

The present invention relates to a motor-driven pump for a cutting machine intended for digging trenches in the ground, of the type in which two drums of horizontal parallel axes, equipped with tools, are arranged in the bottom of a frame of generally rectangular cross-section and are driven in rotation so as to break up the earth in order to produce a trench, the waste earth being raised by means of a pump which sucks it up at the same time as some of the drilling mud with which the trench is kept filled.

Machines of this type must have a width at most equal to the width of the wall which is cast in the trench thus dug in the ground.

Moreover, since it is sometimes expedient to increase the power applied to the cutters, the quantity of waste which has to be raised to the surface increases accordingly if the performance of such machines is to be improved.

Likewise, it is sometimes expedient to make trenches of increasing depth, thus making it necessary to use dredging pumps having lifts which can reach more than 50 metres and which must give high deliveries.

Since the debris coming from the earth waste can be in the form of relatively bulky pieces, the only pumps which can be used in practice are centrifugal pumps, the rotational speed of which is limited by the rotational speed of the drive motors (usually hydraulic) or which can increase their lift only by an increase in the diameter of their shell.

The present invention relates to a motor-driven waste pump intended for cutting machines for digging trenches in the ground, the particular feature of which is that they occupy a small overall space, thus making it possible to avoid needlessly increasing the width of the trench and therefore the width of the wall cast in the latter, this motor-driven pump nevertheless having a sufficient power and a sufficient lift to eliminate the drilling waste.

The subject of the present invention is a

motor-driven pump of this type, characterized in that the axis of rotation of the pump is inclined at approximately 45° relative to the vertical in a vertical plane parallel to the axes of the cutters.

5 As a result of this arrangement according to the invention, it is possible to use a centrifugal pump, the shell of which has an outside diameter which is considerably larger than the free space available in terms of width inside the machine.

10 According to a preferred embodiment of the invention, the motor-driven pump also has the characteristic of being driven by a hydraulic motor, the cylinders of which are arranged in the form of a barrel of substantially vertical axis and the pistons of which
15 act on a plate which is mounted directly on the shaft of the rotor of the pump.

 By means of this preferred embodiment of the invention, an integrated motor-driven pump unit is achieved, the shaft of the rotor of the pump supporting
20 the plate of the motor directly. Thus, the latter can become free of the rolling bearings which, in conventional hydraulic motors, are necessary for ensuring the correct rotation of the plate.

 Moreover, a result of this preferred embodiment
25 of the invention is that the hydraulic motor fastened to the pump housing occupies only a very small volume and does not project beyond the visible vertical contour of the shell of the pump.

 According to a particular embodiment of the
30 invention, the motor-driven pump assembly just described is supported, in its lower part, by the cover of the shell, through which the pump suction passes.

 Because of this, the motor-driven pump assembly can easily be mounted on a frame, the length and width of
35 which are slightly smaller than the overall size of the motor-driven pump assembly and which can thus easily be installed and removed for maintenance, for example by means of a fork-lift truck.

 To make it easier to understand the invention, an

embodiment of it, taken as an example and shown in the accompanying drawing, will be described as an illustration and in a non-limiting way. In this drawing:

5 - Figure 1 is a diagrammatic elevation view of the lower part of a machine equipped with a motor-driven pump according to the invention,

 - Figure 2 is a view from the left corresponding to Figure 1, and

10 - Figure 3 is a view of the motor-driven pump of Figures 1 and 2 in axial section on a larger scale.

 Figures 1 and 2 show diagrammatically the lower part of a machine, the cutters 1 and 2 of which have been represented merely by their contour. These cutters, which consist of drums equipped with drilling tools on their periphery, rotate in the direction of the arrows in Figure 1, thereby returning between them the earth waste produced by the drilling.

 The cutters 1 and 2 are supported in a known way by a structure 3, of which only the lower part is shown diagrammatically in the drawing. This structure can, for example, have a width of 50 to 60 cm, a length of 1m50 to 2m50 and a height which can reach 8 to 10 metres, without these dimensional particulars in any way limiting the invention.

25 The device for pumping the drilling waste consists of a centrifugal pump 4, the axis 5 of which is inclined at approximately 45° relative to the vertical and which is arranged in a plane parallel to the axes 6 of the cutters 1 and 2.

30 According to a preferred embodiment of the invention, the centrifugal pump 4 is driven by a hydraulic motor 7 which is secured to the top of the pump 4.

