

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Mounting Bolt

I, ARTUR FISCHER, a German citizen, of Tumlingen, Kreis Freudenstadt, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a mounting bolt capable of anchorage in a bore.

- 10 Such mounting bolts are known in which the end of the shank to be anchored in the bore is hollow and longitudinally slotted, the other end being solid and being provided with an external thread on which a nut can be screwed to secure an object to be mounted on the shank of the bolt. Such a bolt is provided with an expanding element in the form of a cone that can be introduced into the hollow slotted end of the bolt in order to expand the same and anchor the bolt in the bore when the bolt is subsequently driven into the bore. Since the expansion of the slotted end of the bolt by the cone can only take place when the cone has met the bottom of the drilled bore, the depth of the bore must be adjusted accurately to determine the amount by which the threaded sleeve portion is to project. This is very hard to achieve. When the bolt is driven home, the hollow shank not only moves into the drilled hole, but is also expanded at the same time, and therefore the bolt increasingly ruptures the wall of the drilled bore longitudinally as it penetrates more deeply, so that safe anchoring of the bolt against axial forces is not guaranteed.

- 40 Mounting bolts are also known, in which the end of the shank to be anchored in the bore has a portion of restricted diameter that is tapered in a direction away from the end of the shank, the bolt having externally arranged wedges for co-operation with the tapered part of the shank. The bolt is provided at its outer end with an external thread, and in use is inserted into the drilled bore, together with the external wedges which lie flush in the restricted part of the shank, so far that just enough of the threaded shank projects to allow the attachment of a threaded nut (after the object to be mounted has been placed thereon). When the nut is subsequently tightened, the bolt is partly withdrawn from the bore again, causing the external wedges engaging the wall of the bore to spread apart and become jammed. With this type of bolt it is also practically impossible to control accurately the amount by which the threaded portion of the bolt projects beyond the bore, and furthermore, the restriction in the shank considerably weakens the bolt.

The present invention provides a mounting bolt capable of anchorage in a bore, the bolt comprising a sleeve, an expansion member, a stop member for limiting the penetration of the sleeve into a bore and means for retaining an article mounted on the sleeve, the sleeve being longitudinally slotted at, and its internal bore being tapered towards, one end thereof, the expansion member having a smooth cylindrical outer surface which has at one end a tapered portion which substantially matches the taper of the bore, the sleeve being externally threaded adjacent that end remote from its slotted portion and the stop member and retaining means having an internally threaded portion engageable with the threaded portion of the sleeve, the bolt being such that, in use, the slotted end of the sleeve can be inserted into a bore to a distance predetermined by the position of the stop member on the threaded portion of the sleeve, the expansion member can be inserted into the sleeve until its tapered portion engages the taper of the bore of the sleeve, in which

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[Price 5s. 0d.]

position the other end of the expansion member extends from the other end of the sleeve by an amount at least equal to the length of its tapered portion, the expansion member can then be driven further into the sleeve to expand the slotted end thereof and anchor the sleeve in the bore. The stop means and retaining means may be combined and either one or the combination may be a head or collar provided on the sleeve, but is preferably a threaded nut engaging a matching external screw thread of the sleeve. The expansion member which matches the inner bore of the sleeve and consists preferably of hardened steel ensures that the bending strength of the hollow sleeve is at least equal to that of a solid bolt.

According to one embodiment of the invention the mounting bolt may be provided with an external screw thread at its longitudinally slotted end.

This makes it possible for the mounting bolt to be anchored in bores provided in metal constructions, for example. When the longitudinally slotted end of the mounting bolt expands the ridges of the thread penetrate into the surrounding material of the bore. In this way positive anchoring of the mounting bolt is achieved, and the latter can withstand considerable extraction forces. Also owing to the fact that the slotted end of the mounting element is provided with a thread it may be unscrewed and removed from the anchoring bore when the expanding pin has been removed, to be re-inserted later. Thus, the mounting bolt of the invention can also be employed in cases where, up to now, only conventional fastening screws were used. When the mounting bolt of the invention is used in such cases, the tapping of a thread is no longer necessary, since such a thread is formed by the bolt itself when it is inserted and expanded.

To expand the end portion of the mounting bolt by driving in the expansion member a hammer or a similar tool may be used. However, the expansion member may also be driven into the bore of the mounting bolt by the force of a hydraulic or pneumatic fluid.

