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Method for processing explosive products in a separating machine, and separating machine

The invention relates to a method for processing explosive products in a separating machine comprising a rotary device located in a drum, wherein the drum is located in a machine housing, according to Claim 1. The invention also relates to a separating machine for performing a method according to the invention for processing explosive products, according to Claim 8.

In SU 715 141 A1, a separator which has a cooling device is disclosed. An outer surface of the separator drum is in that case sprayed with a cooling liquid. In US 2 765 978 A, a cooling device for a separator is likewise disclosed, a spraying nozzle being directed towards a selected region of the drum.

EP 0 058 353 A1 describes a process for the degassing of liquids and an associated device. The external surface of a rotary body can be sprayed with a cooling liquid.

WO 2010/101524 A2 discloses a separator which has additional devices for producing a negative pressure in the machine housing.

It is known that explosive products that have a flash point close to the processing temperature cannot be readily processed in a separating machine, in particular in a solid-bowl scroll centrifuge or in a separator, if the processing temperature is in particular only 15 kelvins lower than the specific flash point of the product that is respectively to be processed. According to TRBS (Technische Regeln für Betriebssicherheit [Technical rules for operational safety]) 2152, a threshold for the processing temperature in the case of pure, non-halogenated liquids is defined as 5 K below the flash point of the liquid. A threshold for the processing temperature in the case of solvent mixtures without a halogenated component is defined as 15 K below the flash point.

The temperatures that occur or prevail during processing and/or at rest can cause the flash point within the separating machine, in particular within the solid-bowl

scroll centrifuge or within the separator, to be exceeded, so that a dangerous explosive atmosphere may form.

In order to be able to process such products, the explosion protection within separating machines, in particular within solid-bowl scroll centrifuges or separators, has until now been ensured by inerting processes. This avoids the forming of an explosive atmosphere within the separating machine.

In order to be able to perform such inerting processes, an inerting unit which monitors and controls a supply of inert gas to the separating machine and the maintenance of the necessary pressures within the separating machine is required. In this way, the inert atmosphere within the separating machine can be ensured.

Such monitoring depends on the measuring equipment meeting certain requirements. Furthermore, the system peripherals of an inerted centrifuge must be designed such that the required pressures are maintained and an unwanted escape of inert gas is avoided.

To sum up, the operation of an inerted separating machine is cost-intensive and technically demanding. Furthermore, an inert gas must be provided, which in turn entails further dangers, such as for example the suffocation of persons, and as a result of this, precautions must be taken to protect personnel from this inert gas.

It follows from the above that the object of the present invention is therefore to provide a further-developed method for processing explosive products in a separating machine, in particular in a solid-bowl scroll centrifuge or in a separator, which is not as demanding as previously known inerting processes. The overall intention is to provide a method which can be performed easily and furthermore can be retrofitted in already existing separating machines, in particular solid-bowl scroll centrifuges or systems or separators.

Furthermore, the object of the invention is to provide a separating machine, in particular a solid-bowl scroll centrifuge or a separator, which serves for performing

a method according to the invention for processing explosive products.

The object of the invention is achieved by a method for processing explosive products in a separating machine, according to the teaching as provided in Claim 1. The object of the invention is also achieved by a separating machine for performing a method according to the invention, according to the teaching as provided in Claim 8.

The subclaims represent at least expedient refinements and developments of the method according to the invention or of the separating machine according to the invention.

The method according to the invention for processing explosive products in a separating machine provides that the separating machine first comprises a rotary device located in a drum, wherein the drum itself is located in a machine housing. According to the invention, cooling liquid is directly or indirectly applied, in particular sprayed, onto an outer surface of the drum, at least onto portions thereof and/or intermittently, during processing of the products. Furthermore, the temperature in the machine housing is monitored during processing.

The method according to the invention for processing explosive products in a solid-bowl scroll centrifuge provides that the solid-bowl scroll centrifuge first comprises a scroll located in a drum, wherein the drum itself is located in a machine housing. According to the invention, cooling liquid is directly or indirectly applied, in particular sprayed, onto an outer surface of the drum, at least onto portions thereof and/or intermittently, during processing of the products. Furthermore, the temperature in the machine housing is monitored during processing.

The method according to the invention for processing explosive products in a separator provides that the separator first comprises a rotatable disc stack located in a drum, wherein the drum itself is located in a machine housing. According to the invention, cooling liquid is directly or indirectly applied, in particular sprayed, onto an outer surface of the drum, at least onto portions thereof and/or

intermittently, during processing of the products. Furthermore, the temperature in the machine housing is monitored during processing.

It is evident that the invention provides a method for processing explosive products in a separating machine that can be used equally for solid-bowl scroll centrifuges and separators.

The outer surface of the drum of a solid-bowl scroll centrifuge should be understood as meaning the surface of the drum that is not formed inside, i.e. not facing in the direction of the scroll. In other words, the outer surface of the drum forms the rotor surface. In solid-bowl scroll centrifuges, the subassembly formed by the scroll and the drum is referred to as the rotor.

The outer surface of the drum of a separator should be understood as meaning the surface of the drum that is not formed inside, i.e. not facing in the direction of the disc stack.

Cooling liquid is applied, in particular sprayed, onto the outer surface of the drum, at least onto portions thereof, during processing of the products.

It is also possible that cooling liquid is applied, in particular sprayed, onto both the surface of the drum and the inner surfaces of the machine housing, at least onto portions thereof and/or intermittently, during processing of the products.