 The suction pipe 8 of the pump 4 is connected in a known way to a suction head 9 located between the two cutters 1 and 2, slightly above the axis of these and at the location where the drilling waste is thrown off by the cutters.

 The shell of the pump 4 opens outwards at 10 towards a vertical pipe 11 which is represented by broken

lines in Figure 1 and which rises as far as the open air in order to discharge the drilling waste there.

It will be seen that, as a result of the inclination of the axis of the pump 4, the diameter of the shell can have a width substantially larger than the effective space available inside the body 3 of the machine.

A preferred embodiment of the motor-driven pump according to the invention has been shown in Figure 3 sectionally and on a larger scale.

This Figure 3 shows, once again, the centrifugal pump 4, the axis 5 of which is inclined at approximately 45° relative to the vertical and above which is arranged the hydraulic motor 7.

Two dot-and-dash lines on either side of the drawing represent the dimensional requirement of the motor-driven pump, that is to say the space which this motor-driven pump occupies inside the body of the machine.

According to this embodiment, the motor-driven pump is supported by a lower cover 12 which is equipped with the central port corresponding to the suction pipe 8. The frame of the motor-driven pump assembly consists of the plate 13 which is inclined at an angle matching that of the axis 5 and which is equipped with brackets 14 and 15 to allow the motor-driven pump to be fastened to a horizontal support.

The upper face of the shell is closed by means of a casing 17 which, by means of its cover 18, holds the shaft 19 of the rotor 20 of the centrifugal pump by means of the rolling bearings shown diagrammatically.

According to this preferred embodiment of the invention, the hydraulic motor 7 is fastened directly to the cover 18 of the casing 17, whilst the plate 21 of the motor, extended by a rod 22, is fixed to the shaft 19 of the pump by means of a key 23 which makes the rod 22 of the plate and the shaft 19 of the rotor of the pump integral with one another in terms of rotation.

Figure 3 shows diagrammatically the heads 24 of the pistons of the hydraulic motor which are arranged in

cylinders (not shown) in the upper part of the drawing.

In the known way, the barrel containing the cylinders of the motor 7 is driven in rotation at the same speed as the plate by means of the gears 25 and 26.

5 For the sake of simplicity in the drawing, the screws and bolts have not been shown otherwise than by their axis which is represented by a dot-and-dash line.

10 It will be seen that, according to the invention, the shaft 19 incorporated in the upper face of the pump supports, in its lower part, the turbine 20 and, in its upper part, the plate 21 on which the pistons of the hydraulic motor act.

15 As a result of this, there is obtained a compact device of small overall size which proved highly reliable during tests, albeit produced contrary to the operating specifications of both the manufacturers of centrifugal pumps and the manufacturers of hydraulic motors.

20 In practice, for a given overall volume, the inclination of the axis of the centrifugal pump according to the invention makes it possible to increase the diameter of the shell by approximately 20%, that is to say the lift of the pump by approximately 40%.

25 To make it easier to handle the motor-driven pump assembly illustrated in the drawing, there are two transverse passages 27 which are arranged parallel to the axis 6 of the cutters and are integrated in the structure of the motor-driven pump assembly and which make it possible to engage the two forks of a fork-lift truck, to ensure the easy installation and removal of the motor-driven
30 pump assembly for maintenance purposes.

35 It goes without saying that the embodiments described above are given only as examples and that they can undergo any desirable modifications, without thereby departing from the scope of the invention as defined in the claims.



CLAIMS

1. Motor-driven waste pump intended for cutting machines for digging trenches in the ground, characterized in that the axis of rotation (5) of the pump (4) is inclined at approximately 45° relative to the vertical in a vertical plane parallel to the axes (6) of the cutters (1, 2).
2. Motor-driven pumps according to Claim 1, characterized in that the pump is driven by a hydraulic motor (7), the cylinders of which are arranged in the form of a barrel of substantially vertical axis and the pistons (24) of which act on a plate (21) which is mounted directly on the shaft (19, 23) of the rotor of the pump (4).
3. Motor-driven pump according to either one of the preceding claims, characterized in that it is supported by a frame (14, 15) fixed to the lower cover (12) of the shell of the pump (4).
4. Motor-driven pump according to any one of the preceding claims, characterized in that the upper face of the shell is closed by means of a casing (17) which contains the shaft (19, 23) common to the rotor (20) of the pump (21) and to the plate of the hydraulic motor.