor plate with grooves the edges of which serve as cutting knives for reducing tissue substances to small pieces. These grooves are radially arranged.

It is also advantageous to provide means to avoid obstructions and mechanical damages of the driving device, which means preferably consist of a disc covering the pivot.

As compared to conventional pump devices, the construction of the present invention is characterized by the absence of pistons and valves. In the case of a reciprocal movement, the drive may be effected without a stuffing box and the conveyor chamber can be separated hermetically from the exterior chamber. As compared to other known pumps with surface-like conveying elements, the pump according to the present invention is very simple in construction because the plate is turned on by the fluid and inertia forces and thus complicated driving gears are not necessary. As far as pumps are concerned which are meant to work only at intervals, it is possible to place the movable parts of the device into the fluid flow in such manner that the flowing resistance is kept low. Through the provision of valve flaps the fluid cannot freely flow around the front edge of the oscillating plate. Thus a larger conveying height is produced as compared to known pumps provided with surface-like conveying elements. Foreign substances, such as very long tissue rags, are stripped off the front edge of the plate due to the relative movement between the valve flaps and the plate.

When using elastically yielding casing walls, no foreign substances can be clamped between the axle driving the conveyor plate and the casing and thus damage the drive. Therefore, no lasting obstructions can be caused.

Plates which are constructed like laminae can adapt themselves to the contours of a foreign substance carried along in the flow and can provide a lining during the suction phase. The plate subdivided according to the present invention can also adapt itself to a cross section of the duct which is different from the rectangular shape.

If the driving disc is provided with grooves having sharp cutting edges, a cutting movement is carried out in connection with the plate, whereby the tissue substances carried along in the conveyed stream are reduced to small pieces and the known formation of tresses, which otherwise occur very often, is avoided.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing, by way of example only, preferred embodiments of the inventive idea.

In the drawings:

FIG. 1 is a vertical longitudinal section of a pump according to the present invention;

FIGS. 2 and 2*a* are partial sections showing details of the arrangement of the valve flaps;

FIG. 3 is a sectional view of an embodiment with elastic side walls limiting the conveying movement of the conveyor plate; and

FIG. 4 is a plan view of a plate used for conveying very dirty fluids.

FIG. 1 shows a casing **1** containing a plate **2** which is flexibly secured to a pivot **3** of a driving disc **4**. Valve flaps **5** and **6** are pressed by springs **7** in the direction of the axis of the pump. However, the working reliability of a pump comprising conventional steel springs may be endangered after some working periods. In that case it is advantageous to replace the metal springs by elastic rubber blocks **7***a* (FIG. 2) or by air-filled chambers **7***b* (FIG. 2*a*); the walls of these chambers may also consist of rubber or another elastic material.

Referring to FIG. 3, the driving disc **36** is provided with grooves **35** for cutting the tissue rags carried along with the conveyed fluid. The casing walls **31** additionally are lined with an elastic diaphragm **32** which can elude large, rigid foreign substances contained in the fluid. In this embodiment, the plate **33** is composed of individual laminae **33***a*, shown in FIG. 4. FIG. 4 also shows how two laminae avoid a foreign substance **38** carried along in the conveyed fluid.

The plate of the pump according to the present invention is driven by the circular motion of the pivot **3**, **34** so that a reciprocating motion is imparted to its rear edge. Thus there is always one chamber between the plate and the casing which is enlarged on either side, and into this chamber the conveyed fluid may flow. The flow of the fluid is assisted by valve flaps **5** and **6**, since they prevent the back flow of the fluid which has not yet been conveyed far enough in the direction of the end of the plate. A foreign substance carried along with the flow is safely pushed through the clearance between a valve flap and the plate **2**, **33**. The tissue rags carried along in the fluid flow and trying to settle between the plate **33** and the driving disc **4**, **36** are reduced to small pieces by the grooves **35** provided with cutting edges. Thereby the known and dreaded formation of tresses is avoided.

Although the present invention has been described with reference to particular embodiments thereof, it should be understood that those skilled in the art may make other modifications and embodiments which will fall within the spirit and scope of the principles of this invention.

I claim:

1. A pump for conveying fluids by at least one oscillating area, said pump comprising a casing having spaced apart walls, a driving device, a rigid plate located within said casing and having one end pivotally attached to said driving device, said plate being able to swing between said walls of a pump casing, and projecting means from said spaced apart walls preventing a fluid from flowing freely around the front edge of said plate.

2. A pump according to claim **1**, wherein said projecting means comprise valve flaps movably attached to the pump casing and spring elements pressing the free end of said flaps against the front edge of said plate.

3. A pump according to claim **2**, wherein said spring elements consist of rubber blocks inserted between the casing and the valve flaps.

4. A pump according to claim **2**, wherein said spring elements consist of air-filled chambers of elastic material.

5. A pump according to claim **2**, wherein said valve flaps consist of elastically yielding material.

6. A pump according to claim **2**, wherein said valve flaps are coated with a damping material.

7. A pump according to claim **1**, in which the plate is driven by a circular motion of its connection point with the driving device.

8. A pump according to claim **1**, comprising a diaphragm inserted between the driving device and the plate.

9. A pump according to claim **1**, wherein the casing walls of the pump which limit the movements of the plate are elastically yielding.

10. A pump according to claim **1**, wherein the plate is rigid in the direction of the fluid flow and yielding transversely to said direction.

11. A pump according to claim **1**, wherein the plate is divided into finger-like laminae which are reciprocally swingable.

12. A pump according to claim **1**, wherein the swinging pivot of the plate is arranged in the area between the front edge and the center of gravity of the plate.

13. A pump according to claim **1**, wherein the edge of the plate located on the side of the fluid flow is rounded off.

14. A pump according to claim **1**, wherein said driving device consists of a driving disc having radial grooves, the edges of said grooves being knife-like, sharp cutting edges.

15. A pump according to claim **1**, comprising means to avoid obstructions and mechanical damages to the pivotal attachment of the rigid plate and said driving device.

16. A pump according to claim **15**, wherein said means comprise a disc covering the pivot of said driving device.

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