Feb. 13, 1934. W. GUNTERMANN ET AL 1,947,392

HOLLOW ROD

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Fig.1

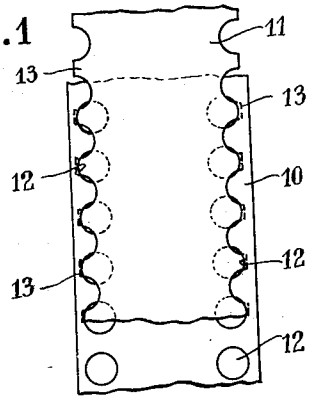


Fig.2

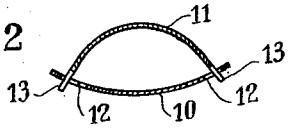


Fig.3

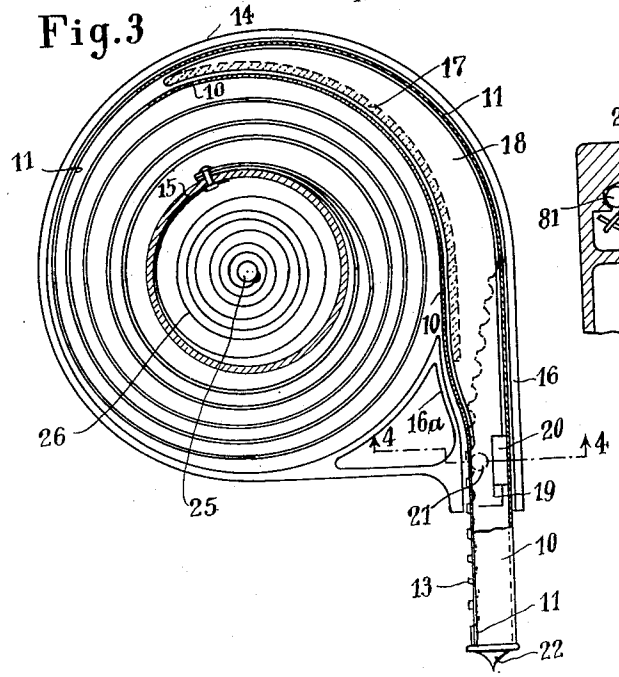
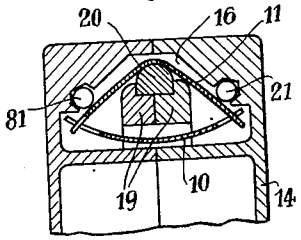


