

DescriptionPress for the dehumidification of humid matter, in particular residual waste

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The invention relates to a press for the dehumidification of humid matter, in particular of residual waste in accordance with the preamble of Claim 1.

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DE 199 09 328 A1 describes a method for processing residual waste, wherein mechanically processed residual waste is biologically stabilized by an aerobic hydrolysis. In such an aerobic hydrolysis, water and air are supplied to the residual waste to be treated in counterflow, so that by cooperation of air and leaching fluid organic cells of the residual waste are broken up and cell water is released. The available carbon is decomposed to carbon dioxide, and the dissolved and acidified organic matter is transported off by the leaching fluid and also partly by the air. Through this aerobic hydrolysis a dumping method is actually realized in an accelerated manner.

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The residual waste thus biologically stabilized has a relatively low proportion of dry substance, so this hydrolysis has to be followed by dehydration. In the solution known from DE 199 09 328 A1, this dehydration is carried out by a high-pressure press, for instance an extruder press. In a like extruder press the residual waste to be dehydrated is drawn in by a worm gear, compacted, and the pressed-out water is carried off.

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It was found that the dry substance content of the residual waste dehydrated in this manner is still

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relatively low, so that comparatively high expenditure for post-drying of the residual waste is necessary.

5 In contrast, embodiments may be based on the objective of furnishing a press for the dehumidification of humid matter, wherein the expenditure for post-drying is reduced.

10 This objective may be attained by a press having the features of Claim 1.

15 In accordance with an aspect of the present invention, there is provided a press for the dehumidification of humid matter, in particular of residual waste, which comprises a worm gear whereby said humid matter may be transported from a material drawing-in device to a material discharge and is concurrently compressed for the dehumidification, comprising a means whereby said humid matter compressed with the aid of said worm gear may be subjected to a drying medium, preferably pressurized air, or to vacuum, so that drying medium flows through said humid matter or the humidity may be transported off, respectively, characterized in that said means includes a central tube encompassed by said worm gear and designed to include outlet nozzles for said drying medium, wherein said central tube is mounted to be non-rotary.

Also disclosed is a press including a worm gear whereby said humid matter may be transported from a drawing-in section to a material discharge, and compressed. In addition to this mechanical compression,

-2a-

the humid matter may be furthermore exposed to pressurized air or to vacuum, whereby further dehumidification of the humid matter takes place. This means that a mechanical dehydration may be superseded by a dehydration by convection or a dehydration by vacuum. It is preferred, however, if dehydration may be achieved substantially by the application of pressurized air.

It was found in preliminary trials that by this variant the dry substance content of the humid matter to be treated may be increased substantially in the absence of post-drying when compared with the conventional solutions, with the possibility of achieving dry substance contents of up to 70% in the treatment of residual waste. It is one essential advantage of this means that owing to parallel application of a drying medium (drying air) or of vacuum, the expenditure in terms of device technology for manufacturing the press may

only be increased insignificantly for the necessary pumps, piping, etc. may be installed at little expenditure.

In a particularly preferred embodiment, the drying
5 medium is supplied via a lance-type central tube encompassed by the worm gear, which has outlet nozzles for the drying medium formed at one end portion. The drying medium then flows through the humid matter approximately in a direction transverse to the
10 longitudinal axis of the worm gear.

This central tube may be non-rotary or mounted to rotate as a unit with the worm gear.

Delivery of the freighted drying medium may be particularly simple if, approximately in the range of the outlet nozzles at the housing of the worm gear, a strainer basket or similar means may be provided which retains the residual waste to be treated and allows the
20 passage of the freighted drying medium.

Flow management of the drying medium may be particularly simple if extraction of the freighted drying medium may be achieved by being supported with the aid of the reduced
25 pressure.

In the case of a like reduced pressure solution, there may be provided downstream of the strainer basket a condenser whereby the discharged humidity may be
30 condensed.

For adjusting the mechanical pressing pressure applied through the intermediary of the worm gear, it may be possible to provide at a material discharge of the press
35 a backup pressure or counterpressure means so that -

depending on the consistency of the humid matter to be treated - different backup pressures may be set.