According to the invention, cooling liquid is applied, in particular sprayed, primarily, in particular exclusively, onto the outer surface of the drum of the separating machine. Direct cooling of the product to be processed and/or the rotary device, in particular the scroll or the disc stack, is usually not necessary, preferably not necessary.

In particular, cooling liquid is applied, in particular sprayed, at least in portions, onto the outer surface of the drum and/or the inner surfaces of the machine housing of a solid-bowl scroll centrifuge that surrounds the upper half of the scroll if it is

imagined that the scroll is divided along the longitudinal axis.

In particular, cooling liquid is applied, in particular sprayed, at least in portions, onto the outer surface of the drum and/or the inner surfaces of the machine housing of a separator that is the upper portion of the drum housing if it is imagined that the drum housing is divided along a horizontal axis.

In the case of a further embodiment of the invention, it is possible that cooling liquid is applied, in particular sprayed, onto the outer surface of the drum over the full circumference thereof and/or the inner surfaces of the machine housing over the full circumference thereof.

As a result of applying, in particular spraying, a cooling liquid onto the outer surface of the drum and at the same time monitoring the temperature in the machine housing during processing of the product, a method for processing explosive products which can be performed without an inerting process is provided. This applies in particular to the processing of products that have a processing temperature which is relatively just below the flash point. In particular, it is possible that the processing temperature is only 5 kelvins lower than the flash point.

It has surprisingly been found that the forming of an explosive atmosphere within the centrifuge can be prevented by directly cooling the components which, during the processing of the explosive product, come into contact with the product.

As a result of the cooling of the outer surface of the drum, the forming of an explosive atmosphere is avoided by preventing a flash point from being exceeded.

It has in turn surprisingly been found that, with regard to the heating of the product to be processed within the drum, the products remaining in the drum are decisive for the additional heating of the material. Most of the stream of product that is passed through the separating machine, in particular through the solid-bowl scroll centrifuge or the separator, takes up little temperature if there is an adequate through-flow, because of the relatively short dwell time. Therefore, the cooling of

the outer surface of the drum and/or the inner surfaces of the machine housing leads to an adequate low temperature of the product located within the separating machine.

It is preferable at most to a slight extent that the cooling liquid comes into contact with the product to be processed or the processed product. The cooling liquid can be selected in accordance with the product to be processed. In a preferred embodiment of the invention, the cooling liquid is cooling water.

Spraying of the outer surface of the drum should preferably be assumed if the separating machine has a spraying system with a number of spraying nozzles as the cooling device.

Cooling liquid may be applied for example by such cooling devices that have cooling pipes. Such cooling pipes may be laid around the outer surface of the drum.

In a further embodiment of the invention, the cooling device may be designed such that an intermediate space is formed in the separating machine. Such an intermediate space is preferably formed between the outer surface of the drum and a housing portion spaced from the outer surface of the drum. In this intermediate space, cooling liquid can circulate. In other words, a cooling liquid can flow in a double-walled drum housing. It is therefore possible that cooling liquid is directly or indirectly applied onto the outer surface of the drum.

In a further embodiment of the invention, it is provided that the maximum temperature of the cooling liquid is regulated. In particular, the temperature of the cooling liquid is regulated to a maximum temperature which is just below the admissible processing temperature of the product. Particularly preferably, the cooling liquid is regulated to a maximum temperature of 35°C, in particular of 30°C, in particular of 25°C.

This usually means that, at normal central European ambient temperatures, the cooling liquid does not have to be cooled to a great extent. Only at higher ambient

temperatures is slight cooling of the cooling liquid necessary.

As a result of cooling of the cooling liquid, the influence of increased ambient temperatures on the increase in the temperature within the separating machine is reduced.

In a further embodiment of the invention, it is possible that the maximum temperature of the cooling liquid located in a tank is regulated. It is possible that the separating machine or the cooling device associated with the separating machine has a tank, in particular a storage tank, wherein the cooling liquid is stored or buffer-stored in this tank.

Regulating the maximum temperature of the cooling liquid located in a tank makes particularly exact cooling of the outer surface of the drum possible. Regulating the temperature of the cooling liquid located in the tank preferably takes place on the basis of temperature monitoring of the cooling liquid located in the tank. As a result of such temperature monitoring and corresponding regulating of the maximum temperature of the cooling liquid in a tank, an adequate temperature difference can be provided.

In the case of the monitoring of the cooling liquid located in a tank, one of the considerations that should also be taken into account is that the circulation of a cooling liquid in a cooling device already causes corresponding heating of the cooling liquid.

A cooling liquid inflow and/or spraying nozzles is/are activated in temporal intervals and cooling liquid is distributed, preferably by way of spraying nozzles, within the machine housing, and preferably onto portions thereof on inner sides of the machine housing.

Upon detecting a first temperature threshold value in the machine housing and/or in a liquid phase outflow, according to the invention the cooling liquid inflow and/or spraying nozzles is/are activated.

It is accordingly provided that application, in particular spraying, of liquid onto the drum, at least onto portions thereof, during processing of the products does not take place during the entire processing time. The application, in particular spraying, of liquid to the drum, and consequently a cooling process, is only started after detecting a first temperature threshold value. This makes it possible to save cooling liquid, since it is only used to the extent necessary on the basis of detected temperatures.

It is also possible that a first temperature threshold value is specified and/or a machine setting is performed such that the application, in particular spraying, of cooling liquid onto the drum takes place during the entire processing time. This is advantageous in particular whenever the separating machine is used at high ambient temperatures or a particularly explosive product is to be processed.

