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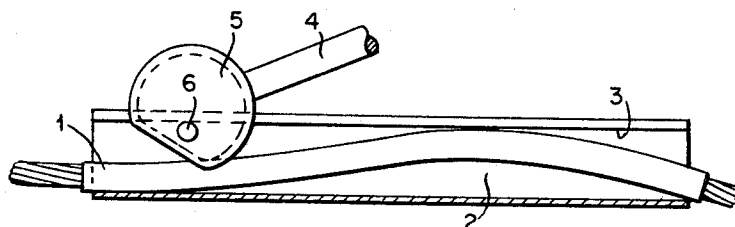
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Attorney—Paul and Paul

[54] **SPLICE STRAIGHTENER FOR AERIAL
 CONDUCTORS**
5 Claims, 8 Drawing Figs.

[52] **U.S. Cl.**..... **140/147,**
 140/123, 72/458
 [51] **Int. Cl.**..... **B21f 1/02**
 [50] **Field of Search**..... **140/106,**
 123, 147, 72/446, 458, 463, 473, 478, 481, 482,
 386, 457, 459

ABSTRACT: An apparatus is disclosed comprising a U-shaped channel with fulcrum ledges running the length of same, which is engaged about a bent splicing sleeve, and a lever cam with handle, with which a straightening force is applied. The lever cam, when inserted into the channel, cooperates with the fulcrum ledges in transmitting a straightening force applied to the splicing sleeve.



