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(54) Title: WHEEL PIN FOR CYCLES AND MOTORCYCLES PROVIDED WITH TORQUE-LIMITING COUPLING DEVICE

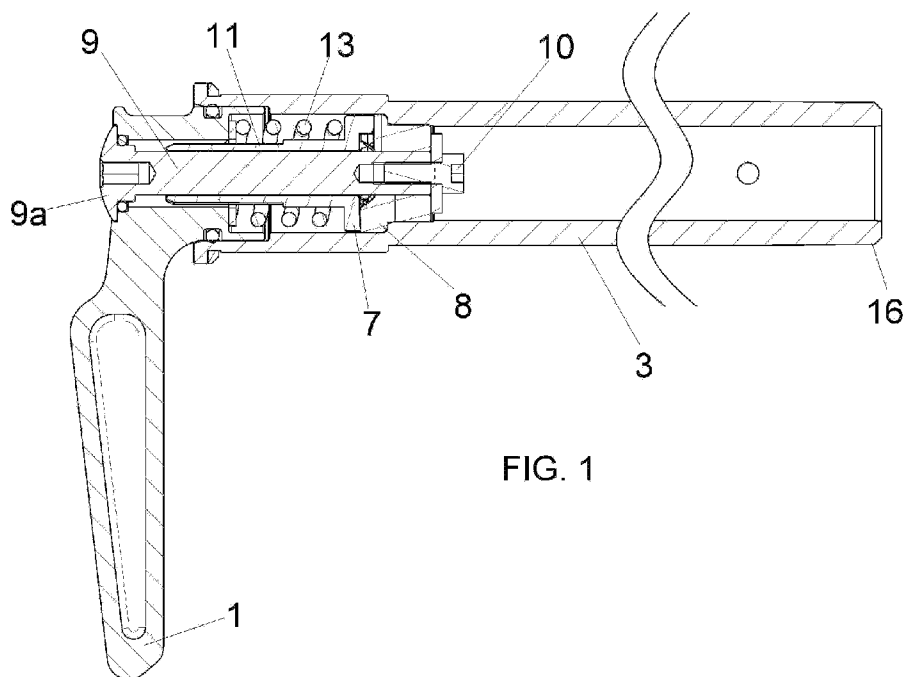


FIG. 1

(57) Abstract: The present invention relates to a wheel pin for cycles and motorcycles of the type designed to be inserted in the housings (5) of the fork (6) inside the hub (4) and tightened to one of the housings, which is provided with a torque-limiting coupling device.

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Description

Wheel pin for cycles and motorcycles provided with torque-limiting coupling device.

The present invention relates to a wheel pin for cycles or motorcycles or similar vehicles.

When mounted, wheel pins of cycles, motorcycles or similar vehicles are inserted in suitable housings obtained in the two legs of the fork and inserted
5 in the wheel hub.

According to the known art, pins are normally realised by means of a pin with threaded end, which is inserted in the housings of the legs of the fork and fitted in position, for example by means of a fixing nut tightened to the threaded end of the pin, or by tightening the pin in one of the two housings
10 provided with thread.

The tightening of the pin on the nut and/or housing must comply with the project value and is of crucial importance.

In fact, excessive torque risks forcing the legs of the stems against the wheel hub, thus braking the rotation of the hub and causing great damages and
15 possible dangers for the user.

On the other hand, an insufficient torque may determine the undesired loosening of the pin from the housing or of the nut from the pin, with severe consequences.

Moreover, the common use of light alloy has increased the need to comply
20 with the value of the coupling torque. In fact, the threading obtained on the pin and/or the housing of the leg of the fork, which are typically made of light alloy, has a very low tolerance with respect to the coupling torque value: excessive coupling torque determines the breakage of the threading of the pin and/or housing, thus requiring the replacement of the damaged parts.

25 According to the known art, correct coupling was to be ensured by using a so-called "dynamometric key", that is to say a tool used to tighten the pin in the housing or the pin and the nut mutually, while maintaining a predefined

maximum torque.

