

This invention relates to a ratchet tie of the kind comprising a socket and an integral toothed band for interengagement therewith, said socket being provided with a bore for operative interconnection
5 with the remote end of the toothed band.

Binding members of this kind have been used to bind electric and other wires and lines, and are generally well-known. Such structures in which a band adapted to secure wires or lines,
10 and comprising a locking socket having a plurality of locking teeth through which the band is firmly inserted are disclosed or mentioned, for example, in the publications of Japanese Utility Model Publication Nos: 42869/1979, 6375/1976 and 24205/1972
15 laid open Nos: 5281/1978 and 115389/1974 and Japanese Patent Publication No: 12831/1976. These prior art binding members suffer from the disadvantage that the band is inclined with respect to the axial direction of a through hole in the socket and is
20 not smoothly insertable through the hole, so that a force in a direction other than axial of the band acts to strain the connecting parts of the locking teeth. The material may thus be deformed by fluctuations in environmental conditions, such as
25 the temperature and humidity experienced during

use of the tie over a long period. For example, a polyamide resin expands considerably with the rise of the humidity or temperature and with increasing adsorption of moisture. Locking of the tie device is thereby made imperfect and the engagement becomes less secure.

According to the knowledge obtained by making binding strength tests, in a conventional tie arrangement, when a high tensile strength is applied, the socket will deform, with resultant weakening of locking capability and binding effects.

The present invention has it as an object to provide a ratchet tie wherein the defects of the conventional tie assemblies are alleviated, and wherein the use of the device is smooth and positive, and interengagement is assured over long periods.

According to the present invention there is provided a ratchet tie comprising a socket and an being provided with a bore having an arcuate surface for operative interconnection with a corresponding surface upon the toothed band, said band being provided on another face thereof with a

plurality of ratchet teeth, said bore including a pivotally mounted ratchet adapted to ride over the ratchet teeth of the band during assembly, and to pivot to interlocking engagement thereafter, characterized in that an aperture is provided generally perpendicular to the bore, said aperture accommodating a projection forming part of the ratchet, whereby said projection becomes locked against a face of the aperture when the ratchet and the toothed band are fully interengaged.

The bore is preferably enlarged and profiled to provide a lead in to the tip of the band in use. The ratchet is mounted on one side of the bore, said aperture being sized such that said ratchet may pivot in a plane substantially perpendicular to the axis of the bore.

As the tie of the present invention is so configured as to prevent the socket from being laterally deformed, even if a strong fastening force is applied to it, interengagement will be positively made. Forces in a direction other than along the axis of the bore will have little effect on the connecting portions of the tie. The _____

meshing of the toothed band with the socket and of the rack of engaging teeth with the locking teeth will remain positive and, even if the binding is made for a long period, the socket will be little deformed and the engagement will be positively prevented from being released or loosened.

Following is a description by way of example only and with reference to the accompanying drawings of methods of carrying the invention into effect.

In the drawings:-

Figure 1 shows a preferred ratchet tie of the present invention, Figure 1A is a side view, Figure 1B is a plan view and Figure 1C is a bottom view.

Figure 2 is a magnified sectioned view of an essential part on line A-A in Figure 1B.

Figure 3 is a sectioned view on line B-B in Figure 1A.

Figure 4 is a perspective sketch showing the band just before being inserted.

Figure 5 is a sectioned view of the essential parts as they are interlocked, Figure 5A shows the band being inserted, Figure 5B shows it when locked in position and Figure 5C shows it being prevented from being released.

In Figures 1A to 1C, socket 1 and band 2 are integrally formed, the band 2 is formed with a convex or concave curved upper surface 3 and is provided with longitudinally extending ribs 5 at each edge of a lower band surface 4. A ratchet rack 6 of serrated engaging teeth is formed between the above-mentioned ribs 5. The band 2 terminates at its end remote from the socket 1 in a portion which gets gradually thinner, and is rounded at its tip. The tip is interconnectable to the socket 1.

The socket 1 has a locking member 8 formed integrally therewith through a connecting part 8a within a through bore 7. The locking member 8 has a plurality of ratchet teeth 9 and a projection 10 formed on the portion of the member 8 remote from the ratchet teeth 9. The locking member 8 is arranged within an aperture 11, generally at right-angles to the axial direction of the bore 7 through the socket 1.

The inner wall 12 of the bore 7, facing the locking member 8 in the socket, is arcuately formed to provide a suitable concave or convex curved surface for co-operation with the arcuate upper surface 3 of the band 2. A lead in portion 13

for the band 2 is formed in the wall of the socket opposite the end of the surface 12. The reverse faces 14 of the bore 7 extend in the axial direction and form channels for the accommodation of the ribs 5 of the band 2.

