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(54) **Brake**

(57) A brake (1) for use in a line reel (2) where a line is wound up on a reel member (3) which includes a hub (4) with side flanges (5) having a diameter which is greater than the diameter of the hub, and which includes a first brake part (6), and where the reel member (3) is adapted for rotating about a shaft member (7) including a fixed journal (8) extending into the hub (4) and including a second brake part (9) that interacts frictionally with the first brake part (6), and which includes a disc spring (12), where the brake power of the brake is adjusted by compressing the two brake parts (6, 9) and the disc spring

(12) by an interactive screw connection (10) between the shaft member (7) and the reel member (3), and where the first brake part (6) is formed by a circular ring-shaped axially oriented brake surface (11) with an inner diameter which is greater than the diameter of the hub, and an outer diameter which is less than the diameter of the side flanges, wherein the second brake part (9) is a disc spring (12) with an axially oriented friction surface (13) interacting with at least one part of the brake surface (11).

EP 2 141 106 A1

Description

Field of the Invention

[0001] The present invention concerns a brake for use in a line reel, wherein a line is wound up on a reel member which includes a hub with side flanges having a diameter which is greater than the diameter of the hub, and which includes a first brake part, and where the reel member is adapted for rotating about a shaft member including a fixed journal extending into the hub and including a second brake part that interacts frictionally with the first brake part, and which includes a disc spring, where the braking power of the brake is adjusted by compressing the two brake parts and the disc spring by an interactive screw connection between the shaft member and the reel member, and where the first brake part is formed by a circular, ring-shaped axially oriented brake surface with an inner diameter which is greater than the diameter of the hub, and an outer diameter which is less than the diameter of the side flanges.

[0002] The invention moreover concerns a hose reel including a line reel combined with a brake of the above specified type.

[0003] The invention moreover concerns a fire hose box including a line reel combined with a brake of the above specified type.

Background of the Invention

[0004] Line reels are i.a. known in connection with cable drums and hose reels for fire hose boxes.

[0005] When a line is unrolled by the user pulling the line, the reel begins to rotate. The reel has a certain inertia which depends on the weight of the reel and the line rolled up. This means that the reel will continue rotating after the pull in the line has ceased. This is inexpedient as hereby there will be formed a bundle of line where one is pulling from the bottom of the bundle by continued unrolling the line. Hereby there is a great risk that the line will be tangled up. Therefore, it is suitable to provide the line reel with a brake so that the unrolling stops when the pull in the line stops.

[0006] Hose reels for fire hose boxes are to be provided with a brake such that the reel during unrolling terminates its rotation within one revolution if the pull in the hose ceases. This is an essential requirement as the hose reel will continue rotating without such a brake. Continued rotation after the pull having ceased will entail the risk that the hose is tangled up so that further unrolling is impeded.

[0007] A specific example of a situation in which the brake comes into function is by unrolling a fire hose where the user runs with the end of the hose in direction of a door. The user stops when reaching the door and stands still while the door is opened. When the door is open, the run towards a place of fire is continued. In this situation, it is absolutely necessary that the hose stops with one

revolution, and does not continue rotating with great speed under the action of inertia from the water-filled hose. If rotation is continued, the hose will become tangled up and will thus not have the length for reaching the place of fire.

[0008] The fire authorities have prescribed a test of brakes for line reels for fire hoses. The test is performed by letting the hose reel rotate 3000 revolutions in 1.5 hours. Then the hose is unrolled at a given speed. At a point during the unrolling, the pull in the hose is stopped. The line reel may then rotate one revolution at most before stopping under the action of the brake.

[0009] There exists a hose reel for fire hose boxes where the main parts, such as the shaft and the brake are made of brass. The brake operates by direct clamping hub and shaft together. The braking capability is adjusted by more or less clamping together of hub and shaft.

[0010] Brass is capable of withstanding the heat arising during the above test. At the same time, brass is dimensionally stable at the temperatures reached by the hose reel. This is important in order to adjust the braking capability to a reasonably constant braking level.

[0011] There has appeared a wish of making a line reel of more modern materials, wherein the main parts of the line reel are simple to make and at the same time with better possibility of shaping.