A first inconvenience is related to the fact that it is not possible or, better said, not advisable to tighten the pin in the housing without a dynamometric key, for example manually or with ordinary tools, in order to avoid the
5 aforementioned problems, for the application of a coupling torque lower or higher than the project value.

Another inconvenience consists in the fact that dynamometric keys are quite expensive.

A third inconvenience consists in the fact that dynamometric keys typically
10 have very exact operation ranges, or fields, and therefore it is sometimes necessary to have two or more dynamometric keys, for example, to tighten the pins of two or more different bicycles or motorcycles in mounting position. This problem is especially felt by professionals of the industry, for example mechanics, tyre repairers, etc., who must have a complete series of
15 dynamometric keys in order to meet the different requirements of different vehicles.

Another inconvenience is related to the fact that, when the user has to dismount the wheel, for example to repair a flat tyre, if he is not provided with a dynamometric key, for example because of distance from towns or
20 mechanics workshops, the user must provide tightening, with the risk of applying an excessive or insufficient torque compared to the project value.

The purpose of the present invention is to find a simple inexpensive solution to the aforementioned purposes.

The present invention relates to a wheel pin for cycles or motorcycles or
25 similar vehicles of the type designed to be inserted in housings obtained in the two legs of the fork and in the wheel hub, and tightened to one of the two housings and/or tightened to a fixing nut and in which the pin comprises a built-in torque-limiting coupling device.

The pin of the present invention integrates a device that limits the maximum
30 coupling torque of the pin, in such a way that the pin cannot be tightened with a torque higher than the one preferred and/or predefined by the user.

According to an executive embodiment, the pin is provided with a torque-

limiting coupling device that is actuated when the value exceeds a predefined coupling torque established by the device manufacturer.

According to an advantageous executive embodiment, the device is actuated to adjust the value of the maximum coupling torque, in order to make the application of the pin and/or the device mounted on the pin more flexible and
5 suitable to different construction requirements.

The pin of the invention is able to overcome the inconveniences of the known art, since the dynamometric key is no longer necessary because of the torque-limiting coupling device provided in the pin.

10 This avoids the cost to purchase one or more dynamometric keys, as well as errors in the application of the maximum torque, being each single pin provided with a device that limits the maximum torque to a predefined value equivalent to the one established by the project.

Another advantage is given by the fact that the pin can be removed and re-
15 inserted also in emergency situations, when the user is not provided with a dynamometric key.

Other characteristics are the subject of the enclosed claims and subclaims.

These and other advantages and characteristics will become evident from the detailed description of the figures, which are enclosed only for illustrative, not
20 limiting purposes, in which:

- fig. 1 is a section with an axial plane of the pin of the present invention;
- fig. 2 is an exploded axonometric view of the pin of the present invention;
- fig. 3 is an exploded axonometric view of the front-toothed coupling mounted onto the pin of the invention.

25 With reference to figs. 1 and 2, the pin (3) of the present invention is provided with a torque-limiting coupling device.

According to the preferred embodiment, the pin (3) is provided with a tightening crank (1). Without leaving the protection scope and precepts of the present invention, the tightening crank (1) can be replaced by a suitable
30 section used to engage a tool, such as a hexagonal key, screwdriver or similar item.

The advantage of the crank (1) is that it provides for manually tightening the

pin in position, without the need of additional tools for simple quick mounting. The pin (3) is designed to be inserted in the hub (4) and in the housings (5) of the fork (6).

According to the preferred embodiment of the present invention, the pin (3) is
5 at least partially hollow, in particular being provided with a cavity in the ending section opposite the threaded end (16) of the pin. The cavity externally ends with an opening (2).

Figs. 2 and 3 illustrate the presence of a front toothed-coupling (G) composed of a first semi-coupling (7) and a second semi-coupling (8), a shaft
10 (9), and a screw element (10).

When actuated in the tightening direction, the crank (1) drives into rotation the pin (3) by means of the front toothed-coupling.

The first semi-coupling (7) is positioned on the bottom of the opening (2) inside the cavity of the pin (3) and the first-coupling (7) is coupled with the pin
15 (3).

The second semi-coupling (8) is inserted and slides axially outside the shaft (9).

