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(54) **Quick coupling system for an abrasive disc to the rotary shaft of a portable grinding machine**

(57) A coupling system, for coupling an abrasive disc (2) to the drive shaft of a portable grinding machine. The system including a backing flange (8) and a retainer ring nut (10). The retainer ring nut (10) is made of plastic or metal and fixed to the abrasive disc (2) via adhesive (5). In one embodiment the retainer ring nut (10) has a circular flange (6), which is inserted into the middle hole (9) of the abrasive disc (2), wherein the height of the circular flange (6) is less than the height of the disc hole (9). In case of thin abrasive discs the retainer ring nut (10) has a circular depression (11) into which a part of a projection (7) of the backing flange (8) can be inserted.

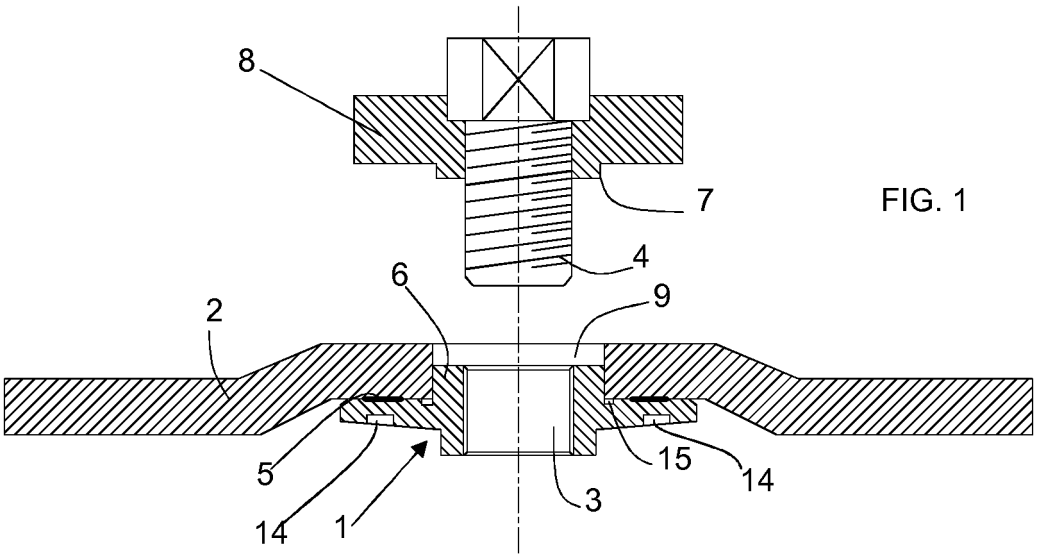

FIG. 1

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Description

FIELD OF APPLICATION OF THE INVENTION

[0001] It is the subject-matter of the present finding a rapid coupling system of an abrasive disc to the rotary shaft of a portable grinding machine.

[0002] The system that is the subject-matter of the finding can be also applied to polishing and cutting discs, and therefore, even if, in the description, reference will always be made to abrasive discs, the finding will be able to be advantageously applied to other types of discs such as, for example, flap discs.

[0003] All the types of discs that are typically used for portable grinding machines consist in an abrasive disc having a circular central fixing hole generally with a diameter of 22 mm = 7/8".

[0004] On the portable grinders, the clamping of the abrasive discs is carried out between two steel flanges, the upper one of which is typically pulled by the rotary shaft by means of a (prismatic) mechanical coupling such as to transfer the torque of the machine to the plane annular surface thereof resting on the abrasive disc upper face, while the second lower ring nut is screwed on the machine shaft by pressing on the abrasive disc lower contact surface.

[0005] The lower threaded ring nut comprises a raised edge that is centred in the lower part of abrasive disc hole. The same applies to the upper flange, which is centred in the upper part of abrasive disc hole. Both edges typically enter the disc hole for about 2 mm.

[0006] The threaded ring nut is arranged to be screwed on the grinding machine threaded shaft, typically the thread is M14 in most of the world, or W 5/8" in some Anglo-Saxon countries.

[0007] The rotation direction of the rotary shaft when the grinder is actuated causes a self-screwing due to the friction that is generated between the two flanges and the disc; such screwing and friction increasing as the resistant force applied at the disc periphery increases.

