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SPACER FOR CABLE-LIKE MEMBERS
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Fig. 1

Fig. 3

Fig. 4

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This invention relates to a spacer for cable-like members and more particularly to such a spacer which shall be adapted to hold cable-like members in predetermined lateral positions relative to each other.

A more specific object of my invention is to provide a spacer of the character designated which shall include a plurality of resilient arms having the ends thereof facing each other and operatively connected to each other by connector members to define a closed figure having cooperating clamping jaws at corners thereof and outwardly of the connector members, the resiliency of the arms being adapted to urge intermediate portions of the arms away from each other whereby the cooperating clamping jaws are urged by lever action against the connector members into clamping engagement with a cable-like member.

Another object of my invention is to provide a spacer for cable-like members of the character designated in which the adjacent ends of the resilient arms are interlocked relative to each other to limit pivotal movement of the clamping jaws relative to each other and relative to the cable-like member being clamped.

A further object of my invention is to provide a spacer for cable-like members of the character designated in which the cable-like members are held in substantially fixed lateral positions relative to each other while at the same time a limited amount of longitudinal and angular movement is permitted between the cable-like members due to the resiliency of the spacer unit.

A still further object of my invention is to provide a spacer for cable-like members of the character designated which shall be extremely simple of construction, economical of manufacture and one which may be spaced at predetermined intervals along a plurality of parallel conductors whereby the conductors do not engage each other as they move relative to each other.

Henceforward in the art to which my invention relates, various devices have been proposed to limit relative lateral movement between a plurality of parallel cable-like members. Such devices have been unsatisfactory due to the fact that the clamp sections turn or pivot relative to the retaining bolt therefore to compensate for differentials in tension or longitudinal motion of the cable, whereby the portion of the cable contacting the clamp is damaged by the "scissor" action developed. In accordance with my invention, there is no twisting or pivotal movement between the clamping sections. Accordingly, the sections of the clamp remain in predetermined positions relative to each other whereby the cable is clamped firmly therebetween.

Spacers for cable-like members embodying features of my invention are shown in the accompanying drawings, forming a part of this application, in which:

FIG. 1 is a side elevational view showing the spacer in use;

FIG. 2 is an enlarged, exploded view showing one corner of the spacer;

FIG. 3 is a fragmental view taken generally along the line 3—3 of FIG. 2;

FIG. 4 is a fragmental view taken generally along the line 4—4 of FIG. 2;

FIG. 5 is a longitudinal sectional view through one corner of the spacer showing the clamping jaws in contact with each other, the retaining bolt being removed for the sake of clarity; and,

FIG. 6 is a side elevational view showing a modified form of my invention.

Referring now to the drawings for a better understanding of my invention, my improved spacer comprises a plurality of identical resilient arms 16, each having end portions 11 and 12, as shown in FIG. 1. Formed integrally with each end portion 11 is a clamping jaw 13. In like manner, formed integrally with each end portion 12 is a clamping jaw 14. In FIG. 1 of the drawings, I show three resilient arms 10 bowed outwardly slightly, as shown. The arms 10 define a closed figure having a pair of cooperating clamping jaws 13—14 in each corner thereof.

The end portion 12 is provided with a threaded opening 16 therethrough for receiving the threaded end 17 of a retaining bolt 18. An inwardly flaring opening 19 is provided in the end portion 11 in alignment with the threaded opening 16 for receiving the bolt 18 with a seating fit. Longitudinally extending, reinforcing flanges 21 are provided along opposite sides of the end portions 11 and 12, as shown in FIG. 5, to add strength to the spacer and to assure that any flexing of the resilient arms takes place a substantial distance inwardly of the clamping jaws 13 and 14.

A transverse recess 22 is provided in each end portion 12 in position to receive a transverse projection 23 carried by the adjacent end portion 11, as shown in FIGS. 2—5. A longitudinally extending recess 24 is provided in each end portion 12 in position to receive a longitudinally extending projection 26 carried by the adjacent end portion 11, as shown. The interlock between the projections 23 and 26 and the recesses 22 and 24, limits pivotal movement of the end portions 11 and 12 relative to each other and the cable, indicated at 27, clamped between the clamping jaws 13 and 14.

From the foregoing description, the operation of my improved spacer for holding cable-like members will be readily understood. The bolts 18 are unthreaded from the threaded opening 16 whereby the cooperating clamping jaws 13 and 14 may be moved outwardly from each other, as shown in FIG. 2, to receive a cable-like member 27. The cooperating end portions 11 and 12 are then drawn toward each other by tightening the bolts 18. As the cooperating clamping jaws 13 and 14 move inwardly toward each other they clamp the cable 27 therebetween, as shown in FIG. 1.

The transverse projection 23 and the longitudinally extending projection 26 enter the recesses 22 and 24, respectively, as the bolt 18 is tightened to thereby align and limit pivotal movement of the end portions 11 and 12 relative to each other and relative to the cable 27. Accordingly, there is no damage to the cable-like member caused by twisting of the clamping jaws relative thereto. The resilient arms 10 are thus formed in position relative to each other for resiliency thereof to urge the portion thereof intermediate the end portions 11 and 12 away from each other while the cooperating, clamping jaws are in clamping engagement with the cable-like member 27 and at the same time by lever action against the bolt, to press end portions 11 and 12 firmly together.

