Feb. 2, 1971 NILS-JOHAN SAHLSTROM 3,560,106

SLURRY HANDLING PUMP

Filed Feb. 13, 1969

Fig. 1.

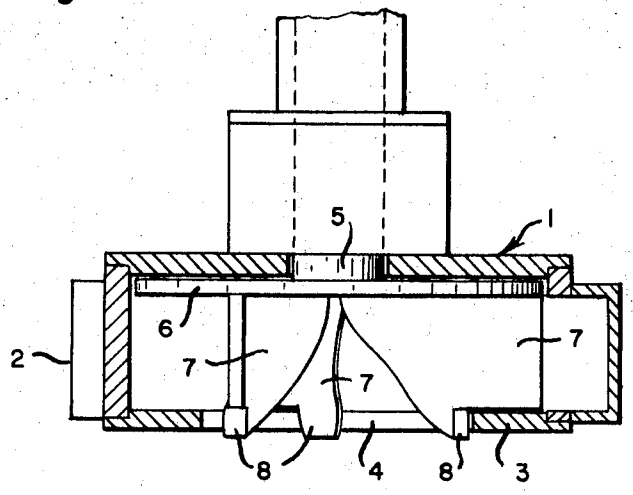
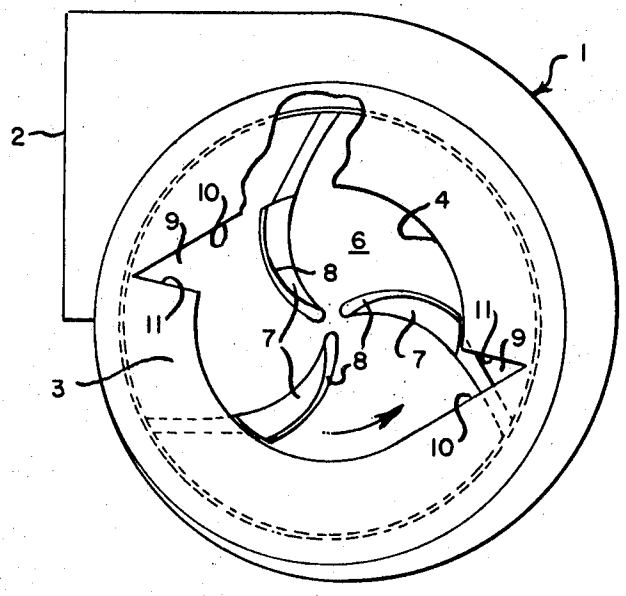


Fig. 2.



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SLURRY HANDLING PUMP

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U.S. Cl. 415—204 6 Claims

ABSTRACT OF THE DISCLOSURE

A slurry handling pump including a scrool casing and a centrifugal impeller having angularly spaced blades with their inner edges being radially spaced from the axis of rotation of the impeller. Portions of the free ends of the blades towards the axis of rotation extend outwardly of the pump inlet. The pump inlet includes a pair of slots extending radially from the edge thereof.

This invention relates to a slurry handling pump, and particularly to a centrifugal pump particularly adapted to handle barnyard or stable manure stored in a tank, or the like.

An earlier invention of mine relates to apparatus for handling barnyard or stable manure, which invention includes a slurry receiving tank and pumping means disposed in the tank. My pumping means, both of this and the earlier invention, has a dual function, one is to act on the solid matter to break it up and blend it with the liquid constituent to form a slurry, and the other is to pump the slurry out of the tank. My pump in my earlier invention, as well as in the present invention, is preferably a centrifugal pump having a scroll casing with a tangential discharge opening and an inlet opening generally coaxial with the axis of rotation of the pump impeller.

One problem in the blending of manure into a slurry, is that of clogging of the pump inlet by mats of straw, large masses of manure, or the like. In my earlier invention I used fixed vanes across the pump inlet for breaking up any masses of material before they could bridge the inlet to clog it. Although these vanes do an adequate job in breaking up the masses of material, there are times when one or more sectors defined between the vanes become clogged.

Another problem in handling slurry is that occasionally solid unbreakable objects, such as stones, for example, are deposited in the storage tank. These solid objects will be drawn into the pump and somtimes will jam the pump resulting in shear pin failure.

The pump of my present invention overcomes the problem mentioned above, as well as other. As to the clogging problem, portions of the free ends of the blades of my pump extend beyond the inlet opening of the casing, and any large mass of material at the inlet will be struck by the blades and broken apart. Thus, I eliminate the need of mounting fixed vanes across my inlet. In addition, I find that I can break up masses of material very efficiently with the extended blade portions. I also arrange my bades so that their inner radial edges are not mounted on a hub, but, rather, are radially spaced from the axis of rotation of the pump impeller. In essence, I provide a blade arrangement which has a central pocket, so to speak. Stones or other unbreakable matter, will enter this pocket area and then get thrown radially into the casing and out the discharge opening to thereby avoid any jamming of the impeller. One other problem is avoided by my hubless blade arrangement, that being the wrapping of fibrous material, such as straw, rope, or the like, around a hub.