Fig.4



Inventors:
Wilhelm Guntermann et al
Karl Stoll.
by Thomas Ackerman Atty

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Fig. 5

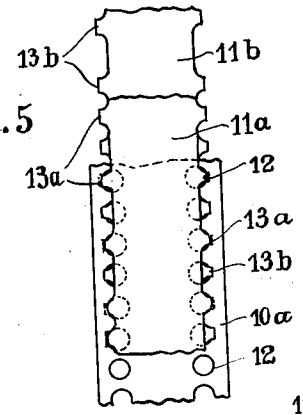


Fig. 6

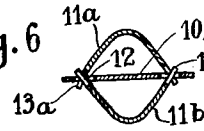


Fig. 8

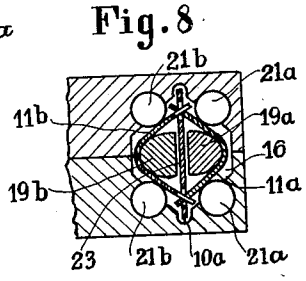
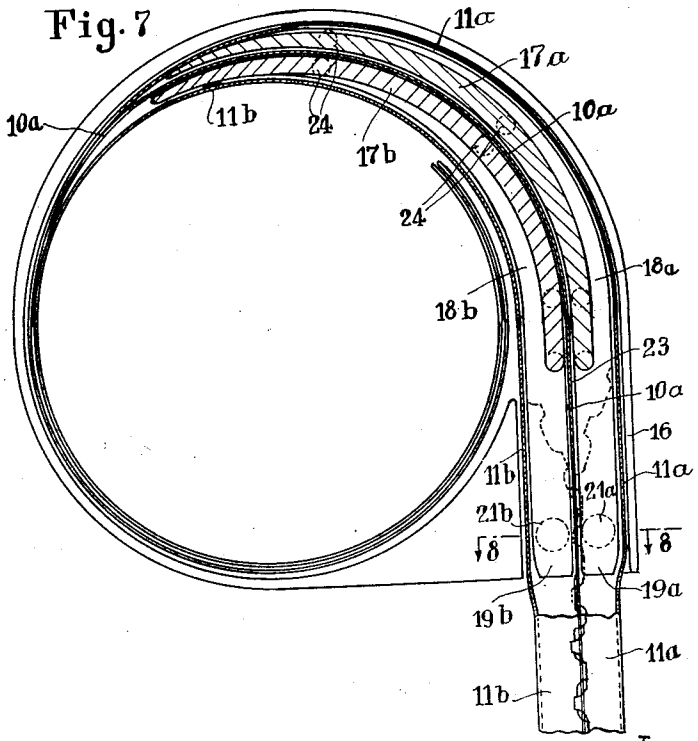


Fig. 7



Inventors:
Wilhelm Guntermann
Karl Stoll
by Marks & Andersen Attys

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UNITED STATES PATENT OFFICE

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HOLLOW ROD

Wilhelm Guntermann and Karl Stoll,
Berlin, Germany

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12 Claims. (Cl. 248—30)

The object of the present invention consists in the task of producing a hollow rod being composed of at least two metal bands disengageably coupled with each other along their longitudinal edges, at the same time being at least partly curved in cross section, the bands of said hollow rod being adapted to be jointly wound up in a flat state after their disengagement. Hollow rods of this description may be utilized for the most different purposes, e. g. as rules, shanks of tripod stands, longitudinal frames for folding boats, tent poles, top bars, supporting arms for lamps and, generally speaking, as carrying or supporting rods in all such cases, where it is of importance to reduce the volume of a stiff rod, when not in use, for the purpose of saving space.

It has already been attempted to produce such a hollow rod adapted to be rolled up, but up to the present the attempts undertaken in this direction have not furnished any serviceable results.

In accordance with the present invention the problem involved has been solved in a simple and successful manner, not only in regard to the constructon of the metal bands provided with coupling members, but also in regard to the design of the inlet- and exit-guide for the bands provided in the winding-up casing, through the medium of which guide the bands are coupled. The essential feature of the present invention consists, in the first instance, in the disposition of coupling members which, at least when winding or rolling up the bands, are situated in the plane of the band. Preferably these coupling members are made to consist of teeth provided at the edges of one of the bands and situated in the plane of the band, and holes or perforations provided in the vicinity of the edges of the other band, in which said teeth are made to engage. A further, essential feature is embodied therein, that in the inlet- and exit-opening of the winding-up casing the free end of a pin is made to project, on the opposite sides of which the two bands are guided, in connection with which at that part of the opening, guiding the serrated band, areas of pressure are disposed on either side of the longitudinal central line of this band, bending thereby the serrated band in cross section round the pin pressing against the longitudinal central line of the band by means of an area of counter pressure.

In accordance with the present invention the hollow rod may be made to consist of three, instead of two bands, i. e. of a central hole band and two lateral serrated bands bent in cross section when being coupled with the hole band, the teeth of said bands being staggered in the longitudinal direction of the bands and made to alternately mesh from opposite sides with successive holes provided in the flat band. In this case, the pin, projecting into the inlet- and outlet opening of the winding-up case, is split in a longitudinal direction and the serrated bands are guided on opposite sides of the pin, whereas the hole band is made to pass between the two halves of said pin, each serrated band being bent round one half of the pin by means of two areas of pressure provided at the wall of the opening.

In the accompanying drawings two examples of performance of the object of the present invention have been represented, in which

Fig. 1 represents an elevation of a section of the hollow rod, whilst

Fig. 2 represents a cross section apertaining thereto.