That is, the resiliency of the arms 10 tends to move the projections 23 and 26 outwardly of the recesses 22 and 24 against the holding force imparted by the bolt 18. Accordingly, there is a firm but resilient-like clamping action between each of the cooperating pairs of end portions 11 and 12 and the clamping jaws carried thereby. Preferably, the projection 23 does not engage the bottom of the transverse recess 22, thereby assuring that the connection will be positively aligned by the engagement of the sloping sides of the projection 23 and recess 22.

It will thus be seen that when the clamping jaws are placed against the cable-like members, the heels or transverse projections 23 do not engage the recesses 22 due to
the fact that the central portions of the resilient arms 10 are slightly bowed. Upon tightening the bolts 18 the arms 10 spring inwardly whereby the projections 23 engage the recesses 22. This springing of the arms results in a constant lever action pressure against the bolts 18 which urges the intermediate portions of the arms 10 outwardly and urges the clamping jaws into firm engagement with the cable-like members. This lever action also prevents loosening of the bolts 18.

The resilient arms 10 are preferably formed of relatively flat material whereby they provide tension spring-like members which permit a limited amount of deflection as the cable-like members move longitudinally relative to each other. Thus, the cable-like members can move slightly relative to each other along their longitudinal axis, and can move slightly angularly relative to each other by springing and/or twisting the resilient arms 10. On the other hand, the cable-like members cannot move laterally with respect to their relative spacings since such movement would require longitudinal compression or elongation of the arms 10 and the arms are not resilient in that direction.

Referring now to FIG. 6 of the drawing, I show a slightly modified form of my invention in which four resilient arms 10a are operatively connected to each other by bolts 18 in the same manner as the resilient arms 10 are operatively connected to each other in FIGS. 1-5 of the drawings. The arms 10a are provided with end portions 11 and 12 having clamping jaws 13 and 14, as described hereinabove. Also, the end portions 11 are provided with projections 23 which engage recesses 22 provided in the end portions 12. That is, the end portions 11 and 12 shown in FIG. 6 of the drawings are identical to the end portions 11 and 12 shown in FIGS. 1-5 of the drawings. Also, the operation of the spacer shown in FIG. 6 is substantially identical to the operation of the spacer shown in FIGS. 1-5, the principal difference being the fact that four cable-like members are supported in the spacer shown in FIG. 6 while only three cable-like members are supported by the spacer unit shown in FIGS. 1-5.

From the foregoing, it will be seen that I have devised an improved spacer for holding cable-like members in predetermined positions relative to each other. By providing resilient arms between the spacer unit in position to urge intermediate portions of the arms away from each other while the cooperating clamping jaws are urged into clamping engagement with a cable-like member, together with means for drawing the clamping jaws toward each other, a resilient clamping unit is provided which assures firm engagement with the cable-like member at all times. Also, by providing means for interlocking the adjacent ends of the resilient arms, the arms are positively aligned and there is no pivotal or twisting movement of the arms relative to each other and relative to the cable clamped in place between the clamping jaws. Furthermore, by providing identical resilient arm members which are adapted to cooperate with each other to provide a composite unit having a selected number of corners, my improved spacer is particularly adapted for mass production.

While I have shown my invention in two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other modifications and changes without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A spacer for holding cable-like members in predetermined positions relative to each other comprising:
   (a) a plurality of resilient arms,
   (b) clamping jaws formed integrally with the ends of each of said arms in facing relation to clamping jaws of adjacent arms to define a closed figure, and
   (c) securing means inwardly of each pair of cooperating clamping jaws drawing said cooperating clamping jaws and the ends of said arms adjacent thereto toward each other to clamp a cable-like member therebetween in a predetermined position,
   (d) said resilient arms being of a shape to position said clamping jaws in contact with the cable-like members with the adjacent ends of said arms in spaced relation to each other so that upon actuating said securing means to draw said clamping jaws and said ends of the arms toward each other the resiliency of said arms exerts a constant lever action pressure against the securing means, urging intermediate portions of said arms located inwardly of said clamping jaws away from each other and urging the pairs of cooperating clamping jaws into clamping engagement with the cable-like members.

2. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 1 in which the locking elements are carried by said adjacent facing ends engaging each other to align and limit rotation of said cooperating clamping jaws relative to each other.

3. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 2 in which the locking elements comprise a projection on one adjacent facing end and there is a recess in the other adjacent facing end in position to receive said projection.

4. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 3 in which the projections and recesses extend both longitudinally and transversely of said adjacent facing ends.

5. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 1 in which the resilient arms are elongated relatively flat members which face each other.

6. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 5 in which the end portions of each resilient arm adjacent said clamping jaws are reinforced whereby flexing said resilient arms takes place inwardly of said clamping jaws.

7. A spacer for holding cable-like members in predetermined positions relative to each other as defined in claim 6 in which longitudinally extending reinforcing flanges are provided adjacent the ends of said resilient arms.

8. A spacer for holding cable-like members in predetermined position relative to each other as defined in claim 1 in which the securing means for each pair of cooperating clamping jaws comprises a retaining bolt, there being a threaded opening through one of said adjacent facing ends receiving said bolt, and there being an inwardly flaring opening through the other of said adjacent facing ends receiving said bolt with a sliding fit.

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