COUPLING FOR CANVAS TUBING

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This invention relates to means for coupling together sections of flexible collapsible tubing usually made of canvas and commonly used for conducting air or gases from one point to another as in ventilation of mines; the present invention being an improvement upon the coupling disclosed in my U. S. Letters Patent No. 1,440,514 dated January 2, 1923, and upon the coupling shown in my U. S. Letters Patent No. 2,003,732 dated June 4, 1938.

The principal object of the present invention is to provide a novel coupling member following the general structure shown in my Patent No. 2,003,732 but modified so that the split ring members will maintain a greater area of the fold or cuff in the tube section in firm contact with the annular groove in the annulus.

Another object is to provide novel split rings each having means adjacent the split to facilitate the operations of coupling and uncoupling the tube sections to the annulus. Former types of split rings necessitated the use of both hands in contracting the rings when inserting same in the tubing or annulus, for the reason that no handles were provided thereon which could be gripped in one hand, and thus the other hand was not free to hold the cuff or annulus, and therefore it was a difficult matter to insert such split rings into the internal grooves of the annulus. Split rings have a natural tendency to expand, and no convenient means were provided for holding the ring in contracted position when the ring member was being inserted into the cuff of the tube or groove of the annulus. However, when using my novel split rings provided with handles adjacent the split, all that is necessary is to fold the exterior cuff on the tubing and then contract the split ring with one hand, gripping the handles provided for such purpose, and insert the contracted ring into the cuff and then insert the cuff into the internal groove in the annulus with the one hand still gripping the handles, the other hand being free to hold the annulus steady while the tubing is being thus coupled. In the preferred form of split ring the ends of the ring adjacent the split are bent backwardly upon themselves and the outer portions then bent outwardly at a suitable angle to form projecting handles which can be readily gripped with one hand to contract and hold the ring in contracted condition for insertion between the folded cuff and body of the tubing section, and for subsequent insertion into the groove of the annulus, whereupon by simply releasing the grip of the hands, the split ring is allowed to expand, completing the coupling operation. Since there are no blunt ends to catch in the tubing material this type of split ring may readily be rotated in either direction in the cuff of the tubing. In another form of split ring, the handles are attached to the ends of the tube adjacent the split; but in both forms the handles are bent at a slight angle to each other when the ring is expanded to provide for proper gripping, and are also bent substantially at right angles to the plane of the ring so that the handles will lie substantially parallel with the outside walls of the tubing but without touching the inflated body thereof, although lying within the cuff of the tubing section.

A still further object is to provide a locking member which can be slipped over the handles to hold the split ring in expanded condition, this member being particularly useful where split rings having very little or no expanding resiliency are used.

Other minor objects of the invention will be hereinafter set forth.

I will explain the invention with reference to the accompanying drawing which illustrates several practical embodiments thereof; and will refer to the claims for summaries of the essentials of the invention, the novel features of construction, and novel combinations of parts, for which protection is desired.

As shown in Fig. 1 is a side elevation of a length of ventilating tubing formed of a plurality of tube sections of flexible material connected together by my novel annular couplings which are shown suspended from a cable.

Fig. 2 is an enlarged longitudinal section through a coupling showing the adjacent parts of the tubing, and showing the position of a handle of the split ring in the cuff of the tubing.

Fig. 3 is a plan view of one form of split ring, expanded.

Fig. 4 is a view of the ring shown in Fig. 3, contracted.

Fig. 5 is a plan view of a modified form of split ring, expanded, with a locking member applied to the handles.

The coupling shown in Figs. 1 and 2, comprises an annulus formed of inner and outer annular members A and A', of corresponding cross-section, said members being made of any suitable material, preferably sheet metal rolled into desired split annular shape, having their ends over-lapping and united in any suitable manner such as by solder or rivets. The inner member A is provided with lateral flanges A2 which are bent...
backwardly over the edges of the outer member A', and the members A—A2 secured together to form a rigid unitary structure.