It is also possible that the temperature of a centrate produced by the separating machine, in particular the solid-bowl scroll centrifuge or the separator, i.e. the liquid phase separated off from the product, is monitored. Such monitoring of the centrate establishes temperature increases of the product at an early time during the processing. It is possible, when an admissible centrate temperature is exceeded, to stop the supply of products to be processed in the separating machine, in particular of products to be processed in the solid-bowl scroll centrifuge or the separator. In the case of a separator, this may comprise both the heavy liquid phase and the light liquid phase.

Upon detecting a second temperature threshold value, which is greater than the first temperature threshold value, in the machine housing and/or in a liquid phase outflow according to the invention a supply of the product to be processed in the separating machine, in particular in the solid-bowl scroll centrifuge or in the separator, is stopped and liquid, in particular cooled liquid, is pumped into the drum or into the separating space of the separating machine.

The supply of liquid, in particular cooling liquid, into the drum of a solid-bowl

scroll centrifuge or a separator, preferably takes place by way of the inflow pipe through which the product to be processed is normally supplied to the drum. The supplying of liquid preferably takes place for such a time until the temperature value detected in the machine housing has fallen again below the second temperature threshold value.

As a result of stopping the supply of product to be processed and the supply of liquid, the forming of an explosive atmosphere is prevented. This is attributable to the fact that there is no replenishing flow of product to be processed, which is potentially explosive, into the drum and in addition the flash point of the product that is still in the separating machine is diluted as a result of the dilution with liquid, in particular cooling liquid.

Upon detecting a third temperature threshold value, which is greater or higher than the second temperature threshold value, the separating machine, in particular the solid-bowl scroll centrifuge or the separator, is preferably switched off. In other words, the solid-bowl scroll centrifuge or the separator is run down with safety in mind when the third temperature threshold value is reached. It is intended that it is preferably only made possible for the solid-bowl scroll centrifuge or the separator to be switched on again after the temperature(s) detected in the machine housing and/or in the liquid phase outflow has/have fallen below the second temperature threshold value.

It is also possible that, upon detecting the second temperature threshold value, the cooling liquid itself is cooled such that the maximum temperature of the cooling liquid has a lower value than was specified before the first temperature threshold value was detected. In other words, regulating of the cooling liquid temperature can take place in dependence on the temperature(s) detected in the machine housing. In particular upon detecting a second temperature threshold value and/or a third temperature threshold value, corresponding regulating of the maximum temperature of the cooling liquid can bring about corresponding cooling of the explosive product located in the drum.

It is also possible that the detection of a second temperature threshold value takes place in combination with the detection of a temperature value for the cooling liquid located in a tank.

The regulating of the cooling liquid temperature, in particular the regulating of the temperature of the cooling liquid that is located in a tank, may take place on the basis of the detection of the temperature in the machine housing and/or in the liquid phase outflow and by additional detection of the cooling liquid temperature in the tank.

It is also possible that the throughput of the product to be processed in the separating machine takes place in dependence on detected temperature values. It is possible that, when the admissible centrate temperature is exceeded, the supply of product is stopped in order to prevent further heating of the product located in the drum. It is also possible that the product temperature itself and/or the through-flow rate is regulated in dependence on the detected centrate temperature. If the through-flow rate is too low, the heat input into the product during the processing is higher and can lead to the second or third temperature threshold value being exceeded.

In a preferred embodiment of the invention, the cooling liquid is collected after the application, in particular after the spraying, of the liquid in the machine housing and is subsequently used again for application, in particular spraying. A cooling liquid circuit which, after the application, in particular spraying, of liquid onto the outer surface of the drum provides collecting of the cooling liquid that has flowed off and subsequent application, in particular spraying, may be formed. It is possible to check the cooling liquid for contaminants before it is used again, so that the cooling liquid may optionally be cleaned.

It can be stated that the proposed method according to the invention can be implemented and handled extremely easily. No inert gases have to be used. This eliminates the dangers involved in the use of inert gases.

It has been found that the method according to the invention can be used

particularly well in the processing of alcohol products or oil sludge media. The alcohol products may include, inter alia, drinking alcohol products.

A further aspect of the invention concerns a separating machine for performing the method according to the invention. The separating machine has a rotary device located in a drum, wherein the drum is located in a machine housing.

According to the invention, a cooling device, in particular a spraying system with a number of spraying nozzles, is formed in the machine housing, wherein the cooling device, in particular at least one of the spraying nozzles, is directed towards the outer surface of the drum or is arranged such that cooling liquid can be directly or indirectly applied to the outer surface of the drum. In addition, at least one temperature monitoring unit is formed in the machine housing.

In particular, a further aspect of the invention concerns a solid-bowl scroll centrifuge for performing the method according to the invention. The solid-bowl scroll centrifuge has a scroll located in a drum, wherein the drum is located in a machine housing. According to the invention, a cooling device, in particular a spraying system with a number of spraying nozzles, is formed in the machine housing, wherein the cooling device, in particular at least one of the spraying nozzles, is directed towards the outer surface of the drum or is arranged such that cooling liquid can be directly or indirectly applied to the outer surface of the drum. In addition, at least one temperature monitoring unit is formed in the machine housing.

In particular, a further aspect of the invention concerns a separator for performing the method according to the invention. The separator has a rotatable disc stack located in a drum, wherein the drum is located in a machine housing. According to the invention, a cooling device, in particular a spraying system with a number of spraying nozzles, is formed in the machine housing, wherein the cooling device, in particular at least one of the spraying nozzles, is directed towards the outer surface of the drum or is arranged such that cooling liquid can be directly or indirectly applied to the outer surface of the drum. In addition, at least one temperature

monitoring unit is formed in the machine housing.

