

The invention relates to a combination of a nut and a washer in accordance with the precharacterising portion of Claim 1. A combination of this type is known from GB-A-744016.

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A nut is described in this GB-A-744016 from which a hand lever extends radially for tightening the nut. The nut constitutes a circular segment and is provided with a radial opening so that the bolt can be moved from the side against a bolt. The opening in the nut is defined by arms which are integrally constructed with the nut and has internal surfaces which are parallel to an axial plane and which are arranged at a spacing from one another which is somewhat larger than the diameter of the screw thread which extends over 180° of the internal surface of the nut. The lower end of the nut is partially frustoconically tapered coaxially with its thread and engages a corresponding, upper frustoconical surface on a workpiece supported on a plate. The plate is provided with a bore through which the bolt is inserted from below.

The problem of simply and rapidly fastening a bolt, which is axially movable in a bore and which, at one end of the bore, passes out of it, so that it is no longer movable in the axial direction of the bore occurs particularly in fastening devices for pivotable WC seats. In a conventional construction, these fastening devices for pivotable WC seats have a pivot pin which is pushed into a through bore in a pivotable apertured seat and then further into a blind hinge bore in a pivotable cover. The fastening devices are thus usually used in pairs. The pivot pins of the fastening devices are connected to a support plate, connected to which is a vertically

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extending bolt. This bolt is introduced into a fastening bore in a WC bowl and conventionally restrained from below. This is generally effected by a wing nut which must be screwed from below over the entire length of the portion of the bolt projecting out of the fastening bore until it comes into engagement and can be tightened. Since the fastening bores in the WC bowl usually extend, determined by the installation, in the vicinity of a wall, the screwing of the wing nut onto the projecting portion of the bolt is, due to the height of the WC bowl in the vicinity of the floor, particularly troublesome and tedious, caused to the restricted space conditions. The WC seat is consequently generally not removed from the WC bowl, which is commonly manufactured from porcelain, after the initial installation has occurred for reasons of comfort and frequently also for cleaning purposes, but this is highly desirable for reasons for hygiene. Various fastening devices for pivotable WC seats are known in the prior art which attempt to mitigate this inconvenience. These known fastening devices for pivotable WC seats all, however, have either the disadvantage that they are too complex to manufacture and are thus too expensive for the average final user or the actual fastening portion of the fastening device remains on the WC bowl when removing the WC seat from the WC bowl for cleaning purposes or the like whereby the desired effect of facilitating the cleaning of the WC bowl is destroyed.

It is thus the object of the invention to develop a nut with a radial slot extending to its thread and extending over the entire height of the nut so that tightening a bolt, which is axially movable in a bore and which may be form-lockingly fixed in position in the axial direction

at one end of the bore by an engagement surface and passes, at the other end of the bore, out of the latter, is rendered possible with high tightening torques without the nut sliding off the bolt approximately radially to the thread axis due to the forces which occur under the high tightening torques.

It is further the object of the invention to provide a fastening device for a pivotable WC seat in which a bolt extending vertically downwards from a support plate through a bore may be fastened rapidly and simply with high tightening torques with a nut to be produced in accordance with the invention, whereby the nut and optionally additional elements should be economical to manufacture.

The object is solved as regards its first portion by a combination of a divided nut and a centring washer in which the nut has at one end of the thread a concentrically arranged collar with a centring surface inclined to the axis of the nut, whereby further adjoining the centring surface towards the exterior there is a circular engagement surface and whereby the inner wall of the hole in the washer extends inclined at an angle complementary to the centring surface.

The washer in accordance with the invention cooperates by means of its inclined inner wall preferably in the form of a frustoconical surface with the centring surface of the concentrically arranged collar on the nut, whereby the nut is centred and slipping of the nut from the bolt due to the forces which occur during tightening is prevented.

The external diameter of the frustoconical surface of the washer, i.e. of the inner wall, is smaller than the external diameter of the frustoconical surface of the centring surface on the nut. The result of this is that the concentrically arranged collar, which affords the centring surface, on the nut is compressed when the conical shell of the centring surface is pressed into the conical shell of the inner wall of the hole during the tightening process. A particularly firm fit of the nut is thereby ensured.

