a painstaking manual intervention. Once the roller cutter is pushed towards its operating position, several blocking wedges are then put in place. Documents JP H10 140980, JP 2007/070825, JP H07 180488 and FR 2 758 853, could in particular be referred to, which describe cutting tools comprising roller cutters attached in a housing on the cutting head using wedges held fixed in position with respect to the housing by means of bolts, screws and/or journals.

It will be understood therefore that this procedure is long and tedious for the operators.

Thus, it has been provided in document WO 2011/076616 on behalf of the applicant, a new roller cutter comprising a locking member adapted to be immobilized in the housing, such that the roller cutter makes up a rigid block in view of the handling thereof, and means for prestressing the roller cutter that can include integrally borne screws of the roller cutter. In a particular embodiment, the locking member includes a bayonet adapted to cooperate with a cavity of the housing and rotatably movable between a position of inserting the roller cutter in the housing and a position of locking the roller cutter in the housing.

However, in use, the roller cutter undergoes very high pressure and vibration stresses which might move out the bayonet. Indeed, it is difficult to apply a prestressed strain enough to resist the vibrations of the roller cutter in a hard field.

SUMMARY OF THE INVENTION

~~One purpose~~Embodiments of the present invention ~~is thus~~ seek to provide a cutter holder and a cutting set for a tunnel boring machine comprising a tunnel boring machine

roller cutter and an associated cutter holder, capable of supporting the very harsh environment of the roller cutters, in particular the high pressure and vibrations generated by rolling the roller cutter on the cutting face, and which further allow any human intervention upon replacing one roller cutter to be reduced, or even suppressed.

~~Another purpose~~Embodiments of the invention ~~is to~~ also seek to provide a method for replacing a roller cutter of such a cutting set, as well as a handling device for the roller cutter adapted to implement this method, by enabling in particular any loss of parts to be avoided.

Also, the handling device of the cutting set ~~must be~~is preferably easy to clean and should not include any areas that retain water or mud.

Finally, this device ~~must be~~ is preferably usable in existing cutting heads, preferably without requiring significant modifications to the same.

~~For this,~~A first aspect of the invention provides a cutter holder for a tunnel boring machine, said cutter holder being adapted to accommodate a roller cutter freely rotatably mounted about an axis of rotation in said cutter holder and comprising:

- a housing, defining a chamber arranged to accommodate the roller cutter, said housing comprising two cavities formed in opposite walls of the chamber, and
  - two clamping sets, configured to be ~~removably~~ mounted on either side of the roller cutter removably in the housing, and each comprising a base plate, adapted to be attached to the roller cutter in the housing, said roller cutter remaining rotatably free about its axis of rotation, and
  - a centre wedge and two side wedges,

and adapted to each receive a further side wedge distinct from the clamping sets, and

- it further comprises a side wedging system, attached to one of the opposite side walls of the chamber, adapted to apply a side strain to the housing.

According to a third aspect, the invention also provides a clamping set of a cutter holder for a tunnel boring machine such as described above, configured to be removably mounted on either side of a roller cutter in a housing, and each comprising:

- a base plate, adapted to be attached to the roller cutter ~~(10)~~ in the housing, said roller cutter remaining rotatably free about its axis of rotation, and

- a centre wedge and two side wedges,

the clamping set being characterised in that the centre wedge is movably mounted on the base plate and in that both side wedges are mounted on the base plate and the centre wedge by being hinged thereto between a retracted position, wherein the side wedges are retracted and enable the clamping set to be removed from the housing ~~(2)~~, and a clamping position, wherein the side wedges ~~(36)~~ swing and fit into the cavity ~~(26)~~ facing the housing in order to prevent the clamping set from being extracted from the housing.

According to a fourth aspect, the invention also provides a cutting set for a tunnel boring machine, comprising a roller cutter, attached in a cutter holder as described above.

