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(54) **Roller crusher, and method of fixing a position of a roller in a roller crusher**

(57) A roller crusher comprises at least one roller (2) mounted on a shaft (3), at least one first supporting arm (4), and a frame. The first supporting arm (4) is rotatably attached to the shaft (3) at a first end, and to the frame (5) at a second end. The first supporting arm (4) further comprises a first hole, and the frame (5) comprises a

second hole. The roller crusher (1) further comprises a first fixing member (8) adapted to be inserted in said first and second holes, when said holes are aligned with each other, for locking said first supporting arm (4) in a fixed position. A method of fixing a position of a roller in a roller crusher is also disclosed.

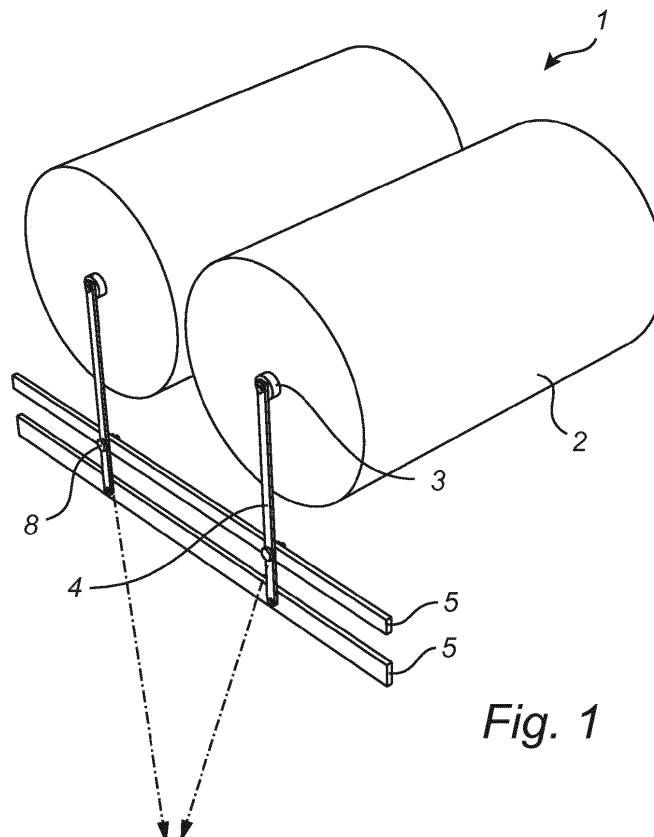


Fig. 1

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Description

Technical Field of the Invention

[0001] The present invention relates to a roller crusher comprising at least one roller mounted on a shaft. The present invention further relates to a method of fixing a position of a roller in a roller crusher.

Background Art

[0002] A common roller crusher, such as that disclosed in EP-516 952, consists of two essentially horizontal rollers, each mounted on a respective shaft. The shaft is in turn supported by a frame, such that the rollers are placed at a suitable distance from each other. In operation, the rollers rotate in opposite directions, towards each other, such that material to be ground is crushed and ground in the gap between the rollers.

[0003] It is preferable that this gap is automatically adjustable depending on the flow of material to be ground. This is accomplished by at least one of the rollers being pivotable in relation to the frame, also referred to as a floating roller. However, the rollers are worn differently depending on if they float, as mentioned above, or are non-pivotably secured to the frame. As a consequence of both general wear and said possible differences in wear, the rollers need to be exchanged every now and then. This exchange is often complicated, both due to the mounting procedure and due to the rollers themselves. The rollers are difficult to manage due to their heavy weight and large size.

[0004] One solution which facilitates the exchange of rollers is discussed in US- 5, 060, 874, which describes a mounting solution wherein each shaft carries externally conical hubs in order to establish a friction high enough such that the roller stays in place on the shaft during operation of the roller grinder, but is still possible to change without damaging the roller crusher. However, this solution only discusses an improved way of fitting a roller on a shaft, it does not discuss a better way of managing the rollers themselves, e.g., during exchange. Thus, there remains a need for an improved roller crusher which allows simpler exchange of the rollers, and which makes it possible to extend the useful lifetime of the rollers.