Embodiments may provide for the treatment of
5 residual waste, the drying medium is supplied with a pressure exceeding the pressure at the material discharge by about 1 bar, whereas a slightly reduced pressure is applied in the extraction range.

10 Further advantageous developments of the invention are the subject matters of the further subclaims.

A preferred embodiment of the invention shall be explained in more depth hereinbelow by referring to
15 schematic drawings, wherein:

Fig. 1 is a longitudinal sectional view of a press in accordance with the invention for the dehumidification of residual waste, and

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Fig. 2 is a schematic cross-sectional view of the press of Fig. 1.

The press 1 represented in Fig. 1 comprises a worm
25 gear housing 2 wherein a worm gear 4 is mounted rotatably. Through the intermediary of this worm gear 4, residual waste 6 may be drawn via a material drawing-in device 8 into a worm gear space 10 and transported to a material discharge 12. Through a suitable pitch of the
30 worm gear helices, the humid residual waste 6, i.e., the residual waste charged with water, is compressed, with water being squeezed out in the process.

The worm gear 4 has a lance-shaped central tube 14 at
35 the outer circumference of which the worm gear helices

3 March 2006

are attached. An end portion of the central tube 14 protrudes from the worm gear housing 2. This end portion carries a drive pinion 16 which is in operative connection with an output gear 18 of a drive motor 20. In
5 the represented embodiment, the drive pinion 16 and the output gear 18 are interconnected through a belt or a chain 22.

The end portion of the central tube 14 which
10 protrudes from the worm gear housing 2 is connected with a pressurized air compressor 26 via a pressure line 24, so that pressurized air may be injected into the central tube 14.

15 On the left-hand end portion of the central tube 14 in the representation of Fig. 1 a multiplicity of outlet nozzles 28 are formed through which the pressurized air may exit from the central tube 14. In the embodiment represented in Fig. 1, these outlet nozzles 28 are formed
20 along one end portion of the central tube 14 only - in principle, however, it is possible to provide these outlet nozzles over the entire length of the central tube. By the solution selected in Fig. 1 it is ensured that the pressurized air enters into the worm gear space
25 10 within a range in which the residual waste already is present in a compressed form.

In a position approximately radially opposite the outlet nozzles 28 there is formed on the peripheral wall
30 of the worm gear housing 2 a strainer basket 30 which is encompassed by a vacuum box 32. This vacuum box 32 comprises a suction nozzle 34 opening into a condenser 36. To the gas chamber of the condenser 36 there is connected a vacuum pump 38 whereby the vacuum box 32 and
35 the condenser 36 may be subjected to a reduced pressure

of 0.9 bar, for example. The condensate 40 may be extracted via a valve means 42 and supplied to further processing.

5 On the left-hand end portion of the worm gear housing 2 in the representation of Fig. 1 a backup pressure means 44 is provided whereby the diameter of an outlet nozzle of the material discharge 12 may practically be modified so that a counterpressure counteracting an axial
10 displacement of the residual waste may be built up in the worm gear housing 2.

 The residual waste 6 to be dehydrated is drawn in by the rotating worm gear 4 into the worm gear space 10 and,
15 in the representation in accordance with Fig. 1, transported to the left into the area encompassed by the vacuum box 32 and partly compressed in the process. Pressurized air is injected via the pressurized air compressor 26 into the rotating central tube 14 of the
20 worm gear 4 at a predetermined overpressure which is, e.g., by approximately 3 bars higher than the pressure applied via the backup pressure means 44. In accordance with Fig. 2, which shows a cross-sectional view of the press 1 in Fig. 1, the unfreighted pressurized air 46
25 radially exits through the outlet nozzles 28 of the strainer basket 30 from the central tube 14 and impacts on the residual waste to be dehydrated. At the annular space 48 encompassed by the vacuum box 32 a reduced pressure is applied by the vacuum pump 38, so that the
30 pressurized air flows through the residual waste 6 due to the pressure difference (pressure of the pressurized air delivered by the compressor 26 - reduced pressure of the vacuum pump 38) in a radial direction, i.e. transversely to the axis of the worm gear 4. Owing to this
35 comparatively high pressure difference, flow channels 50

form within the residual waste 6 which do, however, have a constantly changing course. As a result of this pressurized air flow and the mechanical compression of the residual waste via the worm gear 4, water 52 is drawn
5 from the residual waste 6 and transported into the vacuum box 48 together with the pressurized air 46. The pressurized air 54 loaded with water then enters into condenser 36 in the direction of the arrow and is there condensed in the above described manner. The amount of
10 pressurized air exiting via the material discharge is negligible.