The socket 1 having a locking member 8 connected to it and the band 2 are integrally formed of a plastics material. The material to be used may be a polyamide, polypropylene or any other thermoplastic resin; a hard plastics material of high flexibility is preferred.

The socket 1 of the present invention can be made very small, and even when including the locking member is easy to mould, and to separate from the mould.

The aperture 11 is disposed perpendicular to the bore 7 and communicates therewith; and is provided with engagement surface 15.

In operation, when the band 2 is wound about a bundle of wires, for example, and inserted through the bore 7 of the socket 1, the ribs 5 of the band will be guided by a lead in 13 to ensure smooth axial insertion thereinto. The ratchet teeth 9 mesh with the teeth of rack 6 by the arcuate locking movement of the locking member 8 and its connecting part 8A.

As the band 2 is inserted it is guided by the lead in 13 in the side wall of the socket 1 so as to advance in an axial direction along the arcuate surface wall 12. Hence, a force in a direction different from the above-mentioned axial direction will have little effect on the assembly. Thus, no force other than that acting on the socket as in Figure 5A will have a significant effect; projection 10 acts to reinforce the locking action of the ratchet teeth in use.

When the band 2 is interlocked with the socket 1 as in Figure 5B, even if a force acts in the disengaging direction, as shown in Figure 5C, the projection 10 of the locking member will be prevented by the opposed wall surface 15 from being rotated. The surfaces of the locking teeth 9 will tend to move slightly out of the perpendicular to the axis of the bore 7, and the locking member 8 will be subjected to a force by which it is pushed toward the arcuate wall surface 12. Forces other than in the axial direction will have little effect on the connecting part 8A of the locking member and therefore the interengagement will be kept positive.

Specifically as the projection 10 of the locking member 8 contacts the opposed wall surface 15 of the aperture 11 provided at right angles to the axial direction of the bore 7 in the socket 1, the band will be positively prevented from disengagement.

Further, even if the side wall of the socket 1 is deformed, the ribs 5 have tapered end surfaces and the arcuate curved surface 3 of the band together with the arcuate inner wall 12 and lead in 13 of the bore 7 will always keep the teeth of the rack 6 and the ratchet teeth 9 within the socket in a fixed inter-relation and therefore, even if there are fluctuations of temperature and humidity over long periods the assembly will not separate or loosen and will be kept in a desired inter-engagement.

Further, because of the fastening force applied on the assembly, the curved surface of the band 2 will tend to deform to a nearly flat surface. Thus, the force tending to return the deformed band to its original form will prevent the problem of "slip" from the bound articles.

Thus, the ratchet tie according to the present invention can smoothly and positively lock bundles

- 1 of wires or other elongate articles, and is
- 2 adapted particularly to be used for a long
- 3 period.



CLAIMS:

1. A ratchet tie comprising a socket and an integral toothed band for interengagement therewith, said socket being provided with a bore having an arcuate surface for operative interconnection with a corresponding surface upon the toothed band, said band being provided on another face thereof with a plurality of ratchet teeth, said bore including a pivotally mounted ratchet adapted to ride over the ratchet teeth of the band during assembly, and to pivot to interlocking engagement thereafter, characterized in that an aperture is provided generally perpendicular to the bore,
10 said aperture accommodating a projection forming part of the ratchet, whereby said projection becomes locked against a face of the aperture when the ratchet and the toothed band are fully interengaged.
2. A tie according to claim 1 wherein the bore is enlarged
15 and profiled to provide a lead in to the tip of the band.
3. A tie according to either of claims 1 or 2 wherein the ratchet is mounted on one side of the bore, said aperture being sized such that said ratchet may pivot in a plane sub-
20 stantially perpendicular to the axis of the bore.



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4. A tie according to claim 3 wherein a portion of the bore opposed to the ratchet has an arcuate face.
 5. A tie according to any preceding claim wherein a remote end of the projection is accessible for movement to disengage the ratchet from the band.
 6. A tie according to any preceding claim wherein the surface
10 of the band remote from the teeth has an arcuate profile.
 7. A tie according to any preceding claim wherein the longitudinal edges of the band each terminate in a rib to support the teeth.
 - 15 8. A tie according to claim 7 wherein the bore is profiled to receive the ribs.
 9. A ratchet tie substantially as hereinbefore set forth
20 with reference to and/or as illustrated in Figures 1 to 5 of the accompanying drawings.
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