Summary of the Invention

[0005] It is an object of the invention to solve, or at least lessen, the problems discussed above.

[0006] A particular object of the invention is to provide a roller crusher, in which it is easy to remove a roller for exchanging or reconditioning.

[0007] Another object of the invention is to provide a roller crusher, in which it is possible to choose if a particular roller is to be fixed or floating.

[0008] A further object of the invention is to provide a

method which makes it possible to fix a position of a roller in a roller crusher.

[0009] Yet another object is to provide a method which simplifies removal of a roller from a roller crusher.

[0010] Still another object is to provide a method which makes it possible to extend the useful life of a roller in a roller crusher.

[0011] According to a first aspect of the invention, these and other objects are achieved, in full or at least in part, by a roller crusher comprising:

at least one roller mounted on a shaft,
at least one first supporting arm, and
a frame,
said first supporting arm at a first end being rotatably attached to said shaft, and at a second end rotatably attached to said frame,
said roller crusher further comprising a first fixing member arranged to lock said first supporting arm in a fixed position. In such a roller crusher, it is simple to fix the position of a roller, thereby simplifying removal of the roller. Further, the possibility of fixing the roller in position makes it possible to vary the configuration of the roller from floating to fixed and vice versa. In this manner, the wear behaviour of the roller may be varied, such that the useful life of the roller is extended.

[0012] In an embodiment, said first supporting arm comprises a first hole, and said frame comprises a second hole, said first fixing member being arranged to be inserted in said first and second holes, when said holes are aligned with each other, for locking said first supporting arm in said fixed position. This is a mechanically simple and reliable way of achieving a locking of the supporting arm, and hence, of the roller. As used herein, the term "aligned" implies that the first and second holes are placed in such relation to each other that the fixing member is insertable through both holes. If the fixing member is straight, the holes will, when aligned, have to be placed with their central axes along a common straight line. However, if a curved fixing member is used, the holes need not be placed exactly on a common straight line. The first supporting arm may be arranged to be locked in a vertical direction when said first and second holes are aligned and said first fixing member is inserted in said first and second holes. If the first supporting arm is locked in a direction such that a centre of gravity of the roller is located on a vertical axis extending through the point of attachment of the first supporting arm to the frame, the forces acting on the fixing member may be reduced to purely vertical forces from the gravity acting on the roller, enabling a simple design of the fixing member. If the supporting arm forms a straight line from the shaft to the point of attachment to the frame, then this is achieved if the supporting arm is locked in the vertical direction.

[0013] In one embodiment, the first fixing member is arranged in said frame, said first supporting arm being

arranged to abut said first fixing member for locking said first supporting arm in the fixed position. In this manner, there is no need to form a hole through the supporting arm. This may be particularly useful for locking the roll in a position in which it is pivoted such that its centre of gravity lies outside the point of attachment of the supporting arm to the frame.

[0014] The frame may comprise a second hole, said first fixing member being arranged to be inserted in said second hole. This may be a simple way of arranging the first fixing member on the frame, which makes it possible to easily remove the fixing member if so desired.

[0015] In an embodiment, the roller crusher comprises two rollers arranged in parallel, between them forming a crushing gap. The roller crusher may be a so called high pressure roller crusher or high pressure grinding roller.

[0016] In an embodiment, the roller crusher further comprises a second supporting arm at a first end being rotatably attached to said shaft, and at a second end rotatably attached to said frame. The second supporting arm may be attached to the same end of the roller shaft as the first supporting arm, or to the opposite end. The use of a second supporting arm may stabilize the roller in the fixed position.

[0017] In another embodiment, the second supporting arm comprises a third hole, and said frame comprises a fourth hole, said roller crusher further comprising a second fixing member adapted to be inserted in said third and fourth holes, when said holes are aligned with each other, for locking said supporting arm in a fixed position. In this manner, it is possible to fix the roller in a position chosen from a plurality of possible positions.