In the case of a solid-bowl scroll centrifuge according to the invention, it may be both a 2-phase solid-bowl scroll centrifuge and a 3-phase solid-bowl scroll centrifuge.

In the case of a separator according to the invention, it may be both a 2-phase separator and a 3-phase separator.

In the case of the cooling device, it may be for example such a device that has cooling pipes. Such cooling pipes may be arranged on the surface of the drum. In such a case, cooling liquid is applied indirectly to the outer surface of the drum.

In a further embodiment of the invention, the cooling device is designed as an intermediate space formed in the machine housing, wherein a cooling liquid can be circulated in the intermediate space and the intermediate space is formed by at least one outer surface of the drum and a further housing portion spaced apart from the outer surface. In the case of such an embodiment of the invention, cooling liquid can be applied directly onto the outer surface of the drum. A kind of double-walled housing into which the cooling medium can be continuously introduced is formed. In other words, it is possible that the drum has a double-walled drum housing, wherein the cooling liquid can flow in the intermediate space formed as a result of the double-walled design. The advantage of such an embodiment of the invention is that cooling liquid is applied onto the outer surface of the drum over a large surface area. It is also unnecessary for the cooling device to be arranged in a directed manner, since cooling liquid can be applied onto almost the entire surface of the drum.

Preferably, the spraying nozzles are formed in an upper side or in the region of an upper side of the machine housing or in the region of a top surface of the machine housing.

As a result of the arrangement of the spraying nozzles, it is also possible that the

inner side of the machine housing can be sprayed with cooling liquid, at least onto portions thereof.

Such an arrangement of the spraying nozzles makes it possible that cooling liquid can be sprayed in particular onto the outer surface of the drum of a solid-bowl scroll centrifuge that is located in the upper part if it is imagined that the scroll is divided along the longitudinal axis of the scroll.

When forming a separator according to the invention, at least one of the spraying nozzles may be arranged in the machine housing such that a cooling liquid is sprayed onto the upper portion of the drum housing if it is imagined that the drum housing is divided along a horizontal axis. Preferably, the horizontal axis is at the height of the outlet openings, in particular the outlet nozzles, of the separator.

To increase the degree of cooling, it is additionally possible that the spraying nozzles are arranged in the entire machine housing, so that cooling liquid can also be sprayed onto the drum from the sides and/or from below. In other words, the spraying nozzles may be arranged such that fully circumferential cooling of the outer surface of the drum is made possible.

In the case of one embodiment of a separator according to the invention, at least one spraying nozzle may also be formed in the region of a fastening bar along which the solid discharge usually flows.

For example, such a fastening bar is of a double-walled design, so that at least one spraying nozzle can be arranged in particular in the double-walled construction. It is alternatively or additionally possible that at least one spraying nozzle is arranged in the machine housing such that it is directed from outside towards the region of the fastening bar, in particular double-walled fastening bar. Since increased temperatures in connection with the solid discharge can be assumed in particular in the region of the fastening bar, the arrangement of at least one spraying nozzle in this region is particularly advantageous.

The temperature monitoring unit may in the simplest case be formed by a temperature sensor. It is also possible that a temperature monitoring unit additionally has a computing unit. In a further embodiment of the invention, it is possible that a number of sensors are connected to a single computing unit.

It is possible that a temperature monitoring unit and/or a device for cooling the cooling liquid is formed in a tank for storing the cooling liquid. The temperature monitoring unit of the tank for storing the cooling liquid may be connected to the temperature monitoring unit of the machine housing. It is also possible that the temperature monitoring unit of the tank for storing the cooling liquid is a unit associated with the temperature monitoring unit of the machine housing.

It is possible with the aid of a device for cooling the cooling liquid to cool the cooling liquid located in the tank. Such cooling may take place for example when there are rising outside temperatures or rising ambient temperatures and when various threshold values in the machine housing are reached.

A further temperature monitoring unit may be formed in a liquid phase outflow or in the region of the centrate outflow of the separating machine, in particular the solid-bowl scroll centrifuge or the separator. With the aid of this temperature monitoring unit, the centrate temperature or the temperature of the liquid phase separated off by the separating machine, in particular the solid-bowl scroll centrifuge or the separator, can be determined and/or monitored.

When the separating machine according to the invention is a separator, in particular a 3-phase separator, a temperature monitoring unit may be respectively formed in the region of the light liquid phase outlet and in the region of the heavy liquid phase outlet.

It is also possible in connection with a separator according to the invention that the temperature in a solid cyclone is detected. A solid separated off or produced by the separator is usually transported into a solid cyclone.

It is also possible that a collecting and returning device for used cooling liquid is formed in the machine housing. It is possible that a cleaning unit is formed in this collecting and returning device. The collected cooling liquid can consequently be cleaned once again before re-use. A detection unit for establishing a degree of contamination of the cooling liquid is also possible.

On the basis of the device according to the invention and the method according to the invention, for example such an explosive product that has a flash point of > 44°C can be processed in a separating machine, in particular in a solid-bowl scroll centrifuge or in a separator. The processing of explosive products that have an even lower flash point is also possible by corresponding adaptation of the method and/or of the separating machine.

In particular, materials of explosion group IIA or IIB can be processed. Furthermore, processing of temperature classes T1 - T4 can also take place.