By the above described press 1 it is possible, in the treatment of residual waste containing organic
15 constituents, to adjust a dry substance content of 60-70%, so that the expenditure for post-drying of the residual waste is minimum compared with conventional solutions.

20 In the above described embodiment the worm gear helices are mounted at the outer circumference of the central tube 14. In principle, the central tube might also be mounted to be non-rotary in the worm gear housing 2 and extend through the rotatably driven worm gear in
25 the axial direction.

The above described press 1 may, of course, also be utilized for the dehumidification of other humid matters.

30 Under particular operating conditions it may be sufficient if the press 1 is operated with pressurized air only or with vacuum only.

A press for the dehumidification of humid matter, in
35 particular of residual waste is disclosed, which

3 March 2006

comprises a worm gear whereby the residual waste may be compressed mechanically. During transport with the aid of the worm gear, the humid matter is subjected to a drying medium, preferably pressurized air or a vacuum, whereby
5 it is delivered from the press.

List of reference symbols

	1	Press
	2	worm gear housing
5	4	worm gear
	6	residual waste
	8	material drawing-in device
	10	worm gear space
	12	material discharge
10	14	central tube
	16	drive pinion
	18	output gear
	20	drive motor
	22	chain
15	24	pressure line
	26	pressurized air compressor
	28	outlet nozzles
	30	strainer basket
	32	vacuum box
20	34	suction nozzle
	36	condenser
	38	vacuum pump
	40	condensate
	42	valve means
25	44	backup pressure means
	46	pressurized air
	48	annular space
	50	flow channel
	52	water
30	54	freighted pressurized air

- 10 -

claims

1. A press for the dehumidification of humid matter, in
5 particular of residual waste, which comprises a worm
gear whereby said humid matter may be
transported from a material drawing-in device to
a material discharge and is concurrently
compressed for the dehumidification, comprising a
10 means whereby said humid matter compressed with
the aid of said worm gear may be subjected to a
drying medium, preferably pressurized air, or to
vacuum, so that drying medium flows through said
humid matter or the humidity may be transported
15 off, respectively, characterized in that said means
includes a central tube encompassed by said worm
gear and designed to include outlet nozzles
for said drying medium, wherein said central
tube is mounted to be non-rotary.
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2. The press in accordance with Claim 1, wherein a worm
gear housing is designed to include in the range
of said outlet nozzles a strainer basket
through which said freighted drying medium may
25 be transported off.
3. The press in accordance with any one of the foregoing
claims, including a vacuum pump through which a
reduced pressure for transporting off said freighted
30 drying medium may be applied.
4. The press in accordance with Claim 2 or 3, wherein
downstream of said strainer basket a condenser
for condensing the humidity transported off
35 jointly with said drying medium is provided,

- 11 -

wherein said vacuum pump is connected to said condenser.

- 5 5. The press in accordance with any one of the foregoing claims, including a backup pressure means for adjusting a backup pressure in the range of said material discharge.
- 10 6. The press in accordance with any one of the foregoing claims, wherein said drying medium flows through said humid matter approximately in a direction transverse to the worm gear axis.
- 15 7. The press in accordance with any one of the foregoing claims, wherein said drying medium is supplied at an excess pressure which is approximately by 1 bar higher than the pressure in the range of the material discharge.

- 12 -

Abstract

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5 particular of residual waste is disclosed, which
comprises a worm gear whereby the residual waste may be
compressed mechanically. During transport with the aid of
the worm gear, the humid matter is subjected to a drying
medium, preferably pressurized air or a vacuum, whereby
10 it is delivered from the press.