Fig. 3 is a longitudinal section through the winding-up casing, in connection with which a part of the hollow rod has been drawn out of the opening of the casing, whereas the bands made to compose the hollow rod are, however, wound up.

Fig. 4 is a section through the outlet-opening of the casing along the line 4—4 of Fig. 3, whilst

Fig. 5 is an elevation of a hollow rod in accordance with the second example of performance,

Fig. 6 representing a cross section appertaining thereto.

Fig. 7 illustrates a longitudinal section through the winding-up casing, and

Fig. 8 a section through the inlet and outlet opening of same along the line 8—8 of Fig. 7.

In the example of performance in accordance with Figs. 1–4, the hollow rod is made to consist of two elastic bands i. e. preferably of steel bands 10 and 11, adapted to be wound up in a flat state. The one of these two bands, viz. the band 10 has been provided with a row of holes 12 in the vicinity of its edges, said holes being suitably of such shape, that they slightly taper in an outward direction. For this purpose the holes may be given the shape of a trapeze or of a semi-circle. It is, however, advisable, to cause them to be of circular shape, as this has been shown in the example of performance. The hole band 10 may be made to be perfectly flat; it is, however, advantageous to be of such shape, that it automatically bends or curves on being stretched in consequence of its own elasticity, assuming, on the other hand, a flat shape on being wound up. The other band

11 is serrated on either of its longitudinal edges, in connection with which the tooth division agrees with the hole division of the band. The flanks of the teeth 13 are advantageously slightly inclined towards each other in an outward direction. For this reason they could be given the shape of a trapeze. It is, however, of advantage, to cause their flanks to be curved, whilst the gaps between the teeth are formed by means of semi-circular notches of the edges of the band. The serrated band 11 is of such nature, that it possesses normally a flat shape, allowing, however, to be bent in cross section in opposition to its elasticity. For the purpose of coupling the two bands with each other, the serrated band 11 is positively bent in cross section to such an extent, that its teeth are opposite the holes 12 of the band 10, being subsequently caused to engaged with its teeth 13 the holes 12 of the band 10. Owing to its elasticity the serrated band 11 will, thereafter, be slightly stretched again causing the teeth 13 to be firmly pressed into the holes 12. Owing to the fact that the teeth 13 are slightly enlarged towards their base, whereas the holes 12 are tapering in an outward direction, it will be attained that the teeth are securely held fast in the holes. In order to render it possible to wind up the bands, the serrated band 11 is again bent to a slightly greater extent and released from the holes of the band 10, whereupon it wholly stretches in cross section. The hole band 10, however, retains its bent or curved shape in the first instance, but will be pressed flat on being wound up in opposition to its elasticity.