It will of course be appreciated that the internal diameter of the washer is slightly greater than the external diameter of the bolt so that the washer can simply be slid over the portion of the bolt projecting out of the fastening bore whilst the nut is pressed in the radial direction against the bolt directly below the washer.

It is further provided that the inner wall of the hole in the washer comprises two frustoconical surfaces, each extending from the exterior to the interior. An equivalent construction of the two sides of the washer is thus produced, that is to say it is immaterial in which direction the washer is pushed onto the bolt projecting out of the threaded bore since in each case one of the two frustoconical surfaces of the nut to be tightened is directed towards it.

It is further proposed that the basic geometrical shape of the nut has a straight circular cylinder which contains the threaded bore and adjoining which there is a circular disc having the engagement surface. The circular disc having the engagement surface is preferably

provided with a radially extending unloading gap arranged opposite to the slot in the nut.

5 This embodiment of the nut in accordance with the invention produces a stable construction and the unloading gap nevertheless results in the forces necessary for bending the radial slot being maintained small so that the process of positioning the nut on the bolt is simplified.

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The circular disc having the engagement surface can furthermore be shortened by a circular segment arranged at right-angles to the slot, whereby the positioning of the nut on the bolt is simplified and material is saved.

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Furthermore, it is proposed that the nut has two wing-like gripping surfaces, which are preferably disposed in a plane perpendicular to the plane of the slot containing the nut axis and which can furthermore be connected to the circular cylinder and extend over the entire free height of the same. Such an embodiment of the nut in accordance with the invention enables installation of the same by hand without a special tool being necessary.

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25 It is preferably further provided that the nut and the washer are manufactured from a plastics material in an injection moulding process, whereby the centring surface and the inner wall are inclined in a preferred embodiment at an angle of 30° .

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As regards its second portion, the solution of the object in a fastening device of the generic type for a pivotable WC seat is characterised in that the fastening element, which is screwable from below onto the bolt, is a

combination of a nut and washer in accordance with the invention described above.

5 It is further preferably provided in a fastening device in accordance with the invention for a pivotable WC seat that the support plate, the bolt extending downwardly perpendicular to it and the pivot pin arranged horizontally spaced from the support plate are of one-piece construction and are manufactured of plastics material in an injection moulding process. The nut and 10 the washer are preferably also manufactured of plastics material in an injection moulding process so that an economical fastening device is provided.

15 In a somewhat more stable embodiment, it can be provided in accordance with the invention that the bolt merges into an unthreaded angled portion constituting the pivot pin and that the support plate is screwable onto the bolt, whereby not only the bolt but also the support 20 plate preferably comprise metal.

The invention will be described in more detail below with reference to the drawings. In the drawings:

25 Fig. 1 is a view in the axial direction of the nut in accordance with the invention from below,

Fig. 2 is a partly sectioned view on the line II-II in Fig. 4 of the nut in Fig. 1 in the direction of 30 the slot,

Fig. 3 is a side view of the nut,

Fig. 4 is a plan view of the nut,

Fig. 5 is a plan view of the washer in accordance with the invention,

Fig. 6 is a longitudinal sectional view of the washer in accordance with the invention,

Fig. 7 is a view of a schematically illustrated WC bowl with a WC seat supported on it which is connected to the WC bowl by means of a fastening device in accordance with the invention using the nut and washer combination in accordance with the invention, the nuts being shown schematically at a time shortly before their installation, and

Fig. 8 shows the view of Fig. 7 at a time at which the nuts in accordance with the invention have been positioned on the bolts of the fastening devices in accordance with the invention.