[0008] The abrasive disc can be removed from the rotary shaft through an apposite wrench that inserts in two holes drilled in the lower ring nut and a conventional hex wrench engaging on apposite lands obtained on the upper ring nut.

[0009] In the more modern grinders, the disassembly is obtained by locking the drive shaft by means of an apposite device with which all the grinders are by now provided, and by applying a rotation in the direction opposite to the screwing with the free hand.

[0010] In this common embodiment, the (lower) threaded ring nut is not permanently secured to the abrasive disc, and therefore it has to be always positioned again at the time that said disc or a new disc is installed.

[0011] In order to avoid the drawbacks cited above, a system has been proposed, that has been illustrated in the U.S. patent No. 4,694,615, in which an abrasive disc is disclosed, including a threaded ring nut that is permanently secured to the abrasive disc and that, thanks to its cap configuration, is crimped to the disc by riveting of an annular rim that is part of the ring nut itself exiting from the disc at the opposite side relative to the disc depression, that is, at the opposite side relative to the grinding wheel shaft.

[0012] At the same time, the riveting tightens the upper protective flange (which is mandatory in the U.S. market for all the grinding wheels exceeding 150 mm ø).

[0013] It shall be apparent that this solution is intended to the U.S. market and very expensive, being implementable only with extremely malleable metals, which allow a complex riveting.

[0014] Assembly is practically in symbiosis with the use of the rear safety flange, which is mandatory in the U.S.

[0015] The cost of such an assembly often exceeds the cost of the grinding wheel. Another alternative of a known type is the one disclosed in the U.S. patent 5,287,659, which assigns the transmission of the grinder torque to the abrasive disc through a polygonal, and anyhow not-circular, shape coupling between the inserted ring nut and the abrasive disc body.

[0016] This unexceptionable technically solution has the insurmountable economical obstacle of the very high implementation cost of grinding wheels with a non-circular hole.

[0017] Moreover, it does not seem that the implementation of this patent has ever gained diffusion.

[0018] There exists a patent application, DE 102005050836, in which solutions are claimed that are different from the one that is very simply and cost-effectively implemented in the subject-matter that is claimed in the present patent application.

[0019] Object of the present finding is to allow using an abrasive disc of an unified standard type, both plane and with depressed centre, and of the most varied thicknesses, which includes a very simple threaded ring nut with M14 or W 5/8" pitch, generally made in Nylon, ABS, or anyhow plastic resins with high mechanical strength or, finally, in metal, which is obtained by machining or die casting, of a negligible cost relative to the cost of the abrasive disc. The ring nut is disposable when the disc is worn out.

[0020] The functioning of the finding is exactly the same of the underlying threaded metal ring nut, which all the grinding machines come bundled with.

[0021] The difference is that the threaded ring nut that is the subject-matter of the finding is integral to the disc, and is disposed of with the worn-out disc.

[0022] The advantages consist in the simultaneous screwing of the two items: abrasive disc and ring nut; in the non-necessity of using the clamping wrench, since the system of the two combined components is self-tightening.

[0023] Also, the disc disassembly operation is simplified, since by locking the movement of the grinder shaft with the apposite device, a manual action of reverse ro-

tation is sufficient to disassemble the disc.

[0024] If the thread of the grinders shaft is in good conditions and clean, the screwing (and unscrewing) is easy and quick.

[0025] Both the metal ring nuts supplied with the machine and the clamping wrench typically used in the grinding machines are prone to wear.

[0026] This problem does not exist with the finding, which is disposable, and since it is typically in plastic, the wrench is almost never used, and if it were, it never wears, because it only works on the plastic.

[0027] Another advantage of the present finding is given by the fact that, unlike the techniques described in the above-mentioned prior art patents, it allows the application also to thin discs such as, for example, to cutting discs with a thickness of 0.6 - 0.8 mm.

[0028] These objects and advantages will be more clearly pointed out by the following description of two embodiments, illustrated, by way of non-limiting example only, in the annexed drawing tables, in which:

- Fig. 1 illustrates a cross-sectional view of an abrasive disc according to the finding prior to the assembly on the grinding machine rotary shaft:
- Fig. 2 illustrates a cross-sectional view of the same abrasive disc of Fig. 1, mounted on the grinder machine shaft;
- Figs. 3 and 4 illustrate a cross-sectional view of a thin disc, for example, a cutting disc, before and after the assembly on the grinding machine, respectively.