It is possible that changed, i.e. increased, processing temperatures in comparison with the prior art can be used when processing an explosive product.

In the case of mixtures with one flammable component, the processing temperature may be: flash point of the mixture - 9 kelvins. In other words, the processing temperature may have such a value that is at least 9 kelvins lower than the flash point of the product to be processed.

In the case of mixtures or products that have a number of flammable components, the processing temperature may be: flash point minus 19 kelvins. In other words, the processing temperature may have such a value that is at least 19 kelvins lower than the flash point of the product to be processed.

In particular, it is possible to use the separating machine according to the invention for processing alcohol products or for processing oil sludge media. The alcohol products may include drinking alcohol products.

The solid-bowl scroll centrifuge according to the invention may operate in zone 2 IIB T4.

The method according to the invention and the associated separating machine according to the invention are described in more detail below on the basis of schematic representations, in which:

Fig. 1 shows a solid-bowl scroll centrifuge according to the invention; and

Fig. 2 shows a separator according to the invention.

The same reference numerals are used below for identical and identically acting components.

The solid-bowl scroll centrifuge 10 shown in Figure 1 comprises a scroll 30 located in a drum 20. The subassembly comprising both the drum 20 and the scroll 30 is referred to in general as a rotor. The rotor is distinguished by the fact that both the drum 20 and the scroll 30 rotate.

The drum 30 or the rotor is located in a machine housing 40. In the machine housing 40, in particular in the region of the top side 41 of the machine housing 40, there is a spraying system 50. The spraying system 50 has a number of spraying nozzles 51. The spraying nozzles 51 are directed towards the drum 20 such that the outer surface 21 can be sprayed with cooling liquid, in particular with cooling water, at least onto portions thereof.

Preferably, the spraying nozzles 51 are directed such that in particular spraying of the upper half of the outer surface 21 of the drum 20 is made possible. The upper half should be understood as meaning the half of the drum 20 or of the outer surface 21 that is formed if it is imagined that a section is taken through the longitudinal axis L of the scroll. Since the drum 20 rotates during the processing of a product, consequently the complete outer surface or almost the complete outer surface of the drum 20 is cooled during the processing.

The spraying nozzles 51 are distributed within the machine housing 40 such that the cooling liquid also impinges on the inner sides 43 of the machine housing 42 onto portions thereof.

In addition, it is possible that such spraying nozzles that are also arranged in the bottom side 42 of the machine housing 40 are used, so that simultaneous fully circumferential spraying of the outer surface 21 of the drum 20 is made possible during the processing of the product. If spraying nozzles are to be formed in the region of the bottom side 42 of the machine housing 40, they must sometimes be operated with a greater pressure, so that cooling of the outer surface 21 is possible.

It is also evident that the solid-bowl scroll centrifuge 10 is designed with a number of temperature monitoring units 60 - 63. The temperature monitoring units 60 - 62 thereby determine the temperatures in the machine housing 40. The temperature monitoring unit 63 detects or monitors the temperature of the centrate 70 produced by the solid-bowl scroll centrifuge 10.

For the processing of explosive products, these products are transported into the interior space 18 of the drum by way of the inflow pipe 15. In the interior space 18 of the drum, which may also be referred to as the separating space, a separation of the explosive product into a solid and a centrate 70 takes place.

By way of a solid outlet 71 (only schematically shown), the solid is correspondingly transported away. During the processing of the explosive product, the outer surface 21 of the drum 20 is sprayed with cooling liquid by means of a spraying system 50. At the same time, detecting or monitoring of the temperature in the machine housing 40 takes place. In the present example, this takes place by way of the temperature monitoring units 60, 61 and 62.

It is possible to regulate the cooling liquid used in the spraying system 50 with regard to the temperature. In particular, regulating to a maximum temperature of 25°C takes place.

In addition, the temperature of the centrate 70 is monitored by means of the temperature monitoring unit 63.

Upon detecting a first temperature threshold value in the machine housing 40 and/or in the liquid phase outflow 72, in which the centrate 70 is transported, preferably a supply of the product to be processed in the solid-bowl scroll centrifuge 10 is stopped and cooling liquid, in particular water, is supplied or pumped into the drum 20. The water is transported into the interior space 18 of the drum by way of the inflow pipe 15. This leads to a temporary cooling and dilution of the product in the interior space 18 of the drum. A dilution of the product brings about an increase in the flash point of the product.

Upon detecting a second temperature threshold value, which is higher than the first temperature threshold value, the solid-bowl scroll centrifuge 10 is preferably switched off.

It is alternatively or additionally possible that, upon detecting a/the second temperature threshold value, additionally or alternatively the cooling liquid itself is cooled such that the maximum temperature of the cooling liquid has a lower value than was specified and/or regulated before the first temperature threshold value was detected. The cooling or regulating of the temperature of the cooling liquid preferably takes place in the cooling liquid inflow 52 of the spraying system 50.

The cooling liquid may be collected after spraying in the machine housing 40 by means of a collecting and returning device 80 and subsequently transported to the cooling liquid inflow 52. This makes it possible for cooling liquid to be used sparingly in a solid-bowl scroll centrifuge 10.

In Fig. 2, a further embodiment of a separating machine according to the invention, specifically an embodiment of a separator 10', is shown. The separator 10 that is shown is a 3-phase separator. The method according to the invention and the device

according to the invention can however also be used for 2-phase separators.

In a drum 20, a rotatable disc stack 30' is arranged. The drum 20 is located together with the disc stack 30' in the machine housing 40. In the machine housing 40 there is at least partially a spraying system 50. The spraying system 50 has a number of spraying nozzles 51.