An exemplary embodiment of a nut in accordance with the invention will firstly be described in more detail with reference to Figs. 1 to 4. Such a nut 10 has a circular cylindrical body 12 which carries an internal thread 14 disposed concentrically with its axis A. At a lower end of the thread 14 the nut has a collar 16 which is disposed concentrically with the axis A of the nut and which has the basic geometrical shape of a truncated cone. The collar is bounded in the radial direction by a centring surface 18 which, seen geometrically, constitutes a frustoconical surface. The acute angle of the truncated cone is 60° , i.e. the frustoconical surface, that is to say the centring surface, is inclined at an angle of 30° to the axis A of the nut. Externally

adjoining the centring surface 18 is a circular annular engagement surface 20 afforded by a circular disc 22 connected to the cylindrical body 12. As shown in Figs. 1 and 4, the nut in accordance with the invention has a radial slot 24 which extends to its thread 14 and which extends over the entire height of the nut, as shown in Fig. 2. The slot 24 is so selected as regards its size and shape that the peripheral angle remaining of the thread 14 is larger than 180° , i.e. the circular segment cut out of the periphery of the thread by the slot has an acute angle which is smaller than 180° , for instance 160° . The slot extends also through the circular disc 22. When the nut in accordance with the invention is positioned on a bolt and a radial pressure is exerted on it, the lateral regions 22a and 22b of the circular disc 22 and the adjoining regions of the cylindrical main body 12 are pressed together, which is additionally facilitated by an unloading gap 26. The unloading gap 26 is arranged opposite the slot 24.

The nut further has two wing-like gripping surfaces 28a and 28b which are disposed in a plane and by means of which the bolt can be tightened or rotated without a special tool being necessary. The wings or gripping surfaces 28a and 28b are disposed in a plane which extends at right-angles to the plane of the slot 24 passing through the axis A of the nut. Due to the opposite arrangement of the unloading gap 26, slot 24 and gripping surfaces 28a and 28b, a good stability of the bolt is achieved with a simultaneous good material usage so that the bolt can also be manufactured, in particular, by an injection moulding process.

Figs. 5 and 6 show the washer in accordance with the

invention. The washer 30 has a concentrically arranged hole 32, whose inner wall 34 comprises two outwardly diverging frustoconical surfaces 36a and 36b. The angle of inclination of the frustoconical surfaces 36a and 36b with respect to the central axis A is 30° , as in the exemplary embodiment shown in Figs. 1 to 4 of a nut in accordance with the invention, whilst the external diameter of the frustoconical surfaces is slightly smaller than the largest diameter of the frustoconical surface 18 of the collar 16. When the bolt is tightened, the centring surface in the form of the frustoconical surface 18 comes into contact with the frustoconical surface 36a of the inner wall 34 of the washer 30 or - if the washer 30 is in an upside down position - with the identically shaped frustoconical surface 36b. Since the frustoconical surface 18 or the centring surface has, in the unloaded state of the bolt, a somewhat larger average diameter than the corresponding frustoconical surface of the washer 30, the collar 16 is compressed in the region of the slot 24 when the centring surface, i.e. the frustoconical surface 18 of the collar 16, is moved further into the complementary frustoconical surface 36a, 36b of the washer 30 during screwing in, that is to say during tightening of the nut. The nut is thus centred and slipping of the nut off the bolt, which is not shown in Figs. 1 to 6, is prevented.

Fig. 7 shows a use of the nut and washer combination in accordance with the invention in the context of a fastening device in accordance with the invention for a pivotable WC seat. A WC bowl 40 has two fastening bores 42a and 42b in which axially slidable bolts 44a and 44b are arranged. The bolts merge in their upper region into pivot pins 46a and 46b which extend horizontally and

engage in bores or through holes in a pivotable cover 48 and an apertured seat 50. Rotatably arranged on the thread of the bolts 42a, 42b is a respective support plate 52, which is constructed as a threaded flange, with an engagement surface 54. The position of the support plate on each bolt 44a, 44b can be adjusted by rotating the support plate 52 so that the fastening device is universally suitable for any desired construction of WC seats, i.e. the spacing of the pivot pins 46a, 46b above the surface 41 of the WC bowl 40 is thus adjustable.

Bolts 44a and 44b are fixed in a form-locking manner in the axial direction by the engagement surfaces 54. The length of the bolts 44a and 44b is such that the fastening device is universally suitable for WC bowls with fastening bores 42a and 42b of differing depths. The bolts 44a and 44b are fixed in position by a respective combination of a washer 30 and a nut 10 in accordance with the invention. As shown schematically in Fig. 7, each nut 10 can be pushed onto the respective bolt 44a, 44b in the radial direction directly below the washer 30, whereby it is not necessary to cover the entire dead length of the bolt projecting out of the threaded bore by rotating the nut.