[0018] The roller may extend horizontally during crushing operation.

[0019] According to a second aspect, these and other objects are achieved, in full or at least in part, by a method of fixing a position of a roller in a roller crusher, said roller crusher having at least one roller arranged on a shaft, and a frame, the method comprising the steps of:

arranging a first supporting arm,
rotatably attaching a first end of said first supporting arm to said shaft,
rotatably attaching a second end of said first supporting arm to said frame,
arranging a first fixing member on said frame, and
locking said first supporting arm in a fixed position using said first fixing member. By this method, it is possible to simplify removal of the roller from the roller crusher. Additionally, it is possible to switch configuration of the roller, from fixed to floating, or vice versa.

[0020] In a variant, the method further comprises the steps of
forming a first hole extending through said first supporting arm, forming a second hole extending through said frame,

aligning said first and second holes (6, 7) by pivoting said first supporting arm,
inserting the first fixing member through said first and second holes when they are aligned, thereby locking said first supporting arm in said fixed position.

[0021] Generally, the method may be embodied in the same ways as the roller crusher according to the first aspect.

[0022] Other objectives, features and advantages of the present invention will appear from the following detailed disclosure, from the attached claims, as well as from the drawings. It is noted that the invention relates to all possible combinations of features.

[0023] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc.]" are to be interpreted openly as referring to at least one instance of said element, device, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated.

[0024] As used herein, the term "comprising" and variations of that term are not intended to exclude other additives, components, integers or steps.

Brief Description of the Drawings

[0025] The invention will be described in more detail with reference to the appended schematic drawings, which show an example of a presently preferred embodiment of the invention.

Fig. 1 is a perspective view of part of a roller crusher according to an embodiment.

Fig. 2 is a perspective view of a detail in Fig. 1.

Fig. 3 is a perspective view of part of a roller crusher according to another embodiment.

Fig. 4 is a perspective view of a detail in Fig. 3.

Fig. 5 is a perspective view of a detail of yet another embodiment.

Detailed Description of Preferred Embodiments of the Invention

[0026] With reference to Fig. 1, the roller crusher 1 has two rollers 2, each mounted on a respective shaft 3. The rollers 2 are arranged in parallel and extend essentially horizontally. At one end of each roller 2, a supporting arm 4 is connected between the shaft 3 of the roller 2 and a frame 5 of the roller crusher 1. At one end, the supporting arm 4 is rotatably connected to the shaft 3 of the roller 2, and at the other end, the supporting arm 4 is rotatably connected to the frame 5. At the end of the supporting arm 4 which is connected to the frame 5, a first hole 6 is provided through the supporting arm 4. For each supporting arm 4, a second hole 7 is provided through the

frame 5.

[0027] When one of the rollers 2 needs to be exchanged or removed for reconditioning, the roller 2 has to be fixed in position in order to be manageable. To do this, the roller 2 to be fixed is moved such that the supporting arm 4 is vertically oriented, thereby aligning the first hole 6 in the supporting arm 4 with the second hole 7 in the frame 5. A fixing member 8 is inserted in the holes 6, 7, thereby fixing the supporting arm 4 in the vertical direction. Thus, the centre of gravity of the roller 2 is positioned on a vertical axis extending through the point of attachment of the first supporting arm 4 to the frame 5. The fixing member 8 may be in the form of a bolt, optionally securable by a nut.

[0028] Once the roller 2 is fixed in position, it may be gripped by a suitable lifting device and removed for exchanging or reconditioning.

[0029] The possibility of fixing a roller 2 in position is useful also for being able to choose if the roller is to be fixed in relation to the frame 5, or allowed to float. In a roller crusher, particularly in a so called high pressure roller crusher or high pressure grinding roller, one of the rollers is normally fixed and the other floating, so as to allow adjusting the width of the gap between the rollers 2. In some cases, it may be advantageous to allow both of the rollers to float. With the roller crusher 1 and method described above, it is possible to fix or release the supporting arm 4 by inserting or removing the fixing member 8 as desired, thereby choosing if a particular roller 2 is fixed or floating.