For the purpose of winding up the bands 10, 11 a box-shaped casing 14 is made use of, containing a winding-up spool 15 adapted to be rotated round its axle 25. The casing 14 is provided with an outlet opening having the shape of a short socket 16, whose axis is approximately tangential to the jacket of the casing. On being withdrawn from the casing, the bands 10, 11 are automatically coupled in said short socket, being also automatically disengaged when pushed back into the casing. For this purpose the under-mentioned arrangement has been provided. The casing 14 contains, near the socket 16, a partition 17 which, in order to adapt same to the jacket of the casing, is curved so as to resemble a sector. This partition is provided on its outside with a roll-shaped enlargement 18 extending towards the socket 16 beyond the end of the partition, where its free end is shaped to form a pin 19 which projects into the socket. The two bands 10, 11, being jointly wound up on the spool 15 are, on leaving the casing 14 (and, of course, also on returning into same) guided on opposite sides of the partition 17 and of the pin 19 supported by the former and that in such a manner, that the serrated band 11 is situated on the outside, the hole band 10, on the other hand, on the inside of partition and pin. Near its free end the pin 19 carries on its outside a pressure piece 20 resting on the longitudinal central line of the serrated band 11. On the other hand, the outer half of the wall of the socket 16, guiding the serrated band is provided, on opposite sides of the longitudinal central line of the serrated band, with two pressure pieces 21, consisting advantageously of roller bodies, e. g. balls, as shown, or also rollers. The balls 21 exert, on the bands 10, 11, being withdrawn from the socket 16, an outward pressure on the lateral parts of the serrated band 11, whilst simultaneously the pin 19, with its pressure piece 20 exerts an inward pressure on the middle of the band 11, causing this band to be bent in cross section round the pin 19. At the same time the wall 16*a* of the socket 16, constituting a curved guiding surface, guides from the other side the hole band 10 towards the serrated edges of the band 11, with the result that the teeth 13 are made to engage the holes 12, whereby both bands are thus coupled with each other. On leaving the socket 16 the hole band bends or curves in cross section, whereas the serrated band 11 exhibits the tendency to stretch itself in cross section, resulting in the clamping of the teeth in the holes in consequence thereof, as described above. For the purpose of being able to easily withdraw the bands from the casing, they are firmly connected with each other at their extreme ends, e. g. by means of a head piece 22 which, at the same time, prevents the bands from being pulled completely into the casing. When pushing back the bands into the casing 14 the effect is reversed. The teeth 13 of the band 11 are released from the holes 12 of the band 10, whereupon the band 11 stretches itself again in cross section, whereas the band 10, in opposition to its elasticity, is made to assume a flat form again. The bands 10, 11 will then be wound up on the spool 15. For this purpose the spool 15 rests under the action of a spiral or clock spring 26, disposed within the interior of the spool 15 and attached to the rigid axle 25, said spring developing the tendency to rotate said axle in the winding-up direction. On drawing out the bands 10, 11, this spring 26 will be stretched, but on its own accord it will not be able to draw the bands into the casing and it will be necessary to push the bands into the casing.

For the purpose of simplifying the manufacturing process, the casing 14 and the socket 16 appertaining thereto have been split in the longitudinal central plane, so that the casing consists, so to speak, of two shells being so composed that their edges meet. The partition 17 with the pin 19 attached thereto may, in connection therewith, be split in the same plane, so that their one half is attached to one casing front-wall and the other half to the other casing front wall.

In the example acording to Figs. 5 to 8 the hollow rod is made to consist of three bands, viz. a permanently flat central band 10*a* which, similarly to the band 10 in Fig. 1-4 has been provided with two rows of again circular holes 12, and two edges 11*a*, 11*b*, which are arranged so as to resemble the band 11 as shown in Figs. 1 to 4 and are provided with two rows of teeth 13 along their longitudinal edges. The spacing of teeth 13 along the two edges is, however, double that of the holes in band 10*a*, and the teeth of the two bands are staggered against each other in the longitudinal direction by half a tooth divsion or, what amounts to the same thing, by a hole division of the band 10. For the purpose of coupling the three bands with each other, the teeth bands or serrated bands 11*a*, 11*b* are bent or curved in cross section in oppositon to their elasticity, their teeth 13 being caused from the opposite sides to mesh with the holes 12 of the band 10*a* in connection with which the teeth of the two bands 11*a*, 11*b*, owing to their staggered disposition, are made to alternately engage the successive holes 12 of the band 10*a*. In consequence of the tendency of the bands 11*a*, 11*b* to resume their original flat shape, the teeth 13*a*, 13*b* will be clamped again in the holes 12.

The winding-up casing 14, (Figs. 7 and 8) intended for the reception of the three bands 11*a*, 10*a*, 11*b* of this rod, corresponds generally to that