[0012] Such a material is plastic which is simple to use and easy to shape by injection moulding.

[0013] By experiments it has appeared that it is not possible immediately to substitute brass with a plastic material as the heat generated during unrolling cannot be conducted away in the same way as by brass. This results in that the plastic material is heated to a point where it becomes deformed permanently, and without ability to function as a brake. Either because the brake becomes too tight or because the braking capability is reduced.

[0014] DE 3712500 A1 describes a brake used in a line reel where a line is rolled up on a reel member. The reel member includes a hub with two side flanges, of which one constitutes a first brake part. The reel member is adapted for rotating about a shaft member which include a fixed journal extending into the hub, and a second brake part interacting frictionally with the first brake part. The braking action of the brake is adjusted by clamping together the two brake parts and a disc spring by a screw connection between the shaft member and the reel member.

[0015] CH 622225 A5 describes a brake used in a line reel where a line is rolled up on a reel member. The reel member includes a hub with two side flanges, and a first brake part. The reel member is adapted for rotating about a shaft member which includes a fixed journal extending in the hub and a second brake part interacting frictionally with the first brake part. The braking action of the brake is adjusted by clamping together the two brake parts and a disc spring by a screw connection between the shaft member and the reel member.

Object of the invention

[0016] It is the object of the invention to indicate a brake for a line reel which is capable of efficiently braking the reel when unrolling the line. It is a further object to indicate a reel for fire hoses or a fire hose box which enables keeping official requirements as to stopping the line reel.

Description of the invention

[0017] According to the present invention, this is achieved by a brake of the kind mentioned in the introduction which is peculiar in that the second brake part is a disc spring with an axially oriented friction surface interacting with at least one part of the brake surface.

[0018] This is furthermore achieved by a hose reel including a line reel combined with a brake of the above specified type which is peculiar as specified above.

[0019] This is furthermore achieved by a fire hose box including a line reel combined with a brake of the above specified type which is peculiar as specified above.

[0020] Due to the diameter of the brake surface becoming larger, there is attained a lesser relative speed between the friction surfaces, while at the same time the area of the braking surface becomes larger. These two effects results in less heat development in combination with the heat being distributed over a greater area. The brake therefore becomes less sensitive to the heat development. This makes it possible to choose materials based on other criteria than the requirement to good dimensional stability at high temperatures, and at the same time maintain an efficient braking of the line reel. This invention will therefor enable application of plastic as well as other materials for the brake.

[0021] By the disc spring it becomes easier to perform a precise adjustment of the braking capability since the disc spring can be designed such that it has a longer travel relative to the clamping against the brake surface. Besides, this provides possibility of a very simple and reliable design since movable parts are avoided. Great reliability is an absolute requirement in connection with fire equipment.

[0022] According to a further embodiment, the brake according to the invention is peculiar in that the disc spring and the journal are optionally provided in a plastic material selected among PE, POM, PARA.

[0023] Due to the smaller generation of heat, it has become possible to choose plastic for making the main parts of the line reel. Hereby is achieved that the main parts, such as shaft and disc spring, can be made in a simple way even they may have a complicated design. Plastic materials are moreover found with many different properties such that it will be easy, for example, to adapt the spring forces of the disc spring in relation to the desired properties of the brake. By experiments it has appeared that the above materials are particularly advantageous materials which are simple to produce and shape. Additionally, there are great economic advantages

connected with the possibility of choosing other materials than were known for the invention.

[0024] PE is polyethylene, POM is polyoxymethylene and PARA is polyarylamide.

[0025] The choice of materials is not limited to the above mentioned.

[0026] According to a further embodiment, the brake according to the invention is peculiar in that the brake surface is optionally formed as a surface on a side flange or as a separate braking disc which is fastened with a screw connection to a side flange.

[0027] By choosing to make the braking surface a part of the side flange, the optimal heat transmission away from the braking surface and out into the side flange is achieved.

[0028] If choosing to make the braking surface as a separate braking disc which is fastened to the side flange, it is possible to replace the disc if it becomes worn, without having to replace the entire side flange. At the same time, damage to the surface finish on the side flange is avoided.

