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PATENT REQUEST : STANDARD PATENT

I/We, being the person(s) identified below as the Applicant(s), request the grant of a Standard Patent to the person(s) identified below as the Nominated Person(s), for an invention described in the accompanying complete specification.

**Applicant(s) and
Nominated Person(s):** FUKOKU KOGYO CO., LTD.

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Invention Title: ROTARY FILTER.

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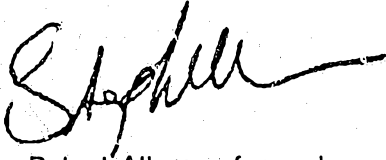
BASIC CONVENTION APPLICATION DETAILS

Application No	Country	Country Code	Application Date
355107/03	JAPAN	JP	20 December 1991

Drawing number recommended to accompany the abstract: 1

DATED this 15th day of July 1992

FUKOKU KOGYO CO., LTD.
GRIFFITH HACK & CO



Patent Attorney for and
on behalf of the Applicant

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Section 29(1)
Regulation 3.1(2)

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NOTICE OF ENTITLEMENT

We, FUKOKU KOGYO CO., LTD.

of, 14-12, KOSUGE 3-CHOME
KATSUSHIKA-KU
TOKYO, JAPAN,

being the applicant in respect of Application No. 19670/92, state the following:-

The person(s) nominated for the grant of the patent:

is the assignee of the actual inventor.

The person(s) nominated for the grant of the patent:

is the applicant of the basic application(s) listed on the patent request form.

The basic application(s) listed on the request form:

is the first application made in a Convention country in respect of the invention

Dated this 29th day of September, 1994.

FUKOKU KOGYO CO., LTD.

GRIFFITH HACK & CO.





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ROTARY FILTER

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(56) Prior Art Documents
WO 90/12919
US 4844799

(57) Claim

1. A rotary filter for filtering water out of raw material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends; said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

a screw means arranged rotatably about a longitudinal axis thereof within said screen drum; said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with a lower end of said screen drum for increasing resistance against trans-

portation of said raw material by said screw means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

a first driving means for rotating said screen drum in first direction at a first rotating speed; and

a second driving means for rotating said screw means in a second direction which is opposite to said first direction at a second rotating speed which is lower than said first rotating speed to transport said raw material introduced into said space from said first end to the second end of said screen drum wherein said first and second driving means respectively and simultaneously rotate said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said screen drum and said screw means at different speeds relative to each other.

2. A rotary filter for filtering water out of raw material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends, said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

a screw means arranged rotatably about a longitudinal axis thereof within said screen drum, said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with

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a lower end of said screen drum for increasing resistance against transportation of said raw material by said screw means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

said screw means further including a shaft formed of a hollow tube supporting a single spiral vane arranged about said hollow tube, a partition provided within said hollow tube adjacent said first end of said drum, and an opening provided in said hollow tube between said first end of said drum and said partition, and through said opening said raw material supply means communicates with said space formed between said screen drum and said screw means;

a first driving means for rotating said screen drum in a first direction at a first rotating speed; and

a second driving means for rotating said screw means in a second direction which is opposite to said first direction at a second rotating speed which is lower than said first rotating speed to transport said raw material introduced into said space from said first end to said second end of said screen drum,

wherein said first and second driving means respectively and simultaneously rotate said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said screen drum and said screw means at different speeds relative to each other.

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COMPLETE SPECIFICATION
STANDARD PATENT

Applicant(s): FUKOKU KOGYO CO., LTD.

Invention Title: ROTARY FILTER.

The following statement is a full description of this invention, including the best method of performing it known to me/us:

SPECIFICATION

Title of the Invention

ROTARY FILTER

Background of the Invention

Field of the Invention

The present invention relates to a rotary filter for filtering or separating water out of water containing raw material such as fish guts and muds.

Description of the Related Art Statements

A rotary filter has been known and has been described in Japanese Utility Model Publication No. 55-9425. In the known rotary filter, a screen plate is shaped into a drum to form a screen drum and the screen drum is rotated. Water containing raw material is supplied into the screen drum from its one end and water-extracted raw material is taken out of the screen drum from its other end. By rotating the screen drum, the water is filtered out of the raw material due to the centrifugal force. Therefore, in order to increase the filtering efficiency, the screen drum has to be rotated at a higher speed.

