

European Patent Office

11. Publication No. 0 142 656 B1

European Patent Specification

- | | |
|--|---|
| <p>45. Publication date of the patent specification:
4.2.87</p> <p>21. App. No. 84110841.8
22. App. Date 12.9.84</p> <p>54. Apparatus for binding an elongated object, for example a bunch of cables.</p> <p>30. Priority 21.9.83 DE 8327158 U</p> <p>43. Publication Date of the Application:
29.5.85 Patent Journal 85/22</p> <p>45. Publication of the Notice of the Grant of a Patent:
4.2.87 Patent Journal 87/6</p> <p>84. Countries named:
DE, FR, GB, IT, NL, SE</p> <p>56. Citations
EP-A 0 045 164
EP-A 0 075 501
DE-A 2 054 520
DE-B 1 279 801
FA-A 2 486 172
US-A 2 988 391
US-A 3 107 935</p> | <p>51. Int. Class B 65 D 63/1</p> <p>73. Patent Holder
Paul Hellermann GmbH
Siemensstrasse 5,
D-2080 Pinneberg (DE)</p> <p>72. Inventor
Six, Jorg Dipl.-Ing,
Eiderstrasse 24
D-2000 Norderstedt (DE)</p> <p>74. Authorised Agent:
Glaw, Delfs, Moll & Ptners
Patent Agents, P.O. Box
26 01 62
Liebherrstrasse 20,
D-8000 Munich 26 (DE)</p> |
|--|---|

Note: Anyone may lodge an opposition to the granted European Patent at the European Patent Office within nine months of the publication of the Notice to Grant the European Patent in the European Patent Journal(s).

The Opposition should be filed in writing and substantiated. It is only considered to have been lodged when the Opposition Fee has been paid. (Art 99 (1) European Patent Agreement).

Description

The invention relates to an apparatus for binding an elongated object, for example a bunch of cables with a band to be tensioned around the object and a lock connecting the ends of the band, which comprises a through hole for at least one end of the band and a bore extending at right angles thereto, which contains a pin to be driven through the band located in the through hole, in which case the pin and the bore are provided with cooperating projections and recesses securing the pin in its end position.

In a known apparatus of this type (US-A 3.353.227) when the pin is driven in, the band is deformed around the end of the pin in the shape of a small cup. The pin is secured in the locked position due to the fact that at its leading end together with the deep-drawn band surrounding it it is squashed flat in the manner of a rivet head within an enlarged part of the bore and thus assumes a diameter which is larger than the diameter in the part of the bore located there behind. Since the material of the lock, the band and the pin is normally somewhat flexible, for example when produced from polyamide, the thickening is in practice carried out vigorously, since otherwise there is a risk that under high band tension the pin slides back with corresponding widening of the lock body. However, when closing the band closure member, since irregularities may occur which may result in the thickening of the pin being less strong than is actually desirable, the danger cannot be excluded that a lock has inadequate strength on account of inadequate deformation of the pin.

However, in order to avoid this drawback it is also

known (FR-A 24 86 172, Figures 1 and 3), to provide the pin and the bore with cooperating threads, which however has the drawback that the pin must be screwed into the lock in a troublesome manner and consequently produces the risk that accidentally the pin is not screwed far enough into the lock.

It is also known (FR-A 24 86 172, Figure 7; US-A 29 88 391), to provide the band lock with a recess, into which the ends of the band to be secured are pressed by means of a pin for their attachment, in which case the pin and the recess have cooperating residual projections and recesses, which come into engagement due to the insertion of the pin in the recess. In this case, the pin is stressed by the force exerted on it by the band exclusively in its release direction, so that the locking connection has to absorb the full force transmitted by the band to the pin. However, as is known, locking connections of plastic parts are only able to withstand a limited force, so that the known apparatus is unsuitable for high stresses.

It is the object of the invention to provide an apparatus of the afore-mentioned type, which has higher locking security, in particular also independently of the care with which the locking operation was carried out.

The solution according to the invention consists in that on their side facing the object to be bound, the pin and the bore comprise locking edges engaging one behind the other in the opposite direction to that in which the pin is released, which edges are arranged so that as the tension of the band increases, they are kept more securely in engagement.

The invention is based on the idea that with this arrangement the pin is pressed by the band forces on the side of the bore facing the object to be bound and that a locking connection provided on this side is therefore not only
5 held together by the resilient forces of the material used, but on the contrary by the band forces. The securing force, by which the locking connection keeps the pin in the bore, is thus all the greater the greater the load on the band.