[0029] Choosing to make the braking surface as a part of the side flange or as a separate braking disc will depend on the particular circumstances around the line reel. For example, how much space is provided for the structure, the necessary heat transmission, how much wear is the braking surface exposed to.

[0030] According to a further embodiment, the brake according to the invention is peculiar in that the journal is hollow and adapted for conducting water to a water conduit which is connected to and wound up on the reel member.

[0031] Hereby is achieved that the line reel can be used in connection with a water conduit which is permanently connected to an external water supply. The line reel is made with sealing faces between the journal and the hub. The water conduit is connected to an opening in the hub, and the permanent water supply is connected to an opening at one end of the journal. The water runs in through the opening in the journal into a space which is delimited by the outer side of the journal and the inner side of the hub, and a packing at each end. The opening in the hub is connected with this space. The water runs from the space out through the opening and into the water conduit.

[0032] According to a further embodiment, the brake according to the invention is peculiar in that the disc spring has a thickness from and including 3 mm to 10 mm, preferably 5.3 mm.

[0033] The above range is found by testing line reels with various inertia conditions and different extensions of the braking surface. It has appeared that a thickness of 5.3 mm is optimal in connection with line reels used in connection with hose reels and fire hose boxes.

[0034] According to a further embodiment, the brake according to the invention is peculiar in that the disc spring has a cross-section consisting of at least two elements chosen among segments of a curve or a line.

[0035] Hereby is achieved that the spring force of the disc spring as a function of the travel can be adapted

exactly to the desired conditions. The travel is controlled by the clamping of the disc spring against the braking surface.

[0036] According to a further embodiment, the brake according to the invention is peculiar in that the braking surface is made of metal, preferably stainless steel.

[0037] Hereby is achieved that the braking surface becomes very durable. Since the braking surface is subjected to friction, a surface coating in the form of paint will be worn away rapidly. Therefore, it is advantageous to choose stainless steel for the braking surface as an untreated surface may easily corrode with the risk that the braking action will change.

[0038] According to a further embodiment, the brake according to the invention is peculiar in that the brake disc has a thickness from and including 0.25 mm to 3 mm, preferably 0.8mm.

[0039] By experiments with various brake discs on different line reels, it has appeared that the above interval is usable for making the brake discs. A good compromise between strength, heat transmission and thermal inertia is achieved. It has appeared that a thickness of 0.8 mm is optimal in connection with hose reels and fire hose boxes.

[0040] In a particularly advantageous embodiment of the invention, the braking surface is provided with a surface treatment, such as nitriding, making it hard-wearing, or a hardening making it hard.

Description of the Drawing

[0041] The invention will be explained in more detail below with reference to the accompanying drawing, where:

- Fig. 1 shows an isometric view of a line reel;
- Fig. 2 shows a side view of a line reel;
- Fig. 3 shows an isometric view of a shaft member;
- Fig. 4 shows an isometric view of a disc spring;
- Fig. 5 shows a sectional view of a disc spring;
- Fig. 6 shows a view of a hose reel; and
- Fig. 7 shows a view of a fire hose box.

[0042] In the explanation of the Figures, identical or corresponding elements will be provided with the same designations in different Figures. Therefore, no explanation of all details will be given in connection with each single Figure/embodiment.

Detailed Description of the Invention

[0043] Figs. 1-2 show a line reel 2 with a brake 1. The line reel 2 has reel member 3 including a hub 4 (see Fig. 2) with two side flanges 5 and a first brake part 6 (see Fig. 1). The line is wound around the hub 4 by a plurality of layers which are supported by the side flanges 5. The capacity of the reel member is determined by the spacing between the side flanges 5 and thereby the length of the

hub 4, and by the diameter of the hub 5 and the diameter of the side flanges 5. The capacity is increased by doing one or more of the following: increasing the length of the hub 4, reducing the diameter of the hub 4, and/or increasing the diameter of the side flanges 5.

[0044] The reel member 3 is mounted on a shaft member 7 by a screw connection 10 (not shown). The shaft member 7 has a fixed journal 8 (see Fig. 3) around which the reel member 3 can rotate. The shaft member 7 is secured to a support or a base (not shown) supporting the line reel 2. The shaft member 7 further includes a second brake part 9.