In another known rotary filter, a screw having a spiral vane is fixedly arranged within the screen drum such that the screw is rotated together with the screen drum. In such a known rotary filter having the screen drum and screw, the screen drum and screw

are rotated together with each other, and thus when the rotating speed is increased, the raw material is promptly discharged from the rotary filter while the water is not sufficiently filtered out. Therefore, in the known rotary
5 filter, the water filtering efficiency could not be made high.

SUMMARY OF THE INVENTION

The present invention has for its object to provide a novel and useful rotary filter, in which the
10 water filtering efficiency can be adjusted at will by rotating the screen drum and the screw independently from each other.

According to one aspect of the invention there is provided a rotary filter for filtering water out of raw
15 material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends; said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

20 a screw means arranged rotatably about a longitudinal axis thereof within said screen drum; said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially
25 horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with a lower end of said screen drum for increasing resistance against transportation of said raw material by said screw
30 means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

35 a first driving means for rotating said screen drum in first direction at a first rotating speed; and

a second driving means for rotating said screw



means in a second direction which is opposition to said first direction at a second rotating speed which is lower than said first rotating speed to transport said raw material introduced into said space from said first end to the second end of said screen drum wherein said first and second driving means respectively and simultaneously rotate said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said screen drum and said screw means at different speeds relative to each other.

According to another aspect of the invention there is provided a rotary filter for filtering water out of raw material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends, said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

a screw means arranged rotatably about a longitudinal axis thereof within said screen drum, said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with a lower end of said screen drum for increasing resistance against transportation of said raw material by said screw means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

said screw means further including a shaft formed of a hollow tube supporting a single spiral vane arranged about said hollow tube, a partition provided within said hollow tube adjacent said first end of said drum, and an opening provided in said hollow tube between said first end of said drum and said partition, and through said opening



said raw material supply means communicates with said space formed between said screen drum and said screw means;

a first driving means for rotating said screen drum in a first direction at a first rotating speed; and

5 a second driving means for rotating said screw means in a second direction which is opposite to said first direction at a second rotating speed which is lower than said first rotating speed to transport said raw material introduced into said space from said first end to said
10 second end of said screen drum,

wherein said first and second driving means respectively and simultaneously rotate said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said
15 screen drum and said screw means at different speeds relative to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal cross sectional view showing an embodiment of the rotary filter according to the
20 invention; and

Fig. 2 is a lateral cross sectional view thereof.

DETAILED EXPLANATION OF THE PREFERRED EMBODIMENT

Figs. 1 and 2 illustrate an embodiment of the rotary filter according to the invention. The rotary
25 filter comprises a screen drum 1 formed by shaping a screen plate in the form of a drum. The screen drum 1 is supported by driving shafts 2 such that the screen drum 1 is rotated about its longitudinal axis A. Within the screen drum 1 there is arranged a screw 3. The screw 3 is
30 arranged such that it can be rotated independently from the screen drum 1. A number of reinforcing rings 4 are provided on the screen drum 1. The driving shafts 2 are arranged in parallel with the longitudinal axis A under the screen drum 1 and the _____



screen drum is placed on the driving shafts, so that the driving shafts are brought into contact with outer surfaces of the reinforcing rings 4. Therefore, by rotating the driving shafts 2 in directions shown by arrows, it is possible to rotate the screen drum 1 about the longitudinal axis A.

The screw 3 comprises a shaft 5 and a spiral vane 6 secured on the shaft 5. The shaft 5 of the screw 3 are journaled by suitable bearing means not shown, so that the screw is rotated about its longitudinal axis C by an electric motor having an output shaft, a sprocket 7 secured to one end of the shaft and an endless chain provided between the output shaft of the electric motor and the sprocket. It should be noted that the screw 3 can be rotated in any direction by driving the motor in any direction.

The shaft 5 is formed by a hollow tube and a raw material supply tube 9 having a supply inlet 8 is coupled with the other end of the shaft. In the shaft 5 there is secured a partition 10 to constitute a space 13 which is communicated with the raw material supply tube 9. This space 13 is further communicated with a space 14 between the screen drum 1 and the screw 3 via an opening 10 formed in the shaft 5.

Although not shown in the drawings, above the screen drum 1 there is arranged a water spray tube for washing clogged filtering holes of the screen drum, and under the screen drum there is provided a tray for collecting and discharging the extracted

water. A reference numeral 12 denotes a discharging outlet through which the raw material is discharged.