The invention is illustrated by way of example in the accompanying drawings, in which, Fig. 1 is an elevation of the sleeve portion of a mounting bolt according to the invention; Fig. 2 is a plan view of the sleeve shown in Fig. 1; Fig. 3 is an elevation of an expansion member for use with the sleeve shown in Figs. 1 and 2; Fig. 4 is a sectional elevation of the sleeve of Figs. 1 and 2 and the expansion member of Fig. 3 shown assembled together; Fig. 5 is an elevation, partly in section, showing the assembled mounting bolt according to Fig. 4 anchored in place in a bore; Fig. 6a is an elevation of

a similar assembly, showing the initial step in a method of anchoring it into a bore; Fig. 6b is an elevation, partly in section, of the assembly shown in Fig. 6a when finally anchored;

Fig. 7 is an elevation partly in section of a further embodiment of mounting bolt before anchorage in a bore.

Fig. 8 is a similar view of the mounting bolt of Fig. 7 shown anchored in a structural component, and

Fig. 9 is another similar view showing the anchored mounting bolt so arranged that it projects beyond the rear face of the component.

Referring to Figs. 1 and 2, a sleeve member 1 has a cylindrical internal bore 2. One end 1a of the sleeve, intended to be anchored in a bore, has intersecting longitudinal slots defining four tongues each of which is provided with peripheral serrations of saw-tooth section. The other end 1b of the sleeve is provided with an external screw thread. The axial bore 2 of the sleeve 1 has a conical restriction 2a at the end 1a of the sleeve. Fig. 3 shows an expansion member in the form of a pin 3 the cylindrical main body portion of which matches the main portion of the axial bore 2, and the conical point 3a of which matches the conical portion 2a of the bore (see Fig. 4). When the pin 3 is inserted in the bore 2, 2a of the sleeve 1, as shown in Fig. 4, the pin projects from the threaded portion 1b of the sleeve 1 by an amount which is at least equal to the length of the conical portion 2a of the bore. A threaded nut 4 with washer 5 (indicated in Fig. 4 by broken lines) engages the outer thread of the sleeve portion 1b.

Fig. 5 shows the mounting bolt described above used to secure a flange which may, for example, be part of the foot of a machine. The bore 7 of which the diameter corresponds to that of the sleeve 1 is drilled a little deeper than would correspond to the required depth of insertion of the mounting bolt. With the pin 3 inserted in the bore of the sleeve 2 just far enough for its conical point 3a to become situated accurately in the matching conical portion 2a of the bore and with the nut 4 (with washer 5) screwed substantially flush on the threaded portion 1b, the mounting bolt is inserted in the bore 7 until the washer 5 rests on the flange. Then the expanding pin 3 is driven into the sleeve 1 until it is flush therewith. Since the nut 4 (with washer 5) acts as a stop, this prevents the sleeve from being driven further into the hole 7, and the conical point 3a of the pin emerges completely from the conical portion 2a of the bore 2, the sleeve portion 1a being expanded accordingly, so that no force that might tend to eject the pin 3 in the upward direction can be transmitted from the wall of the part

2a of the bore. In this way firm, vibration-free anchoring of the mounting bolt can be achieved. In order to prevent the thread of the sleeve portion 1b from becoming damaged when the pin 3 is driven home, this part of the sleeve has a tapered end face as shown, or may be provided with a shoulder.

In the embodiment shown in Figs. 6a, 6b the required length by which the sleeve 1 is to project from the bore 7 is first determined, in accordance with the height of the object 6a to be mounted, by screwing down the nut 4 (with washer 5) on the sleeve portion 1b to the required extent; the bolt thus prepared is then inserted in the bore 7 up to the stop formed by the nut 4 (or washer 5), see Fig. 6a, whereupon the pin 3 is driven into the sleeve 1 until it is flush with the end face thereof. In this way the sleeve portion 1a is expanded and the sleeve 1 firmly anchored in the bore 7. The nut 4 and washer 5 are then removed from the sleeve portion 1b, the object 6a is engaged over the projecting sleeve portion, the washer 5 and nut 4 are replaced (Fig. 6b) and finally the nut is tightened.

In Fig. 7 a sleeve member 11 is provided with a thread 12 over its whole length. A bore 13 extends through the sleeve 11 in the longitudinal direction, the bore being conically restricted towards the end 14 of the sleeve 11. The end 14 has a longitudinal slot 15. A pin 16 which is likewise conically pointed at its end engages the bore 13.

In Figs. 8 and 9 the sleeve 1 is secured in a structural component 17. This is achieved by driving the pin 16 home until it reaches the conically tapered portion of the bore 13. When the pin is driven further home, the end 14 of the sleeve provided with the longitudinal slot 15 expands and the thread 12 penetrates into the material of the component 17, so that a durable, positive connection of the sleeve 11 with the component 17 is achieved.