[0030] In a roller crusher configuration, in which one roller 2 is fixed and the other roller 2 is floating, the wear behaviour will not be the same on the fixed roller as on the floating roller. Therefore, in order to extend the possible useful life of a roller 2, it is useful to be able to switch which roller is the fixed one and which roller is the floating one. With the roller crusher 1 and method described above, this is made possible in a simple and practical way.

[0031] In the embodiments shown in the drawings, both of the two rollers 2 are provided with supporting arms 4. However, if one and the same roller is always supposed to be fixed, it will be enough to arrange a supporting arm only on the other roller.

[0032] In the embodiment shown in Fig. 3, in addition to the supporting arm 4, a second supporting arm 4' is arranged at the other end of each roller 2. The use of such an additional supporting arm 4' adds to the stability of the arrangement. As shown in Fig. 4, the structure of the holes 6', 7' and the fixing member 8' is the same as that shown in Fig. 2, only reversed. The working principle is the same as that discussed above.

[0033] In Fig. 5, a detail of another embodiment is shown. Here, there is no first hole in the supporting arm 4, and no second hole in the frame 5. Instead, a protruding pin 8" extends from the frame 5. This pin 8" is useful for locking a roller in a position in which it is pivoted slightly away from the other roller of the roller crusher. The sup-

porting arm 4 will abut the pin 8", thereby locking the supporting arm in this position, since the weight of the roller may ensure that the supporting arm cannot inadvertently pivot away from the pin 8".

[0034] The embodiments shown in Figs. 2 and 5 may be combined, such that a first and second hole 6, 7 are provided for inserting a fixing member 8 for locking the roll in a position in which the centre of gravity of the roller is aligned with the point of attachment of the supporting arm 4 to the frame, and a pin 8" is provided for locking the roller 2 in a position in which it is pivoted away from or towards the other roller.

[0035] The pin 8" may be attached to the frame 5, e.g., by welding, but may instead be in the form of a bolt inserted in a hole in the frame, optionally securable by a nut.

[0036] A protruding pin attached to the frame may also be combined with a fixing member in the form of a bolt inserted in a second hole in the frame adjacent the protruding pin. Then, the supporting arm may be fixed between the pin and the bolt.

[0037] The skilled person realises that a number of modifications of the embodiments described herein are possible without departing from the scope of the invention, which is defined in the appended claims.

[0038] For instance, the invention has been described in the context of roller crushers having two parallel rollers. However, it is applicable also to other roller crushers, such as roller crushers having only one roller working in conjunction with a stationary member, such as a plate. It is also applicable to roller crushers having rollers oriented in directions other than horizontal, and to roller crushers having three or more rollers.

[0039] Further, in some applications, it may be beneficial to be able to fix a roller in a position other than that corresponding to an alignment of the centre of gravity of the roller with the point of attachment of the first supporting arm to the frame, e.g., a position in which the roller is pivoted slightly away from another roller of the roller crusher. In such case, the relative positions of the first hole in the supporting arm and the second hole in the frame may be chosen accordingly. In some applications, it may be beneficial to be able to fix a roller in more than one position. In such case, more than one first hole may be provided in the supporting arm, and more than one second hole may be provided in the frame.

[0040] In the embodiments shown, the fixing member is in the form of a threaded bolt, securable by a nut. However, the fixing member may instead be a smooth bolt or pin, or take any other form suitable for inserting in the first and second holes when they are aligned.

[0041] The supporting arm, the second hole in the frame, and the fixing member, may be arranged in the roller crusher during manufacture, but may just as well be added on an existing roller crusher.

[0042] The supporting arm need not be straight, extending directly from the shaft to the frame, but could be angled, e.g., L-shaped. If the supporting arm is angled, it will not be vertically oriented when the centre of gravity

of the roll is aligned with the point of attachment of the supporting arm to the frame. Still, if the supporting arm is attached to the shaft of the roller, an imaginary line extending from the attachment to the shaft to the attachment to the frame will be vertical when the roll is fixed in the position in which the centre of gravity of the roller is aligned with the point of attachment to the frame.