In the rotary filter, ~~according to the invention,~~ the screen drum 1 and the screw 3 are rotated independently from each other by means of separate driving sources, so that the rotating speeds and rotating directions of the screen drum and the screw can be adjusted at will independently from each other. In Fig. 2, there is shown a case in which the screen drum 1 and the screw 3 are rotated in the same direction, but they may be rotated in opposite directions. Further the rotating axis A of the screen drum 1 is not always necessary to be coincided with the longitudinal axis C of the screw 3. In the present embodiment, the longitudinal axis A of the screen drum 1 is slightly above the longitudinal axis C of the screw 3.

A water containing raw material is introduced into the rotary filter from the supply inlet 8 of the raw material supply tube 9. Then the raw material is guided into the inner space 13 of the shaft 5 and is further transferred into the space 14 between the screen drum 1 and the screw 3 by means of the opening 10. The raw material is gradually transported toward the discharging outlet 12 due to the rotation of the spiral vane 6 of the screw 3. During this movement, the water is filtered out of the raw material and the water is discharged from the rotary filter via the filtering holes formed in the screen drum 1.



Even when the water filtering efficiency is increased by increasing the rotation speed of the screen drum 1, the transporting speed of the raw material within the screen drum can be adjusted at will by controlling the rotation speed of the screw 3, so that a period of time during which the raw material is remained within the screen drum can be suitably adjusted.

preferred form of the
In this manner, in the rotary filter ~~according to the invention~~ a packing density of the raw material at the discharging outlet 12 can be adjusted at will by suitably determining the rotation speed of the screw 3. For instance, the packing density of the raw material at the discharging outlet 12 may be increased to perform the water extraction to a high degree. Moreover, the supply rate of the raw material at the supply inlet 8 may be set at will. Such features of the rotary filter according to the invention could never be attained by the known rotating filter.

Further, the water containing raw material within the screen drum 1 is subjected to the mechanical filtering operation due to the resistance against the transportation of the raw material within the screen drum caused by the screw 3 which is rotated relative to the screen drum. Together with the adjustment of the time period during which the raw material is remained within the screen drum 1, this results in that the water filtering efficiency can be increased



by several times as compared with the known rotary filter.

As explained above, ~~in the rotary filter according to the invention,~~ a period of time during which the raw material is remained within the screen drum 1 can be adjusted at will regardless of the rotation speed of the screen drum, so that the rotation speed of the screen drum can be increased to attain a very high filtering efficiency. Moreover, the raw material is subjected to the resistance due to the relative rotation between the screen drum 1 and the screw 3 to perform the additional water filtering. Therefore, the water filtering efficiency can be increased largely.



What is claimed is:

1. A rotary filter for filtering water out of raw material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends; said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

a screw means arranged rotatably about a longitudinal axis thereof within said screen drum; said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with a lower end of said screen drum for increasing resistance against transportation of said raw material by said screw means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

a first driving means for rotating said screen drum in first direction at a first rotating speed; and

a second driving means for rotating said screw means in a second direction which is opposite to said first direction at a second rotating speed which is



lower than said first rotating speed to transport said raw material introduced into said space from said first end to the second end of said screen drum wherein said first and second driving means respectively and simultaneously rotate
5 said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said screen drum and said screw means at different speeds relative to each other.

2. A rotary filter for filtering water out of raw
10 material containing water comprising:

a screen drum arranged rotatably about a longitudinal axis thereof and having first and second ends, said longitudinal axis being arranged substantially horizontally and said screen drum having an inner diameter;

15 a screw means arranged rotatably about a longitudinal axis thereof within said screen drum, said screw means having an outer diameter smaller than said inner diameter of said screen drum, said longitudinal axis of said screw means being arranged substantially
20 horizontally and being spaced from said longitudinal axis of said screen drum in a vertical direction such that a lower end of said screw means is brought into contact with a lower end of said screen drum for increasing resistance against transportation of said raw material by said screw
25 means and providing increased water filtering efficiency;

a raw material supplying means for introducing said raw material into a space formed between said screen drum and said screw means;

30 said screw means further including a shaft formed of a hollow tube supporting a single spiral vane arranged about said hollow tube, a partition provided within said hollow tube adjacent said first end of said drum, and an opening provided in said hollow tube between said first end of said drum and said partition, and through said opening said raw material supply means communicates with said space formed between said screen drum and said screw means;



a first driving means for rotating said screen drum in a first direction at a first rotating speed; and

5 a second driving means for rotating said screw means in a second direction which is opposite to said first direction at a second rotating speed which is lower than said first rotating speed to transport said raw material introduced into said space from said first end to said second end of said screen drum,

10 wherein said first and second driving means respectively and simultaneously rotate said drum and said screw means at said first and second rotating speeds and can be independently adjusted to respectively rotate said screen drum and said screw means at different speeds relative to each other.