Anchoring of the sleeve 11 may be effected before or after the attachment of a further component 18 which is to be connected to the component 17. If the sleeve is secured after the attachment of this further component 18, the mounting and fastening operations are thus simultaneous.

The sleeve 11 is provided at its non-slotted end with a nut 19 and, if necessary, a washer 20, and in order to secure it in position it is passed through an aperture of the additional component 18 and introduced into the bore of the component 17, to be expanded as above described. The sleeve is inserted into the bore just far enough for the nut 19 or washer 20 arranged thereon to bear upon the surface of the component 18. When the end portion of the sleeve penetrating the component 17 has been expanded it may still be necessary for

the nut to be given another half or whole turn as the case may be, in order to complete the mounting operation.

The embodiment illustrated in Fig. 9 differs from that of Fig. 8 only in that the slotted end of the sleeve projects beyond the rear face of the component 17. The fact that the sleeve projects beyond the rear face is an improved safeguard against extraction. It should be understood, however, that in this embodiment it will be much more difficult to unscrew the sleeve from the bore after the removal of the pin 16.

The main advantage of the mounting bolts described above lies in the fact that the depth of penetration in the bore as well as the amount by which the sleeve member projects from the same can always be accurately adapted to given conditions owing to the threaded nut acting as a settable stop for limiting insertion.

If desired, the nut may be adapted for use as a fastening element (hook - lug - bush etc.). Instead of a nut displaceable on the threaded sleeve, another stop (flange - plate etc.) may be provided on the sleeve in displaceable or fixed relation. In order to enable the depth of penetration to be varied even when the sleeve is provided with a fixed stop, a varying number of washers may be employed. The stop need not be situated at the extreme end of the sleeve, but, according to requirements, a small or large part of the sleeve may be left projecting to be used for the fastening of the object to be mounted.

The conical part of the bore in the sleeve may be formed by compression and resultant plastic deformation of the end portion of a sleeve provided with an originally cylindrical bore, or the end portion of a piece of tubing, rather than by drilling a conically ended bore in a solid blank by an appropriately shaped tool.

WHAT I CLAIM IS:

1. A mounting bolt capable of anchorage in a bore, the bolt comprising a sleeve, an expansion member, a stop member for limiting the penetration of the sleeve into a bore and means for retaining an article mounted on the sleeve, the sleeve being longitudinally slotted at, and its internal bore being tapered towards, one end thereof, the expansion member having a smooth cylindrical outer surface which has at one end a tapered portion which substantially matches the taper of the bore, the sleeve being externally threaded adjacent that end remote from its slotted portion and the stop member and retaining means having an internally threaded portion engageable with the threaded portion of the sleeve, the bolt being such that, in use, the slotted end of the sleeve can be inserted into a bore to a distance predetermined by the position of

2a of the bore. In this way firm, vibration-free anchoring of the mounting bolt can be achieved. In order to prevent the thread of the sleeve portion 1b from becoming damaged when the pin 3 is driven home, this part of the sleeve has a tapered end face as shown, or may be provided with a shoulder.

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Anchoring of the sleeve 11 may be effected before or after the attachment of a further component 18 which is to be connected to the component 17. If the sleeve is secured after the attachment of this further component 18, the mounting and fastening operations are thus simultaneous.

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the nut to be given another half or whole turn as the case may be, in order to complete the mounting operation.

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- the stop member on the threaded portion of the sleeve, the expansion member can be inserted into the sleeve until its tapered portion engages the taper of the bore of the sleeve, in which position the other end of the expansion member extends from the other end of the sleeve by an amount at least equal to the length of its tapered portion, the expansion member can then be driven further into the sleeve to expand the slotted end thereof and anchor the sleeve in the bore.
2. A mounting bolt as claimed in claim 1, in which the other end of the sleeve has a portion of reduced diameter to provide resistance to spreading of the sleeve under impact with a percussion tool.
3. A mounting bolt as claimed in claim 2, in which the stop means and/or retaining means is axially adjustable on the sleeve.
4. A mounting bolt as claimed in claim 3, in which the other end of the sleeve is provided with an external screw thread the said stop means and/or retaining means

comprising a mating nut.

5. A mounting bolt as claimed in claim 1, in which the stop means and/or retaining means is fixed to the sleeve, and is spaced from the end thereof.
6. A mounting bolt as claimed in any one of claims 1 to 5, in which the stop means and retaining means are combined.
7. A mounting bolt as claimed in any one of claims 1 to 6, in which the slotted end of the sleeve is provided with an external screw thread.
8. A mounting bolt substantially as described herein with reference to Figs 1 to 6b of the drawings.
9. A mounting bolt substantially as described herein with reference to Figs. 7 to 9 of the drawings.

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