The annulus A—A' is of interior diameter equal to or slightly greater than the exterior diameter of the sections D of the flexible tubing which are to be connected together. The annulus A—A' is provided with a pair of interior parallel annular grooves A3—A3 adjacent its side edges for Reception of split rings B of circular cross-section of substantial radius, each ring being adapted to be inserted in loose exterior cuffs C, C, at the ends of the sections D of tubing, which cuffs are formed merely by exteriorly folding back over the body of the tubing a portion of its length, and the cuff when unseen. The split rings B—B are placed in the cuffs C—C and the rings contracted and slipped into opposite ends of the annulus A—A', and the rings permitted to expand thereby seating in the grooves A5—A3 and connecting two sections D of tubing to the annulus A—A'. The coupled sections may then be used in a vertical, horizontal or inclined position, and for this purpose the couplings are preferably provided with eyelets E or other means for engagement with hooks F or other suitable devices by which the coupled sections may be fastened or supported upon a wire or cable G or the like as shown in Fig. 1.

The annulus A—A' (Figs. 1 and 2) has a central portion formed by a pair of opposed substantially conical surfaces A4—A4 which the rings B—B (within the cuffs C—C) engage when expanding. Rounded portions A5—A5 are provided at the outer edges of the conical portions A4—A4 at the outer side walls A5—A6 of the grooves A3—A3 continuing substantially normal to the axis of tubing D. By the above construction the split rings B—B when expanding in the grooves A3—A3 will be forced laterally outwardly of the annulus A—A' until they contact with the outer walls A5—A6 thereof.

In my aforesaid Patent No. 2,003,732 the inner and outer walls of the grooves were connected by acutely bent portions, the radius of the bends being much less than the radius of the split rings, and thus the rings (in the cuff or fold of the tubing) made only a two-point contact with the walls of the groove. In the present embodiment the apexes of the grooves A5—A3 are rounded on a radius slightly greater than the cross-sectional radius of the split rings B—B (by an amount equal or substantially equal to the thickness of the material of the tubing) so that the rings B—B will hold a relatively wide area of the tubing tightly against the walls of the grooves A3—A3, the width of the area being equal to substantially half of the cross-sectional circumference of the rings. In my aforesaid Patent No. 1,440,814, while the grooves were substantially semi-circular in cross-section, said grooves permitted a great amount of lateral movement of the rings therein if the rings were of smaller diameter than the grooves, and such lateral movement would cause leakage of air due to the fact that the rings (and cuffs of the tubing) were not held with sufficient bearing surface against the outer walls of the grooves; but in my present embodiment, the apexes of the grooves A3—A3 provides a combination of relatively great contact surface with means for positively causing the expanding rings B—B within the cuff C of the tubing to slide automatically into place against the outer walls of the grooves, thereby effecting elimination of any possible lateral movement of the split rings in the grooves as the rings are always seated at the apexes of the grooves.

Moreover, the contact of the tubing material with the grooves is substantially along the wall A6 to the innermost point of contact of ring B with inner wall A4 of the groove thus making an effectual alight joint; also since the outer portion of cuff C is bent or folded at right angles over the wall A6, although the cuff is not stitched to the tubing, the cuff is effectively frictionally gripped or clamped between the end of walls A6 and the inflated body of the tubing section D, and this frictional grip together with the ample bearing surface of the cuff along the wall A6 to and under the innermost point of contact of ring B with the inner wall A4 of the groove, is amply sufficient to maintain the tubing intact without stitching or other securing means.

Figs. 3 and 4 disclose one form of my novel expandable split ring member B in which the ends of the ring adjacent the split are bent back upon themselves as at B1 and spaced from the body of ring B a distance substantially equal to the width of wall A6, said ends B1 being further bent as at B2 at substantially right angles to the plane of the ring B so as to form laterally extending handles by which the rings can be gripped in one hand of the operator and contracted from the size shown in Fig. 3 to a size which will enter the end of the annulus A—A'.