Claims

1. A roller crusher comprising:

at least one roller (2) mounted on a shaft (3), at least one first supporting arm (4), and a frame, said first supporting arm (4) at a first end being rotatably attached to said shaft (3), and at a second end rotatably attached to said frame (5), said roller crusher (1) further comprising a first fixing member (8) arranged to lock said first supporting arm (4) in a fixed position.

2. A roller crusher as claimed in claim 1, wherein said first supporting arm (4) comprises a first hole (6), and said frame (5) comprises a second hole (7), said first fixing member (8) being adapted to be inserted in said first and second holes (6, 7), when said holes (6, 7) are aligned with each other, for locking said first supporting arm (4) in said fixed position.

3. A roller crusher as claimed in claim 2, wherein said first supporting arm is arranged to be locked in a vertical direction when said first and second holes (6, 7) are aligned and said first fixing member (8) is inserted in said first and second holes (6, 7).

4. A roller crusher as claimed in claim 1, wherein said first fixing member is arranged on said frame (5), said first supporting arm (4) being arranged to abut said first fixing member (8) for locking said first supporting arm (4) in the fixed position.

5. A roller crusher as claimed in claim 4, wherein said frame (5) comprises a second hole (7), said first fixing member (8) being adapted to be inserted in said second hole (7).

6. A roller crusher as claimed in any one of the preceding claims, comprising two rollers (2) arranged in parallel, between them forming a crushing gap.

7. A roller crusher as claimed in any one of the preceding claims, further comprising a second supporting arm (4) at a first end being rotatably attached to said shaft (3), and at a second end rotatably attached to said frame (5).

8. A roller crusher as claimed in claim 6, wherein said second supporting arm (4') comprises a third hole (6'), and said frame (5) comprises a fourth hole (7'), said roller crusher (1) further comprising a second fixing member (8') adapted to be inserted in said third and fourth holes (6' 7'), when said holes (6', 7') are aligned with each other, for locking said second supporting arm (4') in said fixed position.

9. A roller crusher as claimed in any one of the preceding claims, wherein said roller (2) extends horizontally during crushing operation.

10. A method of fixing a position of a roller in a roller crusher (1), said roller crusher having at least one roller (2) arranged on a shaft (3), and a frame (5), the method comprising the steps of:

arranging a first supporting arm (4), rotatably attaching a first end of said first supporting arm (4) to said shaft, rotatably attaching a second end of said first supporting arm (4) to said frame (5), arranging a first fixing member (8) on said frame (5), and locking said first supporting arm (4) in a fixed position using said first fixing member (8).

11. A method as claimed in claim 10, further comprising the steps of forming a first hole (6) extending through said first supporting arm (4), forming a second hole (7) extending through said frame (5), aligning said first and second holes (6, 7) by pivoting said first supporting arm (4), inserting the first fixing member (8) through said first and second holes (6, 7) when they are aligned, thereby locking said first supporting arm (4) in said fixed position.