According to a fifth aspect, the invention also provides a method for replacing a roller cutter of a cutting set for a tunnel boring machine as described above, characterised in that it comprises the steps of:

(i) extracting a used roller cutter from the housing, comprising the following steps of:

C L A I M S

1. A cutter holder ~~(1)~~ for a tunnel boring machine, said cutter holder ~~(1)~~ being adapted to accommodate a roller cutter ~~(10)~~ freely rotatably mounted about an axis of rotation ~~(X)~~ in said cutter holder ~~(1)~~ and comprising:

- a housing ~~(2)~~, defining a chamber ~~(21)~~ arranged to accommodate the roller cutter ~~(10)~~, said housing ~~(2)~~ comprising two cavities ~~(26)~~ formed in opposite walls ~~(20)~~ of the chamber ~~(21)~~, and
- two clamping sets ~~(3)~~, configured to be mounted on either side of the roller cutter ~~(10)~~ removably in the housing ~~(2)~~, and each comprising:
  - a base plate ~~(32)~~, adapted to be attached to the roller cutter ~~(10)~~ in the housing ~~(2)~~, said roller cutter ~~(10)~~ remaining rotatably free about its axis of rotation ~~(X)~~, and
  - a centre wedge ~~(34)~~ and two side wedges ~~(36)~~,

said cutter holder ~~(1)~~ being characterised in that, for each clamping set ~~(3)~~, the centre wedge ~~(34)~~ is movably mounted on the base plate ~~(32)~~ and in that both side wedges ~~(36)~~ are mounted on the base plate ~~(32)~~ and the centre wedge ~~(34)~~ by being hinged thereto between a retracted position, wherein the side wedges ~~(36)~~ are retracted and enable the clamping set ~~(3)~~ to be removed from the housing ~~(2)~~, and a clamping position, wherein the side wedges ~~(36)~~ swing and fit into the cavity ~~(26)~~ facing the housing ~~(2)~~ in order to prevent the clamping set ~~(3)~~ from being extracted from the housing ~~(2)~~.

2. The cutter holder ~~(1)~~ according to claim 1, wherein each clamping set ~~(3)~~ further comprises a stud bolt ~~(39)~~, mounted on the base plate ~~(32)~~, and an actuating nut ~~(39)~~, mounted on the one hand on the

centre wedge ~~(34)~~ and on the other hand on the stud bolt ~~(39)~~, such that screwing or unscrewing said actuating nut ~~(38)~~ causes the translation of the centre wedge ~~(34)~~ with respect to the base plate ~~(32)~~ and the side wedges ~~(36)~~ to be moved between their retracted position and their clamping position.

3. The cutter holder ~~(1)~~ according to one of claims 1 or 2, wherein:

- the side wedges ~~(36)~~ are rotatably mounted about an axis ~~(Y)~~ on the base plate ~~(32)~~ or on the centre wedge ~~(34)~~, and each comprise an actuating pin ~~(37)~~, and

- two guide grooves ~~(35)~~ are formed in the centre wedge ~~(34)~~ or in the base plate ~~(32)~~ respectively, said guide grooves ~~(37)~~ defining cam surfaces for the actuating pins ~~(37)~~, each actuating pin ~~(37)~~ being accommodated in a guide groove ~~(35)~~ such that the movement of the centre wedge ~~(34)~~ with respect to the base plate ~~(32)~~ causes the movement of the actuating pin ~~(37)~~ along the guide groove ~~(35)~~ and thus the rotation of the side wedge ~~(36)~~ with respect to the base plate ~~(30)~~ between its retracted position and its clamping position.

4. The cutter holder ~~(1)~~ according to claim 3, wherein the side wedges ~~(36)~~ are rotatably mounted on the base plate ~~(32)~~ and the guide grooves ~~(35)~~ are formed in the centre wedge ~~(34)~~.

5. The cutter holder ~~(1)~~ according to one of claims 3 or 4, wherein the axis ~~(Y)~~ of rotation of the side wedges ~~(36)~~ is substantially parallel to the axis of rotation ~~(X)~~ of the roller cutter ~~(10)~~.

6. The cutter holder ~~(1)~~ according to one of claims 1 to 5, wherein the side wedges ~~(36)~~ and the centre wedge ~~(34)~~ comprise associated pressing faces ~~(36a, 34a)~~, configured to be engaged when the side wedges ~~(36)~~ are in the clamping position in order to withstand strains passing through the clamping sets ~~(3)~~ and provide a stable state to said clamping sets ~~(3)~~.

7. The cutter holder ~~(1)~~ according to one of claims 1 to 6, wherein the side wedges ~~(36)~~ extend substantially symmetrically with respect to the base plate ~~(32)~~.