The shaft (9) has a basically cylindrical body associated with a mushroom-shaped enlarged head (9a) in opposite direction to the pin (3), that is to say
20 on the crank-side.

The crank (1) is provided with an opening eye (12) and is free to rotate around the shaft (9) with circular section and cylindrical direction.

The shaft (9) is permanently fixed to the semi-coupling (7) by means of the screw element (10) that mutually engages the shaft (9) and the semi-coupling
25 (7).

With reference to figs. 1 and 2, the second semi-coupling (8) is coupled with or part of a partially hexagonal sleeve (11) at the end that faces the opening (2). Although the section is a hexagonal section in this case, any polygonal section can be used without leaving the precepts and scope of the present
30 invention.

The hexagonal section and/or the sleeve (11) are inserted inside the eye (12) of the crank, which has a complementary engagement section, with

hexagonal shape in this case.

The semi-coupling (7) and the semi-coupling (8) are held in mutual contact by means of a spring element, for example a precompressed spring (13) that pushes the semi-coupling (8) against the semi-coupling (7), thus engaging
5 the teeth of the two semi-couplings.

The semi-coupling (8) is rotated by rotating the crank (1), and following to the engagement of the front teeth, drives into rotation the semi-coupling (7), which moves the hollow pin (3) that is inserted in the housings (5) of the fork (6).

10 At the end of the tightening movement, when the hollow pin (3) encounters resistance against the rotation of the crank, the resistance offered by the pin is transferred to the coupling (7), which is pushed against the semi-coupling (8) which, being free to slide inside the hollow pin (3), is maintained against the semi-coupling (7) by the only force of the spring (13).

15 When the resistance offered by the pin and the semi-coupling (7) exceeds a predefined value, the spring is compressed and the engagement between the teeth of the semi-coupling (7) and the teeth of the semi-coupling (8) is lost.

The loss of engagement between the teeth is delayed if the compression of the spring (13) is higher and therefore the calibration of the spring depends
20 on the maximum coupling torque transmitted by the crank (1) to the pin (3).

When the force exerted by the spring (13) on the semi-coupling (8) is exceeded, the crank (1) no longer transmits force to the pin (3) and idles inside the opening (2) of the pin (3), in particular around the pin (9).

According to a preferred embodiment, the teeth of the front toothed-coupling
25 are generated by means of two concurrent surfaces that generate the tooth, with one surface inclined with respect to the longitudinal axis of the coupling and the other surface parallel to the said axis.

The coupling teeth are designed for mutual engagement with the inclined side during tightening and with the parallel, or straight side during loosening.

30 This ensures that, when the maximum torque condition is reached during tightening, the axial movement of the semi-coupling (8) is favoured, i.e. the teeth slide mutually and the semi-coupling (8) is moved axially. During

loosening, the teeth engage with the straight sides, that is to say parallel to the longitudinal axis of the coupling, thus allowing for loosening.

According to an executive embodiment not illustrated in the enclosed figures, a compression adjustment means of the spring is provided, such as a
5 compression pin transversal to the pin (3) actuating on the part of the spring (13) that faces the opening, the said compression pin actuating on the length of the spring, which is shortened or extended according to the maximum torque to be transmitted.

According to an additional executive embodiment, the length of the spring is
10 changed by actuating on the shaft (9), for instance through the movement or rotation of the shaft (9), which is provided with a crown or section of circular crown that actuates on the part of the spring (13) that faces the opening, thus varying the spring length and pre-compression charge, and consequently the maximum torque to be transmitted.

15 The present invention also relates to a cycle or motorcycle or cycle or mountain bikes or similar vehicles characterised in that it comprises a pin according to the present invention.