- With reference to the Figs. 1 and 2, the coupling system applied to a depressed-centre disc will be now described.
- The system provides to embed a fixing ring nut 1 to an abrasive disc 2; more precisely the following steps are provided for the:
- implementation of a plastic or metal ring nut (by moulding, machining, die casting) having a central hole 3 with a diameter equal to the diameter of a rotary shaft 4 of a conventional portable grinding machine:
- threading of the central hole 3 with pitch and diameter equal to that of the rotary shaft;
- centering and glueing of the ring nut 1 to the abrasive disc 2 by deposition of an adhesive 5 throughout the annular zone surrounding the central hole 3.
- In order to carry out the centering of the ring nut with the disc hole 3 axis, the ring nut provides for a circular projection 6 with an outer diameter that is equal to the disc hole 9 diameter to be able to be inserted in the same hole.
- The circular projection 6 thickness is such as to allow receiving the circular projection 7 of an upper flange 8 of a known type and supplied with the grinder in the disc hole 9.
- Finally, the total thickness of the two projections 6 and 7 has to be lower than the abrasive disc central hole 9 height.
- An important feature of the clamping ring nut illustrated above is that the height thereof is almost completely sunk in the depression of the depressed-centre grinding wheels, which depression, according to the standard, is about 5 mm.
- The depressed-centre grinding wheels have always been so configured as to house the projection composed of the clamping ring nut and the grinder shaft in the depression, and to make so that these do not pop out beyond the grinding wheel lower plane, thus constituting a hindrance to the level cut or flat grinding.
- With reference to Figs. 3 and 4, the fixing system in the case of plane discs having a thin thickness will be now described, but the same ring nut can be equally mounted also on depressed-centre thin abrasive discs.
- The threaded ring nut 10 provides for a circular depression 11 with such a diameter as to allow the housing and centering of the flange 8 projection 7.
- In this manner, the centering projection or edge 7 can pass through the disc central hole and penetrate the circular depression 11.
- The centering projection or edge, which are universally present on all the grinders flanges, have a height ranging between 1.6 and 2 mm, and pop out from the disc when this has a thickness lower than the dimensions set forth before.
- In such case, the excess of the centering has to be housed in the special circular depression 11.

[0029] The ring nut application procedure always takes place by glueing, by using an adhesive, for example, of the epoxy, cyanoacrylic, polyurethane type, and any adhesive having suitable mechanical characteristics.

[0030] The fixing ring nuts described in the two cases are manufactured by means of injection of Nylon or other equivalent and low cost material

[0031] Both types of ring nuts described above will be able to provide for a pair of holes 14 or also two pairs of holes (with mutually different distance between centres and diameter) for the insertion of the pins of a conventional wrench in the case of an unscrewing difficulty upon removing the disc from the grinding machine.

[0032] Other shapes with a hexagonal, or anyhow polygonal projection, both protruding and recessed, such as to receive screwing and unscrewing tools that are different from the conventional ones will be able to characterize the finding.

[0033] In both versions, also a discharge annular recess 15 obtained on the adhesive-coated face will be able to be provided.

Claims

1. A system for the quick coupling of an abrasive disc

to the rotating shaft of a portable lapping machine **characterized in that** it provides to include a plastic or metal locking ring nut to the abrasive disc.

2. The system according to claim 1 **characterized in that** it provides for the following steps:

- providing a plastic or metal ring nut having a middle hole of a diameter suitable to be subsequently threaded;
- centering and bonding the ring nut to the abrasive disc by means of adhesive throughout the annular area surrounding the disc middle hole, the adhesive being epoxy, cyanoacrylic, polyurethane, or any other type of adhesive having suitable mechanical characteristics.
- threading the middle hole so that it has a pitch and diameter equal to the rotating shaft of the lapping machine for which it is intended.

3. The system according to claim 1 **characterized in that** the locking ring nut provides a circular projection 6, the outer diameter thereof being equal to the disc hole diameter.