[0045] The first brake part 6 rotates with the reel member 3 and the second brake part 9 is fixed, like the shaft member 7.

[0046] The first brake part 6 is formed of a circular, ring-shaped axially oriented brake surface 11 (see Fig. 1). In the shown embodiment, the first brake part 6 is a separate brake disc 14 which is fastened to one side flange 5 with a screw connection (not shown). The brake disc 14 is made of stainless steel AISI 304 because it does not have a corrosion-resistant surface coating in the form of paint. Such a surface coating will rapidly be worn off during use.

[0047] In the shown embodiment, the brake disc 14 has a thickness of 0.8 mm.

[0048] The second brake part 9 is a disc spring 12 with axially oriented friction surface 13 (see Figs. 4-5). The disc spring 12 presses with its friction surface 13 (see Figs. 4-5) against the braking surface 11 (see Fig. 1) on the brake disc 14. The braking capability is adjusted by more or less clamping the reel member 3 against the shaft member 7.

[0049] The shown embodiment of the line reel 2 is intended for a water conduit. The fixed shaft member 7 is adapted for connecting to a fixed water supply with a first stub 17 (see Fig. 2). The water is conducted through the hollow shaft member 7 to a second stub 18 (see Fig. 2) in the hub 4. The water conduit is connected to this stub 18.

[0050] Fig. 3 shows a shaft member 7 without the second brake part 9 (see Figs. 4-5). The shaft member has a stub 17 for connecting to a water supply. The water flows in a channel in the hollow shaft member 7 to at least one opening 19 in the journal 8. The openings 19 communicate with a space (not shown) between the hub 4 (see Fig. 2) and the journal 8. The journal 8 is provided with a groove 20 for sealings (not shown) between the journal 8 and the hub 4 (see Fig. 2).

[0051] The second brake part 9 (see Figs. 4-5) bears against a flange 21 with projections 22 which are received in complementing recesses 23 (see Fig. 4) in the second brake part 9, preventing it from rotating in relation to the journal 8.

[0052] The journal 8 is provided with a screw 23 forming one half part of the screw connection 10 (not shown) that clamps the reel member 3 and the shaft member 7 together.

[0053] In the shown embodiment, the shaft member 9 is made of injection-moulded IXEF 1521 which is a reinforced plastic material.

[0054] Figures 4-5 show the second brake part 9 which is a disc spring 12. The disc spring 12 has a friction surface 13 interacting frictionally with the braking surface 11 (see Fig. 11) by bearing against the latter.

[0055] The disc spring 12 is provided an opening 25 for the journal 8 (see Fig. 3) and a contact face 24 around the opening 25 which has recesses 23 that correspond to projections 22 (see Fig. 3) on the shaft member 7 (see Fig. 3), preventing rotation of the disc spring 12 in relation to the shaft member 7 (see Fig. 3). The contact face 24 and the flange 21 (see Fig. 3) bear against each other.

[0056] On the sectional view on Fig. 4 is seen that the cross-section of the disc spring 12 in the shown embodiment is formed of three straight line sections. The middle line section 26 is located at the contact face 24, the two other line sections 27 are at an angle relative to the middle line section 26. In the shown embodiment, the disc spring has a thickness of 5.3 mm. The shape of the line sections, the angle and the thickness are decisive for the properties of the disc spring. Therefore, these are to be adapted to the individual application. The above mentioned values are suited for a line reel 2 for fire equipment.

[0057] The disc spring is made of POM - Kepital F20-52.

[0058] Fig. 6 shows a hose reel 15 with a line reel 2. The line 28 can be either an electric wire or a water conduit. The line reel 2 is provided with a brake 1 which efficiently brakes the line reel 2 when unwinding the line 28. The hose reel 15 has a fixed connection 29 with an electric or water supply. The hose reel 2 is suspended in a support arrangement 30 which is connected to the shaft member 7.

[0059] Fig. 7 shows a fire hose box 16 with a line reel 2. The line reel 2 is provided with a brake 1 which is hidden behind the line reel 2 on Fig. 7. The line reel 2 is fastened to the fire hose box 16 through the shaft member 7 which is also hidden behind the line reel 2 on Fig. 7. The line 28 is a water hose. The fire hose box is provided with a door 31 hiding the line reel 2 when it is closed.