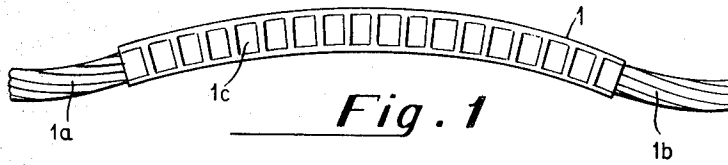


Fig. 1

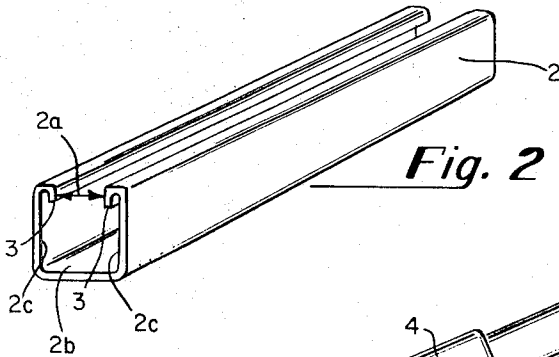


Fig. 2

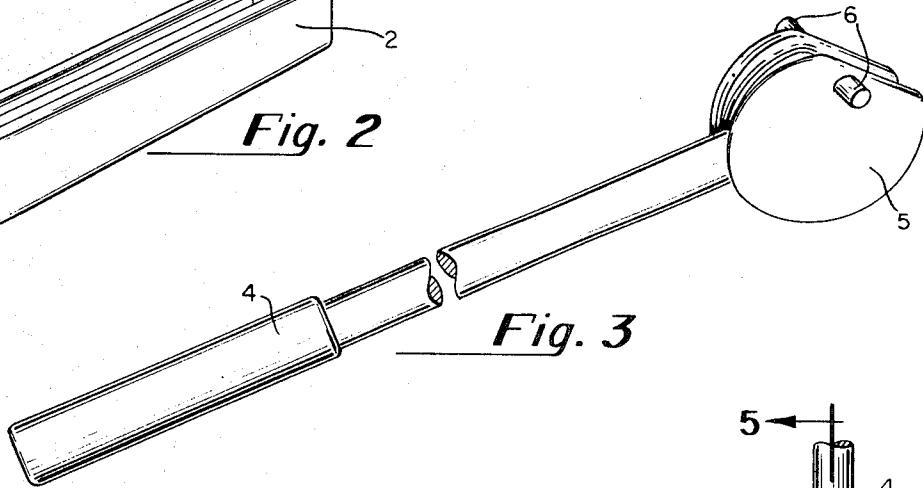


Fig. 3

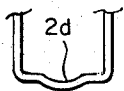


Fig. 8

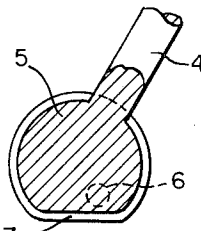


Fig. 5

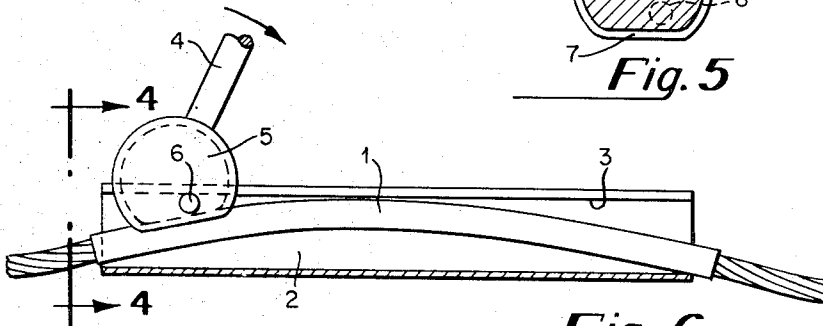


Fig. 6

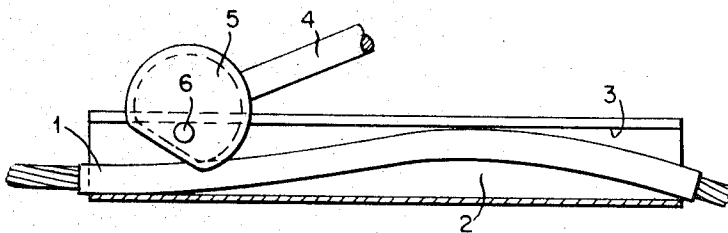


Fig. 7

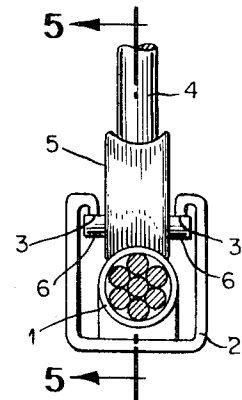


Fig. 4

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SPLICE STRAIGHTENER FOR AERIAL CONDUCTORS BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention lies in the field of straighteners and, more particularly, straighteners for longitudinally curved elongated ductile metal objects such as splices in aerial conductors.

2. Description of the Prior Art

Splicing of distribution and secondary aerial conductors is conventionally accomplished with aluminum compression splicing sleeves which engage the ends of the connecting conductors and are compressed thereon with a compression tool which is used to make a row of transverse indentations in the sleeve. When the compression tool is of the type powered with compressed air, this action also usually causes a pronounced longitudinal curvature of the sleeve. This curvature does not affect the technical characteristics of the conductor but is aesthetically undesirable, and consequently any extreme curvatures are corrected by the lineman. Such correction has conventionally been accomplished by striking the sleeve with a hammer against a small hand-held iron anvil. This method of straightening the sleeve is inefficient and inconvenient because the anvil used subtends only a small portion of the arc, the taut conductor has considerable elasticity and bounce and the transverse orientation of the sleeve curvature is sometimes at a very awkward angle for wielding the hammer. Further, such hammer blows tend to loosen the grip of the splicing sleeve on the conductors.

SUMMARY OF THE INVENTION

The primary object of our invention is to provide apparatus for straightening curved splices in aerial conductors which is simple, convenient, lightweight, inexpensive and effective for the purpose and which overcomes the disadvantages of the prior art.

It is a further object of our invention to provide apparatus with which to straighten curves in splicing sleeves of aerial conductors without affecting the grip of the splicing sleeve on the conductors.

Accordingly, this invention provides a novel and effective tool for straightening curved splices in aerial conductors which comprises a channel for engagement about the splice and a cooperating lever cam for applying the straightening force. The channel has a generally U-shaped transverse section, open at the top, for receiving therein the splice and the camming portion of the lever cam, and is of sufficient length to accommodate at least a substantial portion of the sleeve. The upper portions of the lateral edges of the channel are folded 180° inwardly, thus forming fulcrum ledges running the full length of the channel, these ledges being spaced apart sufficiently to receive the splice therebetween. The lever cam has a generally circular camming surface interrupted by a substantial flat portion and is provided with a pair of opposed laterally extending fulcrum pins for engaging the fulcrum ledges and a handle which extends outwardly between the ledges.

In operation, the channel is engaged about the splicing sleeve which is to be straightened, the lever cam is slid into the channel from one end between the sleeve and the fulcrum ledges so that the fulcrum pins are in engagement therewith. By manipulation of the handle the lever cam pins react against the fulcrum ledges to straighten the sleeve by forcing it toward the flat bottom of the channel. Pressure on the handle is then eased so that the cam can be slid farther into the channel for similarly straightening an adjacent portion of the curved sleeve. In this manner the sleeve is progressively straightened over the full length of the channel, after which the channel may be moved to another portion of the sleeve as further straightening is required.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a side elevational view of a splicing sleeve connecting two conductors.