Claims

1. Wheel pin (3) for cycles or motorcycles or similar vehicles of the type designed to be inserted in housings (5) of the fork (6) inside the wheel hub (4), and tightened to one of the two housings and/or tightened to a fixing nut **characterised in that** the pin (3) comprises a built-in torque-limiting coupling device.
- 5 device.
2. Wheel pin (3) as claimed in the above claim, characterised that the said torque-limiting coupling device comprises at least a front-toothed coupling (G), composed of a first semi-coupling (7) and a second semi-coupling (8) that are mutually engaged, in which engagement is ensured by a precompressed,
- 10 compressed or in any case compressible spring (13), the said spring being designed to push against the second semi-coupling (8) to engage it with the first semi-coupling (7) until a predefined resistance force that coincides with the maximum coupling torque is reached.
3. Wheel pin (3) as claimed in one or more of the above claims, characterised in that the pin (3) is at least partially hollow and provided with end with thread
- 15 (16), in particular a cavity in the end opposite the threaded end (16) of the pin (3), the said cavity ending outside with an opening (2).
4. Wheel pin (3) as claimed in one or more of the above claims, characterised in that the first semi-coupling (7) is positioned on the bottom of the opening
- 20 (2), inside the cavity of the pin (3) and the first semi-coupling (7) is joined with the pin (3), the second semi-coupling (8) being inserted and sliding axially inside the said cavity.
5. Wheel pin (3) as claimed in one or more of the above claims, characterised in that it is also provided with a shaft (9) with basically cylindrical body associated with a mushroom-shaped enlarged head (9a) and opposite the pin
- 25 (3), the said second semi-coupling (8) being inserted and sliding axially outside the shaft (9) with circular section and cylindrical direction.
6. Wheel pin (3) as claimed in one or more of the above claims, characterised in that it also comprises a tightening crank (1) and/or an engagement section
- 30 for a tool, such as a hexagonal key, screwdriver or similar tool, used to make

the crank (1) drive the pin (3) into rotation by means of the front-toothed coupling, the said crank (1) being provided with at least one opening eye (12) and being free to rotate around the shaft (9).

7. Wheel pin (3) as claimed in one or more of the above claims, characterised
5 in that the shaft (9) is permanently fitted to the semi-coupling (7) by means of a screw element (10) or similar element that mutually engages the shaft (9) and the semi-coupling (7).

8. Wheel pin (3) as claimed in one or more of the above claims, characterised
10 in that the second semi-coupling (8) is associated with or part of a sleeve (11) with at least partial polygonal, preferably hexagonal, configuration at the end that faces the opening (2), the said hexagonal section and/or sleeve (11) being inserted inside the eye (12) of the crank (1) with complementary engagement profile.

9. Wheel pin (3) as claimed in one or more of the preceding claims,
15 characterised in that, when the resistance offered by the pin and consequently by the semi-coupling (7) at the end of the tightening movement exceeds a predefined force, the spring is compressed until the teeth of the semi-coupling (7) and the teeth of the semi-coupling (8) are disengaged, being the calibration of the spring (13) directly proportional to the maximum
20 torque transmitted by the coupling to the front teeth.

10. Wheel pin (3) as claimed in one or more of the above claims, characterised in that the teeth of the front toothed coupling are generated by means of two concurrent surfaces that generate each tooth, of which one surface is inclined with respect to the longitudinal axis of the coupling and
25 one surface is parallel to the said axis, the teeth of the coupling being designed to mutually engage with the inclined side during tightening and with the parallel, or straight, side during loosening.

11. Wheel pin (3) as claimed in one or more of the above claims, characterised in that a compression adjustment means of the spring is
30 provided, being composed of a compression pin transversal to the pin (3) that actuates on the part of the spring (13) that faces the opening, the said compression pin being designed to shorten or extend the length of the spring

according to the maximum torque to be transmitted.

12. Wheel pin (3) as claimed in one or more of the above claims, characterised in that the shaft (9) can be adjusted by sliding with respect to the pin (3) and is provided with a crown or section of circular crown that
5 actuates on the part of the spring (13) that faces the opening, determining a variation of the length of the spring and the precompression load of the spring.

13. Cycle or motorcycle or bicycle or mountain bike or similar vehicles, characterised by the fact that it comprises a pin according to one or more of the above claims.