10 In principle it is sufficient to provide the cooperating locking edges solely on this side of the pin facing the the object. However it is more appropriate to arrange the edge (or edges) adjacent the pin peripherally,
15 in order that one is independent of a possibly troublesome and defective orientation of the pin.

The mutual engagement of the locking edges is all the more secure the less the lock body is deformed under the band tension in the region of the locking edges. A deformation of this type may therefore above all
20 be due to the fact that the lock body is exposed to a tension enlarging it due to the ends of the band diverging from it in the opposite direction. This is counteracted according to the invention due to the fact that on the side of the object to be bound, the
25 lock is constructed in a strengthened manner and indeed preferably by ribs provided on the lock body laterally with respect to the through hole and adjacent the object. If one end of the band is connected in one piece to the lock it is appropriate to allow the strengthening ribs
30 to pass into the band in their longitudinal direction, in order that the tensile stresses of the band are transmitted at least for a major part into these ribs and from the latter are transmitted to that part of

the lock body, which seen from the band, lies on the other side of the through hole.

5 If the lock body comprises a bearing surface on its side facing the object, which surface extends at right angles to the through hole, the end of the band to be secured in the lock will be deflected approximately through 90° when entering the through hole. On account of the short distances, the tensile stresses occurring on its bending outer side act in that region in which
10 it is deformed by the pin, in that they are able to increase those forces which urge the pin in the release direction. According to the invention it is therefore appropriate if the angle of deflection of the band as it enters the through holes is reduced due to the
15 fact that the bearing surface of the lock body, which bears directly or with the interposition of the band against the object to be bound, encloses an angle of more than 90° on the side of the band entering the through hole, in the direction of the through hole.
20 The afore-mentioned strengthening ribs are appropriately used to form this bearing surface.

The invention is described in detail hereafter with reference to the drawings, which show two advantageous embodiments:

25 **Figure 1** is a longitudinal section through a first lock construction before its use,

Figure 2 is a longitudinal section through the same lock construction in the closed state,

30 **Figure 3** is a longitudinal section through a second embodiment before its use,

(15)

Figure 4 is a view of this embodiment from the left-hand side in Figure 3,

Figure 5 is a view of this embodiment from the lower side in Figure 3 and

5 Figure 6 is a longitudinal section corresponding to Figure 3, in the closed state.

The lock body 1 of the embodiment according to Figures 1 and 2, to be envisaged having a square outer shape, comprises a flat through hole 2 of constant cross section, 10 which is the same as that of the band 3, which consists in one piece with the lock body 1 for example of polyamide. At right angles to the through hole 2, the lock body 1 contains a bore, whereof the lower section 4 has a somewhat narrower cross section than its upper section 15 5. In the lock prepared for use, the pin 6 is inserted with its head 7 fitting approximately in the bore section 4, so that it is held in position therein by its friction. The foot 8 of the pin 6 is stepped at 9 with respect to the head 7. In the direction at right angles to 20 the plane of the drawing, the pin is narrower than the band.

For use, the band 3 is wrapped around the object 10 to be bound; its end 11 is guided through the through hole 2; it is tensioned; then the pin 6 is inserted 25 in the lock body by a force acting in the direction of arrow 12. In this case the band 3 is deep drawn in the region 13 in the shape of a small cup around the head 7 of the pin 6, so that it encloses the head 7 of the pin 6 on five sides. The pin is pressed so 30 far into the lock body until its step 9 engages behind the step 14 of the lock body.

On account of the tension in the band 3 indicated by arrows, the pin 6 is drawn towards the left in Figure 2, so that the steps 9 and 14 come fully into engagement with each other. The greater the tension of the band, the more reliably the steps 9 and 14 are held in engagement. The securing forces are therefore always greater than those forces of the band 3 which act on the pin in the release direction (in opposition to the direction of arrow 12).