4. The system according to claim 1 **characterized in that** the height of the disc hole is greater than the total thickness of the projections provided on the upper flange and locking ring nut.

5. The system according to claim 1 **characterized in that** the locking ring nut is made of plastic or metal.

6. The system according to claim 1 **characterized in that** the locking ring nut is obtained by means of moulding, die-casting or mechanical processing.

7. The system according to claim 1 **characterized in that**, for reduced thickness discs, the locking ring nut provides a circular depression of such a diameter as to allow housing the upper flange projection therein.

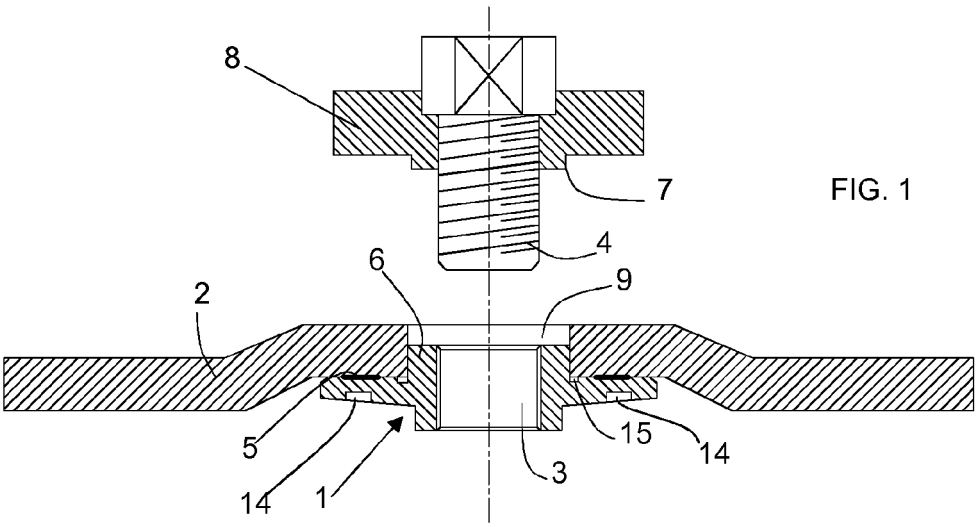
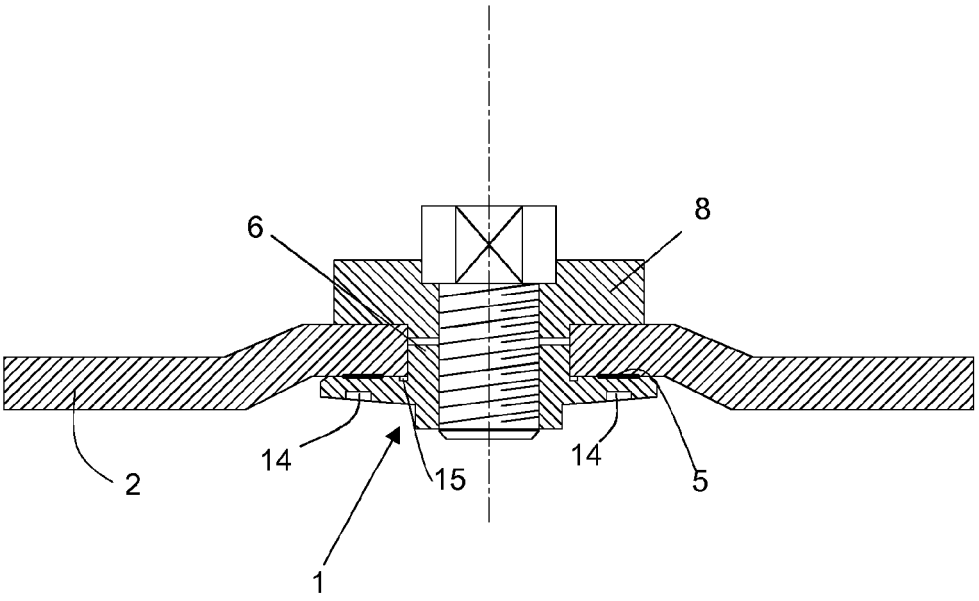