15 3. A rotary filter according to claim 2, wherein said raw material supplying means comprises a raw material supply tube coupled with said hollow tube and having a supply inlet.

20 4. A rotary filter according to any one of claims 1 to 3, wherein said first driving means comprises a pair of driving shafts arranged below the screen drum in parallel with said longitudinal axis of the screen drum and a means for rotating said driving shafts, and said screen drum comprises a plurality of reinforcing rings which contact
25 said pair of driving shafts.

5. A rotary filter according to any one of claims 1 to 4, wherein said second driving means comprises a sprocket secured to an end of said screw means, an electric motor having an output shaft and a chain provided between
30 said output shaft of said electric motor and said sprocket.

6. A rotary filter according to any of claims 1 to 5, wherein said raw material supply means only introduces said raw material at said first end of said screen drum,



and said second drive means forces dewatered raw material from said space into a discharge outlet arranged at said second end of said screen drum.

7. A rotary filter substantially as herein described
5 with reference to and as illustrated in the accompanying drawings.

Dated this 29th day of September, 1994.

FUKOKU KOGYO CO., LTD.
By its Patent Attorneys:

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Fig.1

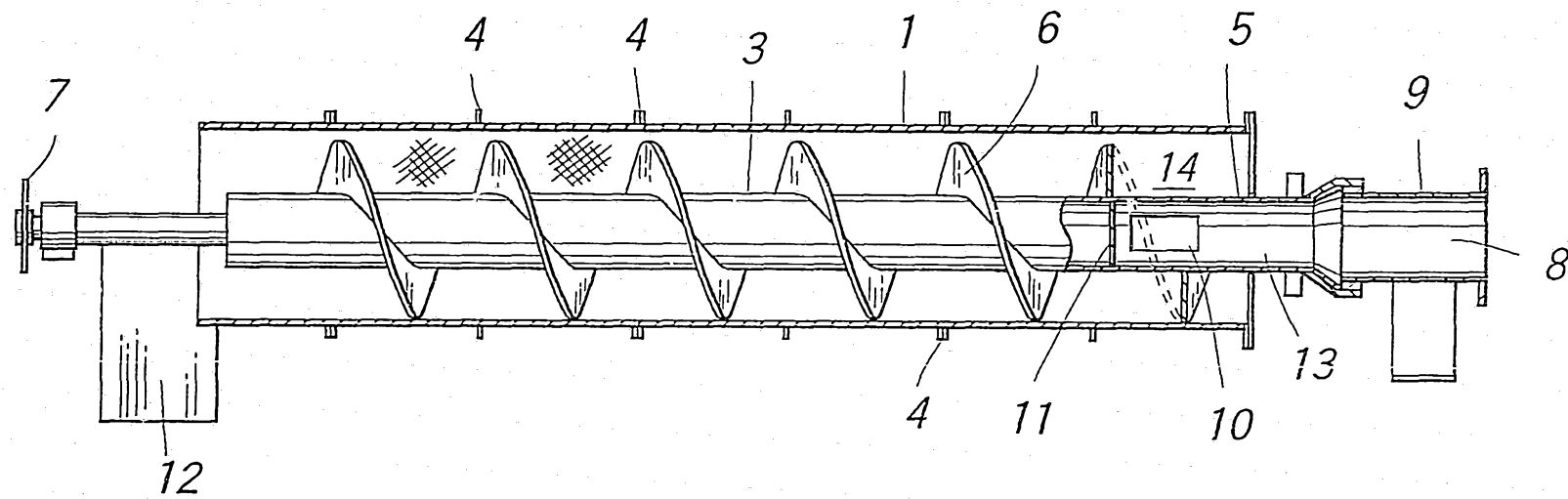
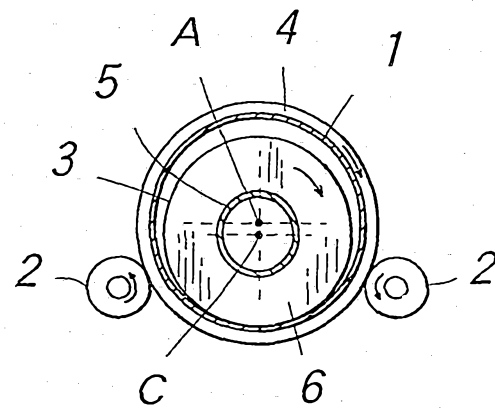


Fig.2



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