8. The cutter holder ~~(1)~~ according to one of claims 1 to 7, wherein the housing ~~(2)~~ further comprises four further cavities ~~(28)~~ each respectively in the opposite side walls ~~(20)~~ between the cavities ~~(26)~~ and the front face ~~(22)~~ of the housing ~~(2)~~, each adapted to receive a further side wedge ~~(36)~~ distinct from the clamping sets ~~(3)~~.

9. A housing ~~(2)~~ of a cutter holder ~~(1)~~ for a tunnel boring machine according to one of claims 1 to 8, comprising side walls ~~(20)~~ and a front face ~~(22)~~, from which the roller cutter ~~(10)~~ projects, defining together a chamber ~~(21)~~ arranged to accommodate the roller cutter ~~(10)~~,

the housing ~~(2)~~ being characterised in that it comprises two cavities ~~(26)~~ formed in opposite side walls ~~(20)~~ of the chamber ~~(21)~~, and adapted to be engaged with the side wedges ~~(36)~~ when said side wedges ~~(36)~~ are in their clamping position in order to prevent the clamping sets ~~(3)~~ from being extracted from the housing ~~(2)~~.

10. The housing (2) according to claim 9, further comprising at least four further cavities (28) respectively formed in the opposite side walls (20) between the cavities (26) and the front face (22) of the housing (2) and adapted to each receive a further side wedge (36) distinct from the clamping sets (3).

11. The housing (2) according to claims 9 or 10, further comprising a side wedging system (40), attached to one of the opposite side walls (20) of the chamber (21), adapted to apply a side strain to the housing (2).

12. A clamping set (3) of a cutter holder (1) for a tunnel boring machine according to one of claims 1 to 8, configured to be removably mounted on either side of a roller cutter (10) in a housing (2), and each comprising:

- a base plate (32), adapted to be attached to the roller cutter (10) in the housing (2), said roller cutter (10) remaining rotatably free about its axis of rotation (X), and

- a centre wedge (34) and two side wedges (36),

the clamping set (3) being characterised in that the centre wedge (34) is movably mounted on the base plate (32) and in that both side wedges (36) are mounted on the base plate (32) and the centre wedge (34) by being hinged thereto between a retracted position, wherein the side wedges (36) are retracted and enable the clamping set (3) to be removed from the housing (2), and a clamping position, wherein the side wedges (36) swing and fit into the cavity (26) facing the housing (2) in order to prevent the clamping set (3) from being extracted from the housing (2).

13. A cutting set ~~(5)~~ for a tunnel boring machine, comprising a roller cutter ~~(10)~~, attached in a cutter holder ~~(1)~~ according to one of claims 1 to 8.

14. A method for replacing ~~(S)~~ a roller cutter ~~(10)~~ of a cutting set ~~(5)~~ for a tunnel boring machine according to claim 13, characterised in that it comprises the steps of:

(iii) extracting ~~(S1)~~ a used roller cutter ~~(10)~~ from the housing ~~(2)~~, comprising the following steps of:

- docking and clamping ~~(S11)~~ on the housing ~~(2)~~ of a handling device adapted for grasping and guiding the roller cutter ~~(10)~~,
- grasping ~~(S12)~~ the clamping set ~~(3)~~ and/or the roller cutter ~~(10)~~ by the handling device,
- releasing ~~(S13)~~ the clamping applied to the clamping set ~~(3)~~ and the housing ~~(2)~~,
- extracting ~~(S14)~~ the roller cutter ~~(10)~~ from the housing ~~(2)~~,
- removing ~~(S15)~~ the handling device from the housing ~~(2)~~,

(iv) installing ~~(S2)~~ in said housing ~~(2)~~ a replacement roller cutter ~~(10)~~, comprising the following steps of:

- grasping ~~(S21)~~ the clamping set ~~(3)~~ and/or the roller cutter ~~(10)~~ by the handling device,
- docking and clamping ~~(S22)~~ the handling device on the housing ~~(2)~~,
- inserting ~~(S23)~~ the roller cutter ~~(10)~~ into the housing ~~(2)~~, said roller cutter ~~(10)~~ being guided by the handling device,
- operating ~~(S24)~~ the clamping set ~~(3)~~ of the roller cutter ~~(10)~~, so as to accommodate the wedge ~~(36)~~ in the cavity ~~(26)~~ of the housing ~~(2)~~.