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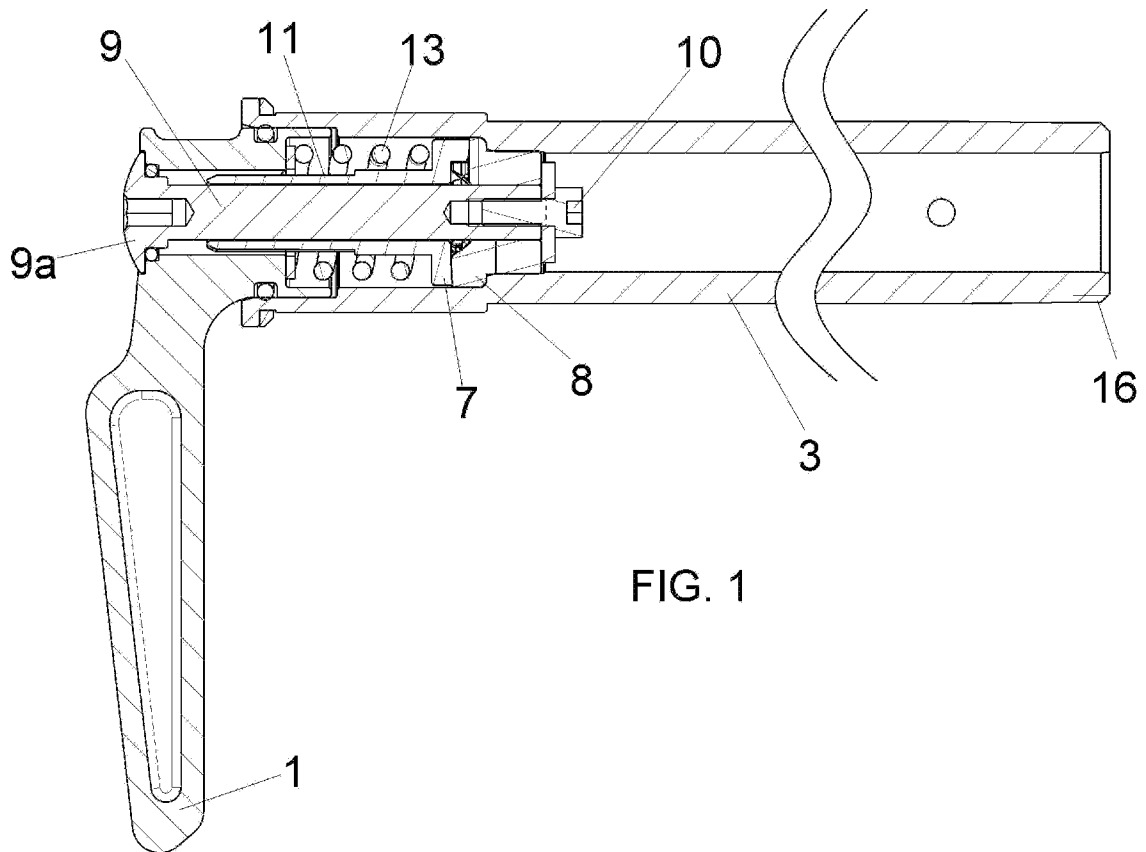


FIG. 1

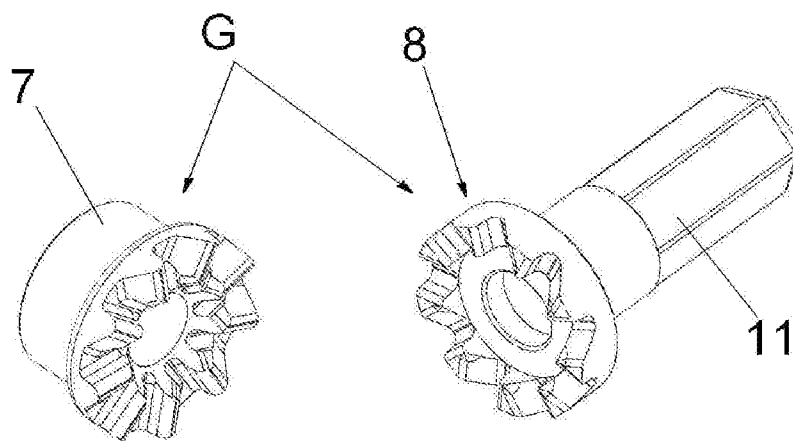


FIG. 3