A spraying nozzle 51 is in this case arranged such that in particular spraying of an upper portion of the outer surface 21 of the drum 20 is made possible. The upper portion should be understood as meaning the portion of the drum 24 of the outer surface 21 that is formed if it is imagined that a section is taken through the horizontal axis H of the drum 20. The horizontal axis H runs in particular at the height of the outlet openings 90, which are designed in particular as outlet nozzles.

Since the drum 20 rotates during processing of a product, consequently the upper portion of the outer surface of the drum 20 is completely or almost completely cooled during the processing.

In addition, according to the embodiment of Fig. 2, such a spraying nozzle 51' that is directed towards the region of the bar 91 is formed. In particular the solid that has been separated off is transported along the bar 91. Consequently, increased temperatures can be expected particularly in the region of the bar.

A further spraying nozzle 51" that is shown by way of example is arranged in the region of the lower portion or the bottom side 41 of the machine housing 40. Accordingly, the spraying nozzle 51" is directed such that cooling liquid can be applied in particular to a lower portion of the drum 20.

The solid that has been separated off preferably enters a solid cyclone 92. A spraying nozzle 51 may also be formed in this solid cyclone 92. This also prevents a solid that has already been separated off from igniting/exploding while it is temporarily being held in the solid cyclone 92.

It is evident that the separator 10' is designed with a number of temperature monitoring units 60 and 64 - 67. The temperature monitoring unit 60 in this case determines the temperature in the machine housing 40, in particular in the region above the horizontal axis H.

Furthermore, a temperature monitoring unit 64 is formed in the region of the bottom side 42 of the machine housing 40.

Furthermore, a temperature monitoring unit 66 is formed in the region of the heavy liquid phase outflow 94 and a temperature monitoring unit 65 is formed in the region of the light liquid phase outflow 93.

In other words, the temperature monitoring unit 66 detects the temperature of the heavy liquid phase produced by the separator 10'. The temperature monitoring unit 65 detects or monitors the temperature of the light liquid phase produced by the separator 10'.

For the processing of explosive products, these products are transported into the interior space 18 of the drum by way of the fixed inflow pipe 15. In the interior space 18 of the drum, which may also be referred to as the separating space, a separation of the explosive product into a solid, a light liquid phase and a heavy liquid phase takes place.

During the processing of the explosive product, a cooling liquid is sprayed onto the outer surface 21 of the drum 20, at least for a time, by means of the spraying system 50. At the same time, the temperature in the machine housing 40 is detected or monitored.

It is possible to regulate the cooling liquid used in the spraying system 50 with regard to the temperature. In particular, regulating takes place for example to a maximum of 25°C. In addition, the temperature of the solid in the region of the bottom side 42 of the machine housing 40 is monitored. Temperature monitoring by means of the temperature monitoring unit 67 in the region of the solid cyclone

92 is also advantageous.

The detecting of temperature threshold values, in particular a first, a second and a third temperature threshold value and regulating the operation of the separator 10' in this respect substantially corresponds to the method in connection with the solid-bowl scroll centrifuge 10. It is accordingly also possible that, upon detecting a second temperature threshold value, a cooling liquid is transported into the interior space 18 of the drum by way of the inflow pipe 15. This leads to a temporary cooling and dilution of the product in the interior space of the drum. A dilution of the product brings about an increase in the flash point of the product located in the interior space 18 of the drum.

Upon detecting a third temperature threshold value, which is higher than the second temperature threshold value, the separator 10' is preferably switched off.

Also in connection with the separator 10', after the spraying in the machine housing 40 it is possible for the cooling liquid to be collected and subsequently transported to the cooling liquid inflow 52 by means of a collecting and returning device (not shown). As a result of this, it can be made possible for cooling liquid to be used in a separator 10' with low environmental impact.

Otherwise, the same explanations as in connection with the solid-bowl scroll centrifuge 10 apply.

List of designations

10	Solid-bowl scroll centrifuge
10'	Separator
15	Inflow pipe
18	Interior space of the drum/separating space
20	Drum
21	Outer surface
30	Scroll

30’	Disc stack
40	Machine housing
41	Top side
42	Bottom side
43	Inner side
50	Spraying system
51, 51’, 51”	Spraying nozzle
52	Cooling liquid inflow
60 - 63	Temperature monitoring unit
64 - 67	Temperature monitoring unit
70	Centrate
71	Solid outlet
72	Liquid phase outflow
80	Collecting and returning device
90	Outlet opening
91	Bar
92	Solid cyclone
93	Light liquid phase outflow
94	Heavy liquid phase outflow
H	Horizontal axis
L	Longitudinal axis

Patentkrav

1. Fremgangsmåde til bearbejdning af eksplosive produkter i en separeringsmaskine (10, 10'), omfattende en roterende indretning, som befinder sig i en tromle (20), hvorved tromlen (20) befinder sig i et maskinhus (40).

hvorved kølevæske direkte eller indirekte påvirker ydersiden (21) af tromlen (20) i det mindste på afsnit deraf og/eller intermitterende under bearbejdning af produkterne, og temperaturen i maskinhuset (40) overvåges under bearbejdningen, hvorved
en kølevæskeindstrømning (52) og/eller sprøjtedyser (51) aktiveres i tidsintervaller, og kølevæske fordeles inden i maskinhuset (40).
kendetegnet ved, at
ved detektering af en første temperaturtærskelværdi i maskinhuset (40) og/eller i en væskefaseudstrømning (72) aktiveres kølevæskeindstrømningen (52) og/eller sprøjtedyserne (51),
ved detektering af en anden temperaturtærskelværdi, som er højere end den første temperaturtærskelværdi, standses en levering af produktet, der skal bearbejdes i separeringsmaskinen i maskinhuset (40) og/eller i væskefaseudstrømningen (72), og væske leveres ind i tromlen (20).