intended for the reception of two bands of the rod in accordance with the first example of performance; it is, like the latter, provided with a winding-up spool fitted with spiral spring which, however, has been omitted in Fig. 7 for the sake of simplicity. The casing 14 in accordance with Figs. 7 and 8 are distinguished from the first example by the fact, that in the vicinity of the inlet and outlet socket 16 for the bands two parallel partitions 17*a*, 17*b* have been disposed, being provided on their sides turned away from each other each with one roll 18*a*, 18*b* which, in the form of a pin 19*a*, 19*b* freely project, beyond the walls 17*a*, 17*b*, into the outlet opening. The pin, 19*a*, 19*b*, formed by these extensions, is split transversely to the longitudinal central plane of the casing 14 and a slot 23 is left between the halves of this pin and between the partitions 17*a* and 17*b*. The intermediate hole band 10*a* is made to pass through this slot, whereas the two serrated bands 11*a* and 11*b* are guided on opposite sides of the pin 19*a*, 19*b*, each between one half of the pin and one half of the socket wall. Each half of the pin 19*a* and 19*b* and with it, each serrated band is associated with two pressure members 21*a* and 21*b* provided at the wall of the socket, said pressure members, being positioned on opposite sides of the central line of the band 11*a* or 11*b* appertaining thereto, causing the latter, on being withdrawn from the casing to be bent round the pin-half 19*a* or 19*b* in cross section, pressing from the inside against the central line of the band. It will thus be obvious that, on withdrawing the three bands, both serrated bands 11*a* and 11*b* will be bent in cross section, their teeth 13*a*, 13*b* being caused to engage the holes 12 of the intermediate band 10*a* maintaining its flat shape, whereupon the three bands, coupled together, leave the socket 16. When the bands are drawn back again into the casing, the effect, produced thereby, will be reversed. The bands, 10*a*, 11*a*, 11*b* will be released from each other and wound up in a flat state. The casing and the socket 16 connected therewith are again split in the longitudinal central plane of the casing. In this instance, however, the partitions 17*a*, 17*b* together with the socket-halves 19*a*, 19*b* attached thereto, form parts which are separated from the casing 14 and which are held in position by the fact, that the partitions 17*a*, 17*b* are made to engage holes in the front wall of the casing 14 by means of pinions 24.

It is obvious, that the new hollow rod, adapted to be wound or rolled up, as well as the arrangement provided at the winding-up casing for the automatic engagement and disengagement of the bands, are distinguished by an exceptional simplicity and appropriateness. By means of the solution of the problem a really useful hollow rod, formed of two or three bands coupled with each other, has been produced for the first time, the latter allowing to be wound up in a flat state and closely together. The disposition of a hole band 10 chosen in conjunction with the existence of only two bands (Figs. 1 to 4), which automatically bends in cross section on being stretched, and that oppositely to the bending of the serrated band 11, possesses the advantage, that also the rod consisting of two bands, is perfectly straight. This will particularly be instrumental in obviating the risk that the rod bends because, when winding up the bands, a stretching of the external and a shortening of the inner rolled fibres takes place.

If required, the serrated band 11 or 11*a*, or the serrated bands 11 or 11*a*, 11*b* may resemble the hole band 10 in that their design permits them to bend in cross section owing to their own elasticity. The radius of this natural curvature is, however, greater, than the radius of curvature in connection with coupled bands. This design of the serrated bands possesses the advantage, that for the coupling of the bands with each other only an additional bending or curving of the serrated bands is required, causing the expenditure of force, necessitated by the positive bending, to be reduced.

We claim:

1. A hollow rod consisting of strips of resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, another of said strips having cooperatingly spaced teeth projecting from its edges and coplanar with the adjacent portions of said strip, said last strip being transversely bent and the teeth thereon being inserted in said openings and holding the last strip in transversely bent condition.

2. A hollow rod consisting of strips of resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, another of said strips having cooperatingly spaced teeth projecting from its edges and coplanar with the adjacent portions of said strip, said last strip being transversely bent and the teeth thereon being inserted in said openings and holding the last strip in transversely bent condition, said teeth having their flanks curved outwardly from their points to their roots whereby to fit said openings in a wedge-like manner.

3. A hollow rod consisting of a pair of strips of resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, the other of said strips having spaced teeth projecting from its edges coplanar with the adjacent portions of said strip with the spacing of the teeth equal to the spacing of said openings, said last strip being transversely bent and the teeth thereon being inserted in said openings and holding said last strip in transversely bent condition.