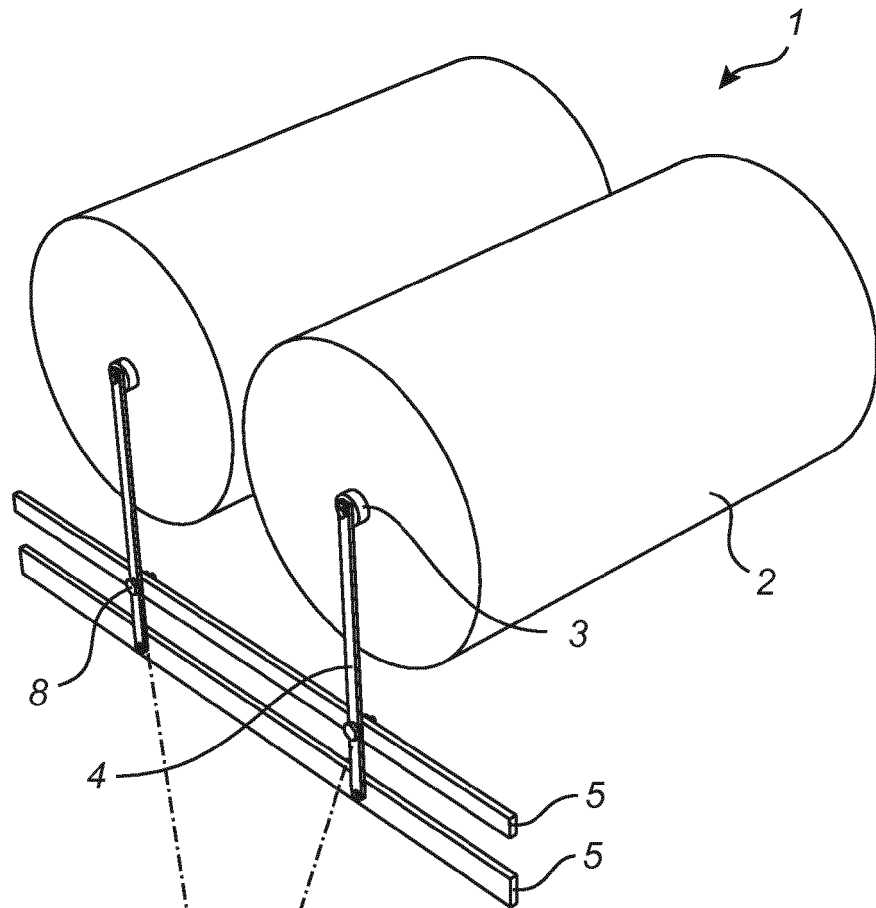


Fig. 1

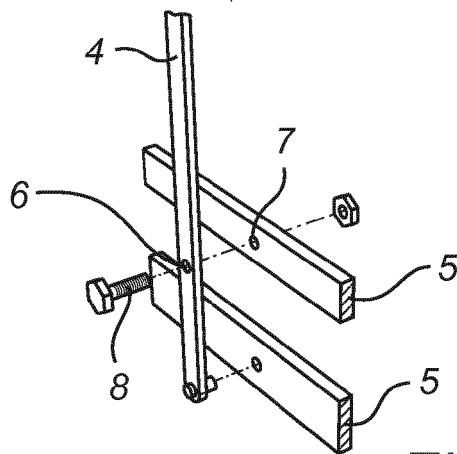


Fig. 2

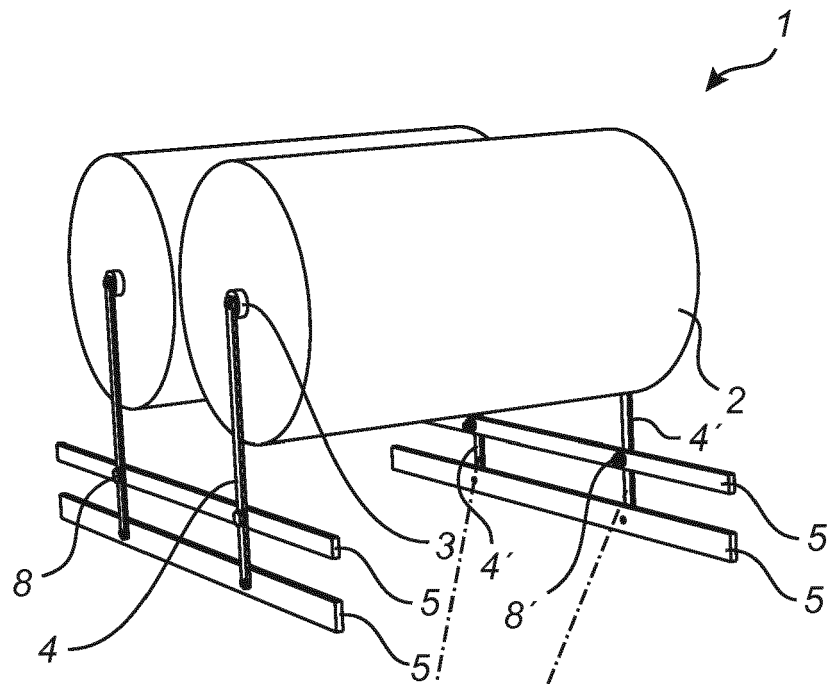


Fig. 3

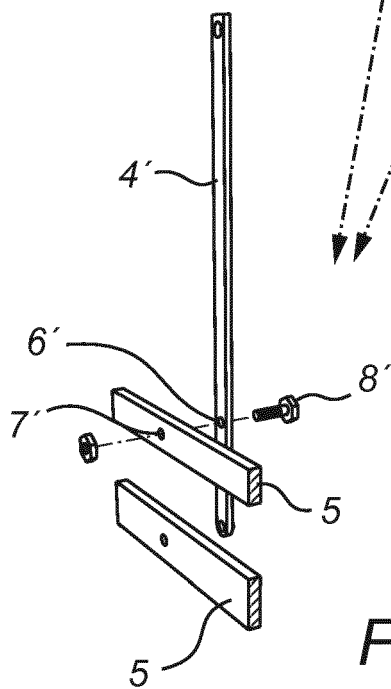
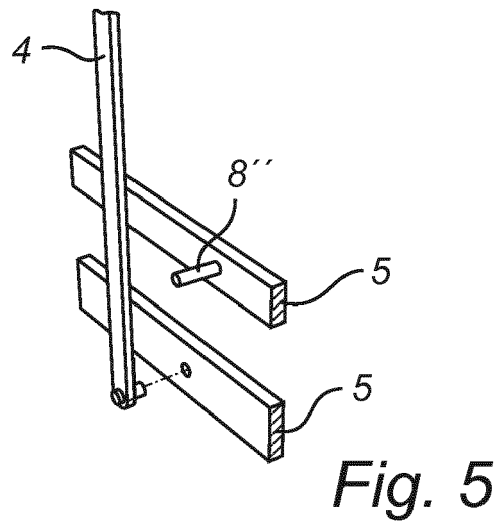


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 12 16 4952

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 619 408 A (SANGATI GUIDO [IT]) 28 October 1986 (1986-10-28) * column 2, lines 44-65; figures * -----	1,4-7,9,10	INV. B02C4/32
X	DE 24 49 344 A1 (VER FLUGTECHNISCHE WERKE) 22 April 1976 (1976-04-22) * page 3, paragraph 4 - page 4, paragraph 1; figure * -----	1,6,9,10	
X	US 6 502 773 B1 (HOSTETTLER RENE [CH] ET AL) 7 January 2003 (2003-01-07) * column 3, lines 4-14; figure 1 * -----	1,6,9,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B02C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 October 2012	Examiner Flodström, Benny
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 16 4952

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30-10-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4619408	A	28-10-1986	CH 657788 A5 30-09-1986
			DE 3404732 A1 30-08-1984
			ES 8500572 A1 16-01-1985
			FR 2541595 A1 31-08-1984
			GB 2136159 A 12-09-1984
			IT 1160480 B 11-03-1987
			US 4619408 A 28-10-1986
DE 2449344	A1	22-04-1976	NONE
US 6502773	B1	07-01-2003	AT 209527 T 15-12-2001
			CN 1261295 A 26-07-2000
			CZ 9903875 A3 12-04-2000
			DE 19726551 A1 24-12-1998
			DE 59802255 D1 10-01-2002
			EP 0991473 A1 12-04-2000
			ES 2167066 T3 01-05-2002
			HK 1027059 A1 03-09-2004
			HU 0002665 A2 28-12-2000
			JP 4694658 B2 08-06-2011
			JP 2002504854 A 12-02-2002
			PL 337574 A1 28-08-2000
			RU 2223148 C2 10-02-2004
			TR 9903235 T2 21-07-2000
			US 6502773 B1 07-01-2003
			WO 9858738 A1 30-12-1998
			ZA 9804653 A 28-01-1999

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 516952 A [0002]
- US 5060874 A [0004]