2. Fremgangsmåde ifølge krav 1,
kendetegnet ved, at
den maksimale temperatur af kølevæsken reguleres, navnlig til en maksimal temperatur på 35°C, navnlig 30°C, især 25°C.

3. Fremgangsmåde ifølge krav 1 eller 2,
kendetegnet ved, at
kølevæsken fordeles i afsnit på maskinhusets inderside (43).

4. Fremgangsmåde ifølge et af kravene 1 til 3,
kendetegnet ved, at
ved detektering af en tredje temperaturtærskelværdi, som er højere end den anden temperaturtærskelværdi, bliver separeringsmaskinen udkoblet.

5. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at
ved detektering af den anden temperaturtærskelværdi bliver selve kølevæsken afkølet, således at kølevæskens maksimale temperatur har en lavere værdi, end denne var specificeret og/eller til, før den første temperaturtærskelværdi blev detekteret.

6. Fremgangsmåde ifølge krav 5,
kendetegnet ved, at
kølevæsken, som befinder sig i en tank, afkøles.

7. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at
kølevæsken opsamles efter tilførslen i maskinhuset (40), og anvendes efterfølgende igen til køling.

8. En separeringsmaskine (10, 10') til udførelse af en fremgangsmåde ifølge et af kravene 1 til 7 med henblik på bearbejdning af eksplosiver, hvorved separeringsmaskinen (10, 10') omfatter en roterende indretning, der befinder sig i en tromle (20), hvorved tromlen (20) befinder sig i et maskinhus,
hvorved en køleindretning er dannet i maskinhuset (40), hvorved køleindretningen er rettet mod tromlens (20) yderside (21) eller er arrangeret således, at kølevæsken kan tilføres på tromlens (20) yderside (21), og ydermere er der i maskinhuset (40) dannet mindst en temperaturovervågningsenhed (60).

9. Separeringsmaskinen ifølge krav 8, hvorved køleindretningen er dannet som et mellemliggende rum, der er dannet i maskinhuset (40), hvorved en kølevæske kan cirkulere i det mellemliggende rum, og det mellemliggende rum er dannet ved hjælp af mindst en yderside (21) af tromlen (20) samt et andet husafsnit, der har en afstand til ydersiden (21).

10. Separeringsmaskinen ifølge krav 8 eller 9, hvorved en tank til opbevaring af kølevæsken omfatter en temperaturovervågningsenhed og/eller en indretning til køling af kølevæsken.

11. Separeringsmaskinen ifølge et af kravene 8 til 10, hvorved der i en væskefaseudstrømning (72, 93, 94) er dannet en temperaturovervågningsenhed (63, 65, 66).

12. Separeringsmaskinen ifølge et af kravene 8 til 11,
hvorved, i maskinhuset (40), en opsamlings- og returneringsindretning (80) for brugt kølevæske er dannet.

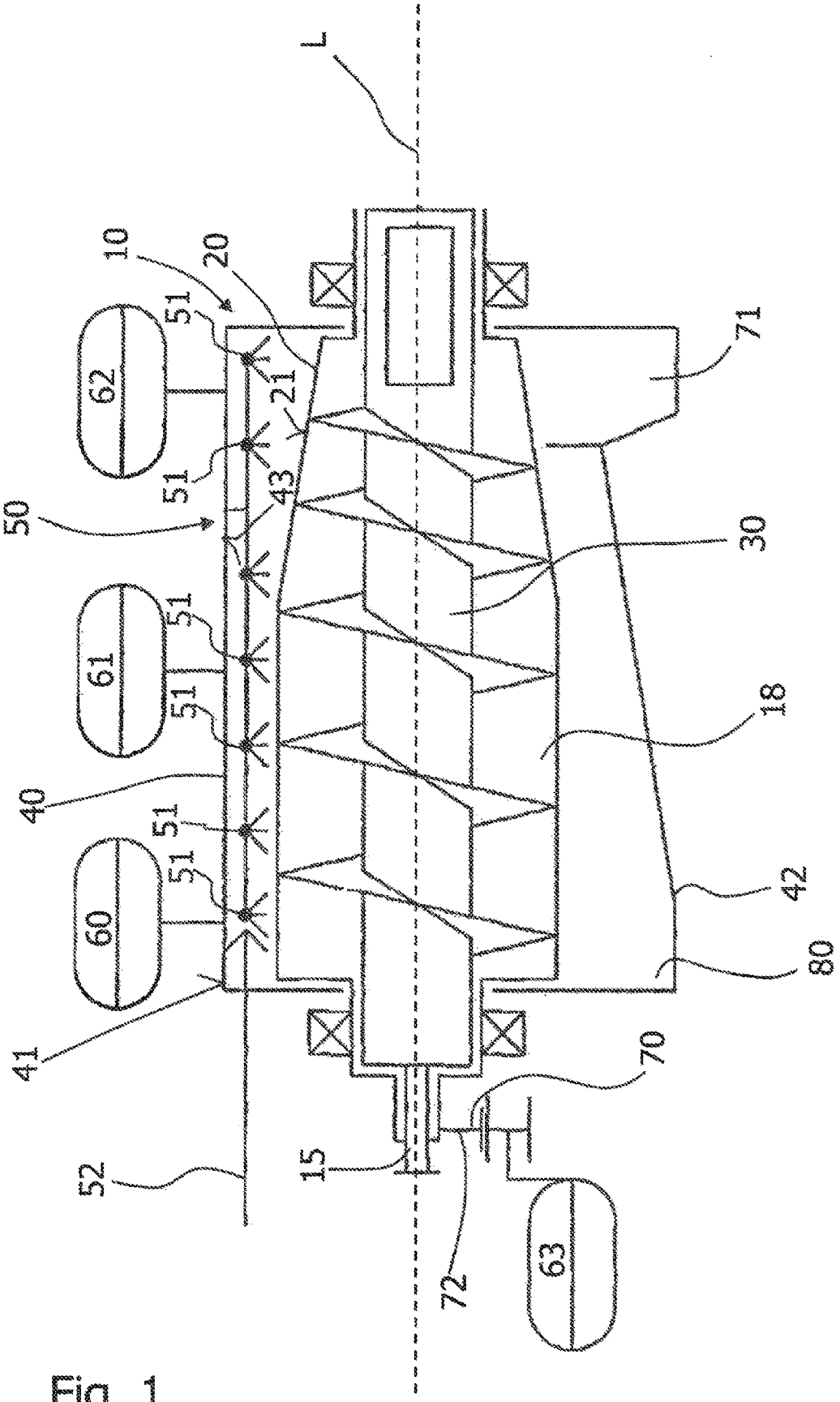
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Fig. 1