4. A hollow rod consisting of a pair of strips of resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, the other of said strips having spaced teeth projecting from its edges coplanar with the adjacent portions of said strip with the spacing of the teeth equal to the spacing of said openings, said last strip being transversely bent and the teeth thereon being inserted in said openings and holding said last strip in transversely bent condition, said teeth having their flanks curved outwardly from their points to their roots whereby to fit said openings in a wedge-like manner.

5. A hollow rod consisting of three strips of resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, the remaining strips having spaced teeth projecting from their edges coplanar to the portions of the strip adjacent thereto with the spacing of the teeth double the spacing of said openings, said remaining strips being transversely bent and having the teeth thereon inserted in said openings with the teeth of one strip alternating with the teeth of the other strip, said remaining strips being held by engagement of the teeth in the openings in transversely bent condition.

6. A hollow rod consisting of three strips of

resilient metal, one of said strips having openings along each edge spaced longitudinally of the strip, the remaining strips having spaced teeth projecting from their edges coplanar to the portions of the strip adjacent thereto with the spacing of the teeth double the spacing of said openings, said remaining strips being transversely bent and having the teeth thereon inserted in said openings with the teeth of one strip alternating with the teeth of the other strip, said remaining strips being held by engagement of the teeth in the openings in transversely bent condition, said teeth having their flanks curved outwardly from their points to their roots whereby to fit said openings in a wedge-like manner.

7. A winding reel combined with the strips of claim 1, including means for connecting and disconnecting the strips as they are unwound and wound comprising a nozzle having one wall merging gradually from transversely flat to transversely trough shape with the sides of the trough flaring, a guide in said nozzle carrying a pin extending longitudinally of the trough, the sides of the trough and pin effecting transverse bending of the tooth provided strip, and guide means in said nozzle for the hole provided strip, said guide means and trough shaped side receding from each other from the mouth of the nozzle inwardly.

8. A winding reel combined with the strips of claim 3, including means for connecting and disconnecting the strips as they are unwound and wound comprising a nozzle having one wall merging gradually from transversely flat to transversely trough shape with the sides of the trough flaring, a guide in said nozzle carrying a pin extending longitudinally of the trough, the sides of the trough and pin effecting transverse bending of the tooth provided strip, the remaining side of the nozzle being longitudinally curved toward said pin from the inner end of the nozzle to cause the hole provided strip to approach the toothed strip as the latter is transversely bent.

9. A winding reel combined with the strips of claim 5, including means for connecting and disconnecting the strips as they are unwound and wound comprising a nozzle having opposed walls merging gradually from transversely flat to transversely trough shapes with the sides of the guides flaring, a slotted guide terminating in a slotted pin and located intermediate said trough shaped sides, said guide and pin forming means to guide the opening provided strip and the guide and nozzle sides forming cooperating means to bend the toothed strips transversely to engage the teeth in the openings as the strips are unwound and to disengage the strips as they are wound.

10. A hollow rod consisting of strips of resilient metal having coacting interlocking and disengageable elements at their edges, the said elements of each strip being coplanar with the strip whereby when the elements are disengaged the strips may lie flat on each other, one of said strips being transversely bent upon engagement of said elements.

11. A winding reel combined with the strips of claim 1, including means for connecting and disconnecting the strips as they are unwound and wound comprising a nozzle having guide means for the opening-provided strip, and a pin supported substantially parallel thereto, said nozzle having its sides spaced from the pin and forming pressure means for transversely flexing the toothed strip around the pin to cause engagement of the teeth in the openings.

12. A winding reel combined with the strips of claim 1, including means for connecting and disconnecting the strips as they are unwound and wound comprising a nozzle having guide means for the opening-provided strip, a pin supported substantially parallel thereto, said nozzle having its sides spaced from the pin and forming pressure means for transversely flexing the toothed strip around the pin to cause engagement of the teeth in the openings, and anti-friction bearings with which the toothed strip engages supported by the sides of the nozzle.

WILHELM GUNTERMANN.
KARL STOLL.