FIG. 1

FIG. 2



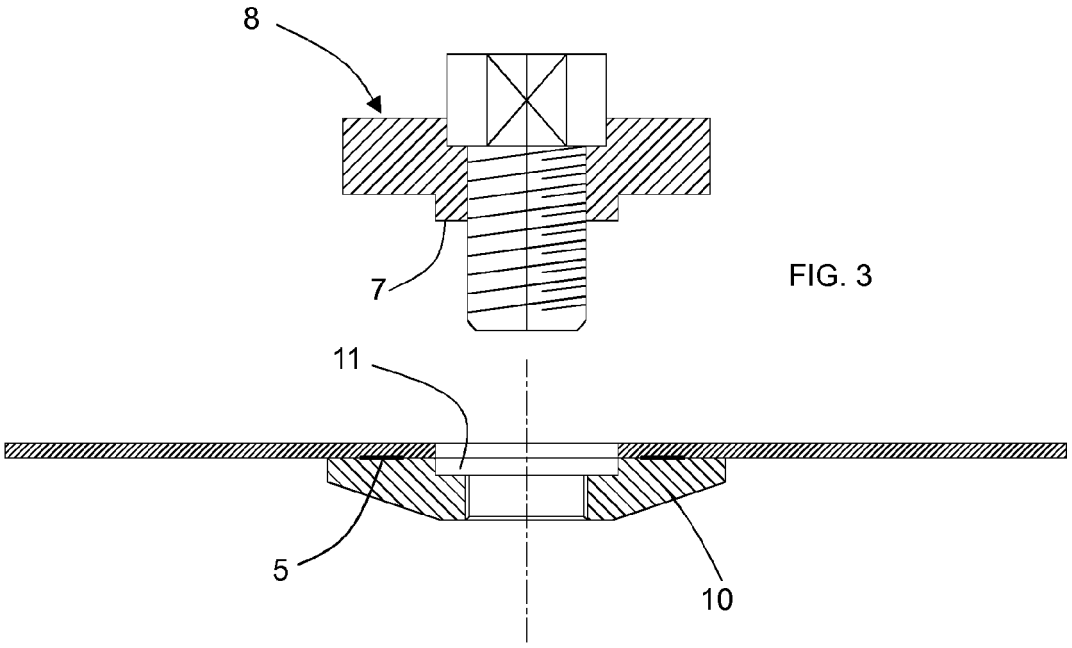


FIG. 3

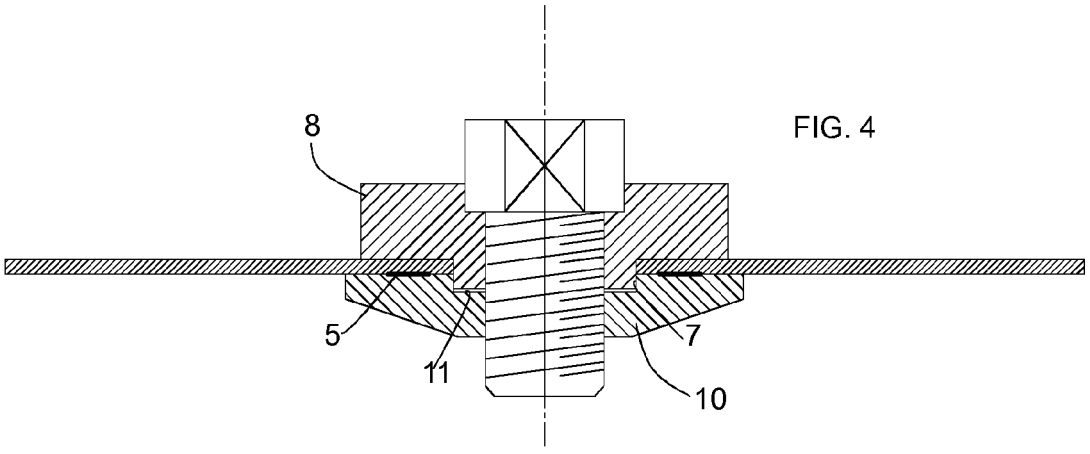


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 09 16 9664

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 April 2010	Janzon, Mirja

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
Munich	1 April 2010	Janzon, Mirja

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