- wherein the rotor is arranged on the drive spindle and the stator is radially spaced apart from the rotor in a drive housing which does not rotate during operation,
- wherein the stator has at least one or multiple winding heads, ~~and~~
- wherein at least one chamber is formed on at least one of the winding heads, in which chamber a coolant film ~~and/~~or bath is formed during operation, so that this winding head is cooled with coolant during operation ~~or is cooled during operation~~
- wherein the coolant in the respective chamber is a lubricating oil and wherein the lubricating oil is used on the one hand for lubricating one or more bearings of the drive spindle and on the other hand for cooling the one or the multiple winding heads
- the one winding head is an upper winding head and the other winding head is a lower winding head, and in that at least one of the chambers is formed on the upper and/or on the lower winding head in each case, and
- one or both of the chambers is/are completely filled with the oil bath during operation.

According to this wording, one or more of the chambers may be formed on each of one or more winding heads.

In this way, one of the winding heads or, optionally, two winding heads are cooled in a simple manner, preferably directly in a coolant film or even bath that forms during operation on one or more outer surfaces. The coolant transports heat away from the winding heads.

Previously, the winding heads were surrounded by air. The thermal conductivity λ of air is 0.0262 W/mK. The thermal conductivity λ of lubricating oil can be, for example, 0.13 to 0.15 W/mK. Thus, the heat transfer to the surrounding medium is already considerably improved, e.g. by a factor of 5. In addition, the heat is dissipated more effectively by rotation or preferably circulation of the lubricating oil, whereas in the prior art the air surrounding the winding head was essentially stationary.

The coolant is a free-flowing coolant. Lubricating oil is used as the coolant, especially since this must be provided anyway for the lubrication of one or more bearings on the centrifuge. One advantage is that, due to the additional cooling of the winding heads, the motor can be loaded more heavily without the motor temperature rising above a permissible value. The cooling is more effective and the power density is therefore high.

It is therefore advantageous that the lubricating oil is used on the one hand for lubricating one or more bearings of the drive spindle and on the other hand for cooling

the one or more winding heads.

The electric drive motor can be, for example, an asynchronous motor or a synchronous motor - e.g. a reluctance motor.

One advantage is that the existing lubricating oil, which is used to lubricate the rolling bearings, is now also used to cool the motor or the winding heads. Thus, the machine does not require any further aggregates and no further cooling medium such as water. The combination of direct heat dissipation from the motor stator - for example at cooling fins - and heat dissipation from the winding heads via lubricating oil flow to the cooling fins is thus particularly effective.

CLAIMS

1. Separator ~~(1)~~ comprising:

   a. a unit which rotates during operation and which has a drum ~~(2)~~ and a drive spindle ~~(3)~~,

   b. a drive motor ~~(10)~~ designed as an electric motor for rotating the drive spindle and having a stator ~~(20)~~ and a rotor ~~(21)~~,

   c. wherein the rotor ~~(21)~~ is arranged on the drive spindle ~~(3)~~ and the stator ~~(20)~~ is radially spaced apart from the rotor ~~(21)~~ in a drive housing ~~(11)~~ which does not rotate during operation,

   d. wherein the stator has at least one or multiple winding heads ~~(20a, 20b)~~,

   characterized in that

   e. at least one chamber ~~(K1, K2)~~ is formed on at least one of the winding heads ~~(20a, 20b)~~, in which chamber ~~(K1, K2)~~ a coolant film or a coolant bath is formed during operation, so that this winding head ~~(20a, 20b)~~ is cooled with coolant during operation,

   f. wherein the coolant in the respective chamber ~~(K1, K2)~~ is a lubricating oil and wherein the lubricating oil is used on the one hand for lubricating one or more bearings ~~(4, 5)~~ of the drive spindle and on the other hand for cooling the one or the multiple winding heads ~~(20a, 20b)~~.

   g. the one winding head is an upper winding head ~~(20a)~~ and the other winding head is a lower winding head ~~(20b)~~, and in that at least one of the chambers ~~(K1, K2)~~ is formed on the upper and/or on the lower winding head ~~(20a, 20b)~~ in each case, and

   h. one or both of the chambers ~~(K1, K2)~~ is/are completely filled with the oil bath during operation.