The handles B2 thus facilitate easy coupling and uncoupling of the tubing sections D with the annulus, as the handles can be readily gripped with one hand, and inserted into the tubing and then while held in a contracted position the ring may be inserted underneath the folded cuff C of the tubing and the ring and tubing then inserted into the annulus and the rings being substantially normal to each other and in contracted position into the annulus A—A'; then by simply releasing the grip on the handles B2 the rings is allowed to expand and the coupling operation completed: and when the ring is expanded within the annulus the bends B' will substantially contact, but not overlap, and the ring will make a tight joint between the cuff and annulus. When using former types of split rings it is impossible to hold the rings in contracted position with one hand, permitting use of the other hand for holding the annulus or cuff, since the rings naturally tend to expand, but when using my novel split rings all that is necessary is to fold the exterior cuff C on the end of tubing section D and then contract the ring using one hand gripping handles B2, and then insert the contracted ring into the cuff C, and then insert the ring and cuff into the annulus while the handles are gripped with the one hand, the other hand being free to hold the cuff or the annulus while the ring is being inserted.

Moreover it is possible to rotate the split rings in the cuffs of the tubing sections in either direction as the spring members are held in contracted position and the tubing ends to catch in the material of the tubing sections. Rotation of the rings in the cuffs is not possible where the ends of the split rings are merely cut bluntly or sharply. My rings may thus be rotated to bring the splits into alignment with the tubing. A3—A3 provides a combination of relatively great contact surface with means for positively causing the expanding rings B—B within the cuff C of the tubing to slide automatically into place against the outer walls of the grooves, thereby effecting elimination of any possible lateral movement of the split rings.
angle to each other to provide for proper gripping when contracting the rings; also that the projecting handles B2 are bent slightly away from the body of the tubing section D so that the projecting ends are about opposite the end of wall A6 of the annulus. This is done so that the ends of the handles B2 will not touch the inflated tubing sections D, although same may contact with the cuff of the tubing section if the cuff is of sufficient length.

Fig. 5 shows another form of split ring in which the handles B2 are separately formed and secured by spot welding or the like to the ring B adjacent the split. The inner ends of handles B2 have offset portions B3 which are attached to the ring B, the offset portions being of length substantially equal to the width of wall A5. The angularity of the handles to each other and to the plane of the ring is the same as that previously described with respect to the rings shown in Figs. 3 and 4. This figure merely illustrates a different way of making a split ring with two handles. In this modification the ends of the split in the ring are blunt or may be beveled, but it is not easy to rotate the ring in the cuff of the tubing since the ends will grab the material. Thus the ring shown in Figs. 3 and 4 is the preferable form since in these figures the ends cannot grab or dig into the tubing material.

Figs. 2 and 5 also show a locking member P with holes P' drilled in its ends, which member can be slipped onto the handles B2 to hold the split rings B in expanded position within the annulus A—A'. This locking member would only be necessary when a ring is used that has very little resiliency, and the locking member may be readily inserted on the handles while in the cuff. The handles B2, being bent at a slight angle towards each other, would have a certain tendency to hold the ring in fully expanded position if the handles also contacted with the wall A6 of the annulus. Locking member P can be used on either type of ring shown, and its position in cuff C is indicated in dotted lines in Fig. 2.

To disconnect or uncouple a tubing section, all that is required is to contract the split ring using handles B2 until the ring and cuff can be drawn out of the groove in the annulus.

I claim:

1. A coupling for flexible tube sections comprising an annulus provided with interior circumferential parallel grooves of substantial V-shaped cross-section; and expandable split rings adapted to conform with the internal diameter of the annulus inserted within exterior cuffs formed at the ends of flexible tube sections and respectively wedged in the grooves in the annulus; and handle means for facilitating contraction of the rings.

2. In a coupling as set forth in claim 1, said means extending between the cuffs and the bodies of the tubing sections.

3. In a coupling as set forth in claim 1, said contracting means comprising handles on the ring at opposite sides of the split inset inwardly of the ring sufficiently to avoid contact with the annulus.

4. In a coupling as set forth in claim 1, said contracting means comprising handles on each ring at opposite sides of the split inset inwardly of the ring sufficiently to avoid contact with the annulus, the outer portions of said handles extending substantially at right angles to the plane of the ring and lying between the cuff and body of the tube section.

5. A coupling for flexible tube sections comprising an annulus provided with interior circumferential parallel grooves of substantial V-shaped cross-section; and expandable split rings adapted to conform with the internal diameter of the annulus inserted within exterior cuffs formed at the ends of flexible tube sections and respectively wedged in the grooves in the annulus; handle means for facilitating contraction of the rings; and a perforated bar adapted to engage said handle means for positively holding the rings in expanded position.

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