Claims

1. A brake (1) for use in a line reel (2) where a line is wound up on a reel member (3) which includes a hub (4) with side flanges (5) having a diameter which is greater than the diameter of the hub, and which includes a first brake part (6), and where the reel member (3) is adapted for rotating about a shaft member (7) including a fixed journal (8) extending into the hub (4) and including a second brake part (9) that interacts frictionally with the first brake part (6), and which includes a disc spring (12), where the braking power of the brake is adjusted by compressing the

two brake parts (6, 9) and the disc spring (12) by an interactive screw connection (10) between the shaft member (7) and the reel member (3), and where the first brake part (6) is formed by a circular ring-shaped axially oriented brake surface (11) with an inner diameter which is greater than the diameter of the hub, and an outer diameter which is less than the diameter of the side flanges, **characterised in that** the second brake part (9) is a disc spring (12) with an axially oriented friction surface (13) interacting with at least one part of the brake surface (11).

2. Brake according to claim 1, **characterised in that** the disc spring (12) and the journal (8) are optionally provided in a plastic material selected among PE, POM, PARA.

3. Brake according to claim 1-2, **characterised in that** the brake surface (11) is optionally formed as a surface on a side flange (5) or as a separate braking disc (14) which is fastened with a screw connection to a side flange (5).

4. Brake according to claim 1-3, **characterised in that** the journal (8) is hollow and adapted for conducting water to a water conduit which is connected to and wound up on the reel member.

5. Brake according to any preceding claim, **characterised in that** the disc spring (12) has a thickness from and including 3 mm to 10 mm, preferably 5.3 mm.

6. Brake according to any preceding claim, **characterised in that** the disc spring (12) has a cross-section consisting of at least two elements chosen among sections of a curve or a line.

7. Brake according to any preceding claim, **characterised in that** the brake surface (11) is made of metal, preferably stainless steel.

8. Brake according to any preceding claim, **characterised in that** the disc spring (14) has a thickness from and including 0.25 mm to 3 mm, preferably 0.8 mm.

9. A hose reel (15) which includes a line reel (2) combined with a brake (1) for use in a line reel (2) where a line is wound up on a reel member (3) which includes a hub (4) with side flanges (5) having a diameter which is greater than the diameter of the hub, and which includes a first brake part (6), and where the reel member (3) is adapted for rotating about a shaft member (7) including a fixed journal (8) extending into the hub (4) and including a second brake part (9) that interacts frictionally with the first brake part (6), and which includes a disc spring (12), where the braking power of the brake is adjusted by compressing the two brake parts (6, 9) and the disc spring

(12) by an interactive screw connection (10) between the shaft member (7) and the reel member (3), and where the first brake part (6) is formed by a circular ring-shaped axially oriented brake surface (11) with an inner diameter which is greater than the diameter of the hub, and an outer diameter which is less than the diameter of the side flanges, **characterised in that** the second brake part (9) is a disc spring (12) with an axially oriented friction surface (13) interacting with at least one part of the brake surface (11).

10. A fire hose box (16) which includes a line reel (2) combined with a brake (1) for use in a line reel (2) where a line is wound up on a reel member (3) which includes a hub (4) with side flanges (5) having a diameter which is greater than the diameter of the hub, and which includes a first brake part (6), and where the reel member (3) is adapted for rotating about a shaft member (7) including a fixed journal (8) extending into the hub (4) and including a second brake part (9) that interacts frictionally with the first brake part (6), and which includes a disc spring (12), where the braking power of the brake is adjusted by compressing the two brake parts (6, 9) and the disc spring (12) by an interactive screw connection (10) between the shaft member (7) and the reel member (3), and where the first brake part (6) is formed by a circular ring-shaped axially oriented brake surface (11) with an inner diameter which is greater than the diameter of the hub, and an outer diameter which is less than the diameter of the side flanges, **characterised in that** the second brake part (9) is a disc spring (12) with an axially oriented friction surface (13) interacting with at least one part of the brake surface (11).



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 3446

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 October 2009	Examiner Pussemier, Bart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

3
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 16 3446

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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