I also provide, in my preferred embodiment, improved means for severing fibrous material, such as straw or rope. My inlet opening is preferably provided with

radially extending slots so that the centrifugal force imparted to fibrous material will urge it into the slots. My blades move over the inner surface of the casing and pass over the slots to thereby shear the fibrous material and throw the top piece radially into the casing to be discharged.

More specifically, my invention preferably comprises: a hollow scroll casing having an axial inlet opening means at one end thereof, and a tangential discharge opening means through the side wall thereof; and centrifugal impeller means supported by the casing for rotation relative thereto; the impeller means including a disc shaped base member disposed adjacent the other end of the casing, a plurality of axially extending angularly spaced blades, each of which blades having one end fixed to the base member and the opposite end having a first portion extending outwardly beyond the inlet opening and a second portion within the casing and adjacent the inner surface of the said one end of the casing.

Other details and advantages of my invention will become apparent as the following description thereof proceeds.

In the accompanying drawings, I have illustrated a present preferred embodiment of my invention in which:

FIG. 1 is a side elevation view partly in section of a slurry handling pump embodying my invention; and

FIG. 2 is a view looking into the inlet opening of the pump of FIG. 1, with a part of the casing broken away to show a detail of construction.

Referring to the drawings, **1** generally represents the slurry handling pump of my invention. Pump **1** would be placed in a storage or receiving tank into which barnyard or stable manure, urine, straw, and the like would be placed. My pump **1** would be arranged in the vicinity of the bottom of the tank. A typical arrangement of my pump **1** disposed in a tank together with auxiliary equipment is shown and described in my U.S. Pat. 3,263,968 for "Slurry Handling Apparatus."

Pump **1** includes a typical scroll shaped casing associated with centrifugal pumps. An impeller assembly is supported by the casing for rotation with respect thereto. The casing is provided with inlet opening means **4** arranged generally coaxially with the axis of rotation of the impeller assembly. The casing is also provided with a tangential discharge opening **2** through the side wall of the casing.

The inlet opening means **4** is provided by a plate member **3** removably fixed to one end, i.e. the lower end for clarity of description, of the casing as by threaded bolts, for example. The plate member **3** is flat and generally circular in shape, with the inner surface thereof being generally flush with the adjacent inner surface of the lower end of the casing. The inlet opening is, as mentioned earlier, generally coaxial with the axis of rotation of the impeller assembly. The inlet opening means **4** is also provided with a pair of diametrically opposed slots **9** extending generally radially outwardly with respect to the edge of the inlet opening. Each slot **9** is formed in a generally V-shape having one side **10** generally tangential to the circle defined by the inlet opening, and the other side **11** being generally along a radial line of the same circle. Thus, any fibrous material, such as straw, rope, or the like, carried around the edge of the inlet opening by the impeller blades will, by virtue of the centrifugal force imparted to it, move along the side **10** of slot **9** and lodge itself therein. The reason for providing the slots **9** for lodging fibrous material will become apparent as this description proceeds.

The impeller assembly includes a disc shaped base member **6** disposed adjacent the upper end of the casing and a shaft **5** suitably centrally fixed to the base member

6 and extending upwardly therefrom. The shaft 5 is arranged in suitably supported bearings disposed above and supported by the casing. Shaft 5 is suitably coupled with a source of power, such as an electric motor, not shown. Three forwardly curved angularly spaced blades 7 are fixed at one end thereof to the lower side of base member 6 and extend axially downwardly therefrom. The other or free end of each of the blades 7 includes a first portion 8 which extends outwardly of the inlet opening. The first portion 8 of each of the blades 7 extends radially from the inner edge of the blade to adjacent the edge of the inlet opening. A second portion of the free end of each blade 7 is above the first portion 8 and extends radially to the outer edge of the blade. In addition, the second portion of the free end of each blade is closely adjacent to the inner surface of the plate member 3. Thus, it might be said that the free end of each blade 7 has a "stepped" shape.

The blades 7 are arranged with respect to each other without any hub. Instead, the inner edges of the blades 7 are radially spaced from the axis of rotation of the impeller and are free rather than being secured to a hub. The blades 7 are thus arranged to define a central pocket, so to speak. As shown in the drawings the inner edge of each blade 7 diverges from the fixed end to the free end thereof with respect to the axis of rotation of the impeller.