As shown in Fig. 8, when tightening the nut in accordance with the invention, each centring surface 18 in the form of a frustoconical surface comes into contact with the downwardly directed portion of the inner wall 34 of the washer 30, whereby the nut remains centred even when being tightened on the respective bolt 44a, 44b and high tightening torque is rendered possible so that a firm fit of the WC seat on the WC bowl 40 is ensured.

In order to remove the WC seat for cleaning purposes, it is merely necessary to undo the nuts 10 a few revolutions until the collar 16 has been rotated out of the axial region of the washer 30, to remove the nuts in the radial direction from the respective bolts and to remove the WC seat from the WC bowl 40, whereby the bolts 44a and 44b slide out of the corresponding bores 42a and 42b. Cleaning of the WC bowl 40 is then possible thoroughly and without difficulty.

Whilst the combination in accordance with the invention of a nut and washer is particularly suitable for realising a fastening device in accordance with the invention for a pivotable WC seat, its field of application is in no way limited thereto.

Claims

1. Combination of a nut (10) and a washer (30) for
5 restraining a bolt (44a, 44b), which is axially
movable in a bore (42a, 42b) and which may be form-
locking fixed in position in the axial direction
10 at one end of the bore (42a, 42b) by an engagement
surface (54) and, at the other end of the bore (42a,
42b) passes out of it, whereby the nut (10) has a
slot (24), which extends over its entire height and
extends radially to its thread (14), and, at one end
15 of the thread, a concentrically disposed collar (16)
with a centring surface (18) inclined to the axis
(A) of the nut (10) and the inner wall (34) of the
hole (32) in the washer (30) extends inclined at an
angle complementary to the centring surface (18);
20 the centring surface (18) and the inner wall (34) of
the hole (32) are frustoconical surfaces; and the
external diameter of the frustoconical surface (36a,
36b) on the washer (30) is smaller than the external
diameter of the frustoconical surface of the
25 centring surface (18); characterised in that the
inner wall (34) of the hole (32) in the washer (30)
comprises two outwardly diverging frustoconical
surfaces (36a, 36b); the basic geometrical shape of
the nut (10) has a straight circular cylinder (12),
which contains a threaded bore (14) and adjoining
30 which in the outward direction there is a circular
disc (22) having an engagement surface (20); which
has a radially extending unloading gap (26) arranged
opposite to the slot (24) in the nut (10) and is
shortened by a circular segment arranged at right-
angles to the slot (24); the nut (10) has two wing-



like gripping surfaces (28a, 28b) which are disposed in a plane perpendicular to the plane of the slot (24) passing through the nut axis (A) and are connected to the circular cylinder (12) and extend over the entire free height of the same; the nut (10) and the washer (30) are manufactured from plastic material in an injection moulding process and the centring surface (18) and the inner wall (34) are inclined at an angle of 30°.

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2. Fastening device for a pivotable WC seat (48, 50) with a support plate (52), a bolt (44a, 44b) extending downwardly perpendicular to it, a pivot pin (46a, 46b) arranged horizontally and spaced from the support plate and a fastening element screwable onto the bolt, characterised in that the fastening element is a combination of a nut (10) and washer (30) as claimed in Claim 1.

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3. Fastening device for a pivotable WC seat as claimed in Claim 2, characterised in that the support plate, the bolt extending downwardly perpendicular to it and the pivot pin arranged horizontally spaced from the support plate are of one-piece construction and are manufactured from a plastics material in an injection moulding process.

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4. Fastening device for a pivotable WC seat as claimed in Claim 2, characterised in that the bolt (44a, 44b) merges into an unthreaded, angled portion (46a, 46b) constituting the pivot pin and that the support plate (52) is screwable onto the bolt.

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5. Fastening device for a pivotable WC seat as claimed



in Claim 4, characterised in that the bolt (44a, 44b) and support plate (52) comprise metal.