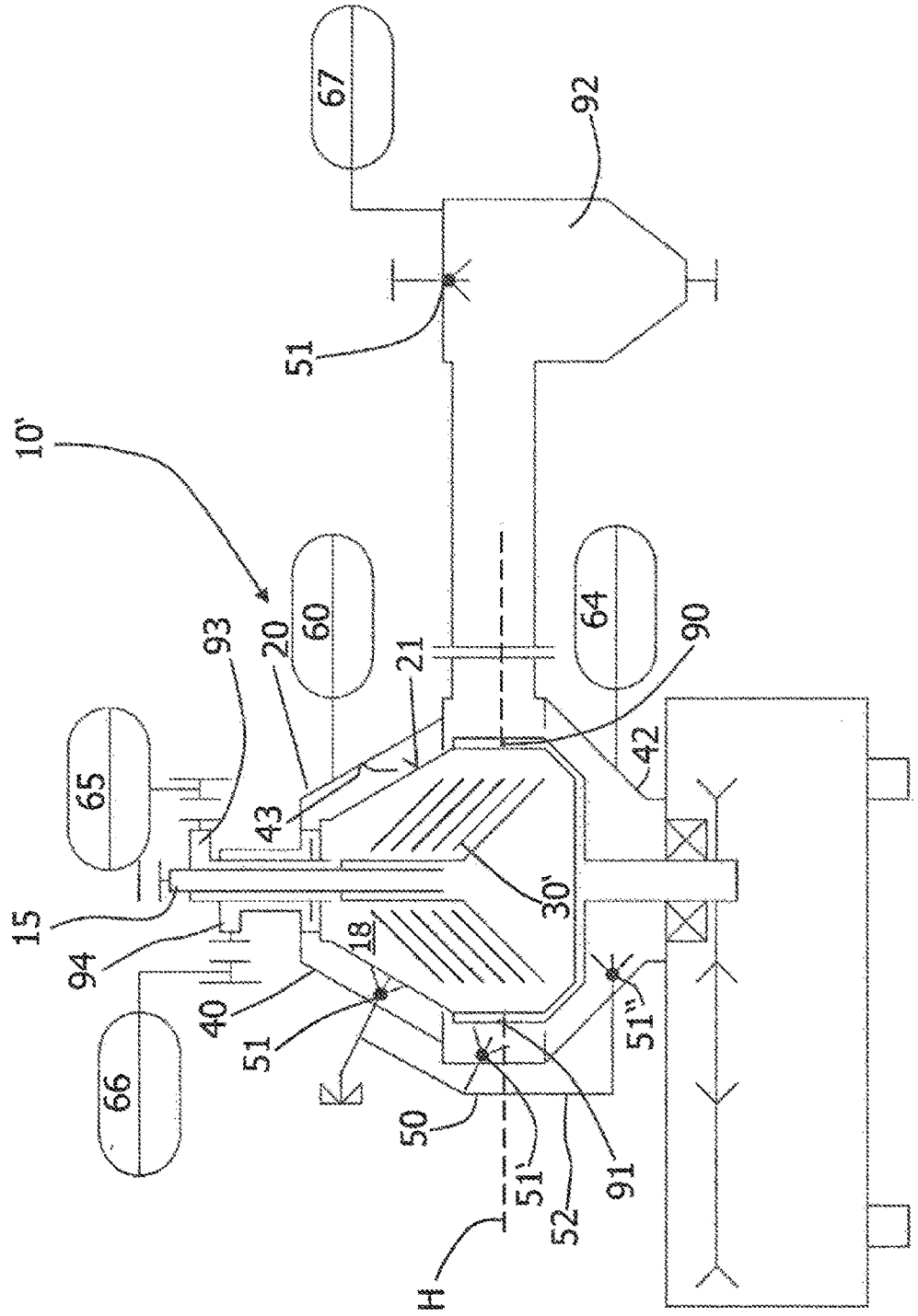
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Fig. 2