With the pump 1 arranged in a storage tank, the material therein will be drawn itno the inlet opening and discharged for recirculation within the tank or out of the tank as desired. The action of the blades 7 on soft solid matter will tend to break it into finer pieces until a smooth slurry is produced. Any large mass of solid material, such as a mat of straw, for example, will be acted upon by the first portions 8 of the blades 7 and will be broken apart without clogging the inlet opening. A small mass of breakable material will be drawn into the pocket between the blades and then thrown out radially into the casing for discharge. These breakable masses will break apart into small pieces by this centrifugal action. A small mass of unbreakable material, such as a stone, for example, will also be drawn into the pocket between the blades and, although it will not break apart, it will be thrown out radially for discharging and will not remain in the casing to jam the impeller. Any fibrous material such as straw or rope will be carried by the blades around the edge of the inlet opening and then will lodge in one of the slots 9 where the second portion of the free end of the blade will cut off the part of the material in the casing and throw it into the casing for discharge.

It should be noted that the first portion 8 of each blade 7 should extend outwardly of the casing enough to act on material to break it apart. In addition, the first portions 8 should be made wide enough for strength purposes, that is, sufficiently strong to break apart material.

It is also noted that the slots 9 can be varied in number as well as shape. The centrifugal force imparted to the fibrous material will cause the material to be urged into any shaped slot extending radially from the edge of the inlet opening.

It should now be appreciated how the advantages of my present invention as set out in the introductory portion of this description are realized. It should also be apparent that the pump of my present invention is considerably simpler in construction, requiring less parts, than the slurry handling pumps used heretofore.

While I have illustrated and described a present preferred embodiment of my invention, it is to be understood that I do not limit myself thereto, and that my invention may be otherwise variously practiced within the scope of the following claims.

I claim:

1. A slurry handling pump, comprising:

a hollow scroll casing having an axial inlet opening means at one end thereof and a tangential discharge opening means through the side wall thereof; and

centrifugal impeller means sapported by said casing for rotation relative thereto; said impeller means including a disc shaped base member ahjacent the other end of said casing, a plurality of axially extending, angularly spaced blades defining a center axial pocket, each of which blades having one end fixed to said base member and the opposite other end having a first portion with a free outer edge extending outwardly beyond said inlet opening means and cooperating therewith to communite slurry and a second portion within said casing and having a free edge adjacent the inner surface of said one end of said casing and forming the main blade pumping portion.

2. A slurry handling pump as set forth in claim 1 wherein said inlet opening includes at least one radially extending slot.

3. A slurry handling pump as claimed in claim 1 wherein said blades are radially spaced from the axis of rotation of said impeller means.

4. A slurry handling pump as set forth in claim 1 wherein said inlet opening means includes a plate member removably attached to said one end of said casing; said plate member having a central opening generally coaxial with the axis of rotation of said impeller means corresponding substantially said inlet opening means, and also having at least one slot extending radially from the edge of said central opening.

5. A slurry handling pump as set forth in claim 4 wherein the inner surface of said plate member is substantially flush with the inner surface of said one end of said casing; said first portion of each of said blades extends radially to adjacent the edge of said central opening; and said second portion extends radially outwardly from said first portion and is adjacent the inner surface of said plate member.

6. A slurry handling pump, comprising:

a hollow scroll casing having an axial opening through one end thereof and a tangential discharge opening through the side wall thereof;

a plate member removably fixed to said one end of said casing and having an inner surface substantially flush with the inner surface of said one end, and also having a central opening substantially coaxial with said axial opening; said plate member further having at least one slot extending radially from the edge of said central opening;

centrifugal impeller means supported by said casing for rotation relative thereto; said impeller means including a disc shaped base member disposed adjacent the other end of said casing, a shaft fixed centrally on said disc member and extending outwardly from said other end of said casing, a plurality of angularly blades fixed to said base member and extending axially therefrom toward said one end of said casing;

each of said blades having an upper end fixed to said base member, a lower end opposite the upper end, an inner edge towards the axis of rotation of the impeller means, and an outer edge away from the axis of rotation of the impeller means;

said lower end of each of said blades having a stepped shape including a first portion adjacent said inner edge and disposed axially outwardly of said plate member and extending radially to adjacent the edge of said central opening in said plate member, and a second portion extending from said outer edge to adjacent the edge of said central opening and lying above said first portion adjacent the inner surface of said plate member; and

said inner edge of each of said blades having a diverging shape from said upper end toward said lower end with respect to the axis of rotation of said impeller means.

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HENRY F. RADUAZO, Primary Examiner

U.S. Cl. X.R.

241—55; 415—213, 219

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,560,106 Dated February 2, 1971

Inventor(s) Nils-Johan Sahlstrom

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 11, "scrool" should read -- scroll --; line 52, "other" should read -- others --; line 59, "bades" should read -- blades --. Column 3, line 28, "itno" should read -- into --. Column 4, line 3, "ahjacent" should read -- adjacent --; lines 53 and 54, after "angularly" insert -- spaced --.

Signed and sealed this 29th day of June 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR
Commissioner of Patents