10 In Figures 3 to 6, which show the second embodiment, corresponding parts are provided with the same reference numerals as in Figures 1 and 2. The lock body 1 has an approximately square outer shape. Connected in one piece therewith, on its underside, on its edge facing the object 10 to be bound is the band 3, which is composed of two bead-shaped edges 20 and a thinner central part 21. The beaded edges 20 project in cross section on the side facing the object to be bound. On the lock body, laterally with respect to the through hole 2, they pass into strengthening ribs 22, which form the bearing surfaces 23, by which the lock body bears on the surface of the object 10 to be bound. The direction of these bearing surfaces 23 encloses an angle with the direction of the through hole 2, which angle is greater than 90° on the side of the band to be introduced into the through hole, so that the latter, as can be seen in Figure 6, is bent by less than 90° as it enters the through hole. It can also be seen that by virtue of these strengthening ribs, the tensile forces exerted on the lock body by the band 3 from its end connected in one piece to the lock are introduced not solely into that part of the lock body which lies below the through hole 2, but also into the part 24 located thereabove, which can

(17)

be strengthened by way of addition by a bead 25 in a manner resistant to bending, in order to be able to better withstand deformation under the tension of the end of the band entering the through hole 2. The bore is constructed to be concentrically cylindrical in its lower section 4 and upper section 5, whereas the upper section 5 has a larger diameter for receiving the deep-drawn region 13 of the band 3. The pin has a concentrically cylindrical shape over its entire length, its diameter being equal to that of the lower section 4 of the bore. In its central region, it comprises an annular projection 26, which at least on its lower side forms a locking edge or bearing surface 27 extending at right angles to the other surface of the pin. As shown, it is appropriately constructed in the same manner on its upper and its lower side, in order that the pin does not need to be orientated in a certain manner at the time of insertion in the bore. The annular projection 26 is constructed so that with elastic deformation of the pin and of the lock body, it can be driven in the direction of arrow 12 through the lower section 4 of the bore, until the bearing surface 27 lies above the opposing bearing surface 28 of the lock body in the through hole 2. This condition is shown in Figure 6. In conjunction with the bore section 4 and the bearing surface 28 defining it, the annular projection 26 with the bearing surface 27 forms a locking connection, which provides considerable resistance to a release movement of the pin in the opposite direction to that of arrow 12, which resistance can only be overcome by deformation of the pin and/or of the lock. In order to increase the resistance to deformation of the bearing surface 28, the latter is raised up slightly at an acute angle in opposition to the release direction of the pin 6, as shown in Figure 3, so that even when

(18)

even when it should have deformed in the release direction, it still always forms a right-angled step, as shown in Figure 2. Although the resistance to deformation is high, in cases of very high band tensions and correspondingly considerable lock body deformation, in some cases it could be inadequate for holding the pin 12 against the forces acting on it in the securing position according to Figure 6, if the effect were not added that the tensioned band pulls the pin towards the left in Figure 6, due to which on the side of the pin 6 facing the object 10 to be bound, the bearing surfaces 27 and 28 are held in reliable engagement, so that it is immaterial whether this engagement at other points is jeopardised by the action of excessive forces, the resilience of the material or the deformation of the lock body. The strengthening ribs 22 and the bead 25 as well as generally the stable construction of the lock body as regards deformation, on its side facing the object 10 to be bound thus cooperate to keep the engagement conditions of the bearing surfaces 27, 28 largely free from deformations, even under conditions of high stress so that the engagement of the bearing surfaces is not impaired by this.

The directional projection may be replaced by a plurality of projections, in which case as regards the number and arrangement of these projections, it must solely be ensured that at least one projection must be located in that peripheral region of the pin 6 which points towards the left in Figure 6 and in which the periphery of the pin is drawn by the tension of the band against the periphery of the bore.

According to the invention, the surface 23 of the ribs 22 bearing against the object 10 to be bound should

(19)

always pass into the surface of the beaded edges 20 of the band 3, as shown in Figure 3, in order to ensure uniform abutment against the object to be bound and thus to ensure a uniform transmission of force. This
5 may be necessary for example when the object to be bound is a flexible sleeve, which over its entire periphery is to be fitted in a tight manner to a connection. Consequently the band 3 is also prevented from being bent excessively in the region in which it passes in
10 one piece into the lock body 1, which could impair both the strength of the band as well as the mechanical properties of the lock body. For better abutment of the surface 23 including the adjoining parts of the edge bead 20, the latter may be curved in a concave
15 manner to correspond to the average curvature of the objects to be bound, as shown in Figure 3.

In order that the annular projection is not damaged when the pin is pressed into the lock body, the pin
6 may consist of more resistant material. If the lock
20 body consists of polyamide, the pin may consist for example of polyamide strengthened with fibreglass. The annular projection on its leading side and/or the inlet side of the bore may also be provided with a chamfer or bevel, in order to facilitate the elastic
25 deformation at the time when the pin is pressed in.