2. Separator according to claim 1, characterized in that the respective chamber ~~(K1, K2)~~ on the respective winding head ~~(20a, 20b)~~ is formed as an annular chamber which is formed at the top, the outside and/or the bottom of the respective winding head ~~(20a, 20b)~~ so that correspondingly an upper, an outer and/or a lower surface of the respective winding head is partially or completely covered by a lubricating oil film during operation.

3. Separator according to one of the preceding claims, characterized in that the respective chamber ~~(K1, K2)~~ has an inlet and an outlet.

4. Separator according to any of the preceding claims, characterized in that one or more cooling channels ~~(74)~~ are formed in the drive housing ~~(11)~~.

5. Separator according to one of the preceding claims, characterized in that the drive housing ~~(11)~~ has cooling fins ~~(12)~~ and that one or more of the cooling channels ~~(74)~~ have lubricating oil flowing through them, which has been discharged from one or both chambers ~~(K1, K2)~~, in order to dissipate thermal energy of the lubricating oil to the environment via the cooling fins ~~(12)~~.

6. Separator according to one of the preceding claims, characterized in that the at least one or more chambers ~~(K1, K2)~~ is/are each designed such that the lubricating oil does not heat up by more or less than 20°K when flowing through the respective chamber ~~(K1, K2)~~ during operation.

7. Separator according to one of the preceding claims, characterized in that the respective chamber ~~(K1, K2)~~ is formed between elements and/or sections of the motor housing ~~(7, 8)~~ and the respective winding head ~~(20a, 20b)~~.

8. Separator according to one of the preceding claims, characterized in that the drive spindle ~~(3)~~ is axially penetrated by a bore ~~(101)~~, wherein the drive spindle ~~(3)~~ is immersed in a lubricating oil sump ~~(102)~~ at the bottom of the drive housing ~~(11)~~, wherein lubricating oil is conveyed through the bore ~~(101)~~ of the drive spindle ~~(3)~~ into the region of a neck bearing and/or into the region of a feed line of the chamber ~~(K1)~~ at the upper winding head ~~(20a)~~.

9. Separator according to claim 8, characterized in that lubricating oil draining from the first chamber ~~(K1)~~ at the upper winding head ~~(20a)~~ is directed through the cooling channels ~~(74)~~ into the second chamber ~~(K2)~~ at the lower winding head ~~(20b)~~, from where it is directed back into the lubricating oil sump ~~(102)~~.

10. Separator according to one of the preceding claims, characterized in that the, preferably single or double, conical drum ~~(2)~~ is placed on the upper end of a rotatable drive spindle ~~(3)~~.

11. Separator according to one of the preceding claims, characterized in that a separating disc stack of separating discs is arranged in the drum ~~(2)~~.

12. Separator according to one of the preceding claims, characterized in that the pre-assembled drive and rotary system unit ~~(100)~~ comprises a closed lubrication system circuit.

13. Separator according to one of the preceding claims, characterized in that the drive motor is located between a neck bearing ~~(4)~~ and a foot bearing ~~(5)~~.

14. Method for cooling a drive motor ~~(20)~~ of a separator ~~(1)~~ according to one or more of the preceding claims, comprising the following steps:

A) providing a separator according to any one of the preceding claims; and

B) flow of lubricating oil through the one or more chambers ~~(K1, K2)~~ during operation in such a way that one or more of the chambers ~~(K1, K2)~~ is/are completely filled with an oil bath during operation.

15. Method according to claim 14, characterized in that lubricating oil flows through the at least one or more chambers ~~(K1, K2)~~ in such a way that the lubricating oil heats up by less than 20°K when flowing through the respective chamber ~~(K1, K2)~~.