FIGS. 2 and 3 are perspective views of the channel and handled lever cam, respectively. FIG. 4 is an end view on the line 4-4 of FIG. 6, which shows the relationship of the channel and cam with respect to each other and with respect to the curved splicing sleeve during the straightening procedure. FIG. 5 is a fragmentary sectional view on the line 5-5 of FIG. 4 showing the outline of the cam surface.

FIG. 6 is a sectional side elevational view of the channel with curved splice therein, showing the position of the cam in readiness for straightening the splice, and FIG. 7 is a view similar to FIG. 6 showing a subsequent stage in the straightening process.

FIG. 8 is a fragmentary end view of a modification of the channel of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, FIG. 1 shows an aerial conductor which has been spliced, the splicing sleeve 1 covering and binding together the abutting ends of the conductors 1a and 1b within. A row of transverse indentations 1c in the sleeve 1, made with a pneumatic-powered compression tool, has produced a typical longitudinal curvature in the sleeve as illustrated.

The flat bottom 2b of an open-top U-shaped channel 2, illustrated in FIG. 2, comprises the anvil of the straightening tool. The upper portion of the lateral edges of channel 2 is curved inwardly and then downwardly 180°, thus forming fulcrum ledges 3 which run the length of the channel. The open part 2a of the channel between the ledges 3 is sufficiently wide to permit the channel to be readily engaged about the splicing sleeve which is typically up to three-fourth inches in diameter. The length of the channel is conveniently about 10 inches for subtending a substantial portion of the splicing sleeve, which conventionally is on the order of 12-16 inches long.

A lever cam 5 having a handle 4 thereon is illustrated in FIG. 3. The camming area of cam 5 is approximately circular interrupted by a comparatively flat portion 7 and the cam surface is transversely grooved so as to engage the sleeve over a relatively broad transverse area to minimize the stress concentrations on the sleeve surface. The ends of the flat portion of the cam are curved gradually to meet the circular portion. The handle, in a typical embodiment, is approximately 1 ft. long, is attached rigidly to the lever cam and extends in the plane of the camming area oppositely from the flat portion and at a slight angle from a perpendicular thereto. Attached to the lever cam, and extending laterally outward from the perpendicular to the camming area, are opposed fulcrum pins 6. These fulcrum pins are disposed near the flat portion of the cam between the ends of the flat portion but displaced from the center thereof.

FIGS. 6 and 7 show the manner in which the lever cam cooperates with the channel for applying a straightening force to the splicing sleeve forming part of an aerial conductor. The channel 2 is placed over the splicing sleeve 1 in such transverse orientation thereto that the curvature of the sleeve is convex upward with respect to the bottom of the channel. The lever cam 5 is then slid in from one end of the channel, the flat surface of the grooved cam sitting on the sleeve and the fulcrum pins 6 sliding in under the fulcrum ledges 3. The fulcrum pins 6 extend outwardly from the cam 5 a sufficient distance to engage fulcrum ledges 3 without binding against the inside lateral edges 2c of the channel 2. From the transverse view of FIG. 4 it can be seen that the reaction force of the curved sleeve against the lever cam 5 is transmitted through the fulcrum pins 6 to the fulcrum ledges 3, to deform the sleeve against the flat bottom 2b of the channel, thereby to straighten the sleeve.

The operation of the device is as follows:

The lineman engages the channel 2 about a badly curved splicing sleeve 1 of a taut aerial conductor, in such manner that the sleeve curvature is convex with respect to the bottom 2b of the channel 2. The lever cam 5 is then slid into the left

end of channel 2 with the flat portion 7 of the cam engaging the sleeve and the fulcrum pins 6 engaging the fulcrum ledges 3. The lineman then rotates the handle 4 in a clockwise direction until the sleeve is compressed moderately tightly. The entire assembly including the conductors extending from each end, is then turned in a transverse plane until the handle is oriented for most convenient manipulation by the lineman.

With the assembly held in such transverse orientation, the cam is forcefully further rotated clockwise, as illustrated in FIG. 6, thereby applying a straightening force to the sleeve. As the cam is rotated, the edge of the straight portion forces the cable down toward the bottom 2b of the channel, while the fulcrum pins 6 remain pressed against the fulcrum ledges 3, thereby transmitting the downward force which is applied to the handle. The clockwise rotation of the cam is then continued until the portion of the sleeve to the left of the cam is straightened out along the channel bottom as shown in FIG. 7.

Upon straightening a portion of the sleeve, the cam is released by a counterclockwise rotation of the handle, and is then slid to the right until it is again engaged on a further portion of the sleeve which remains curved. The straightening and sliding process is repeated in this manner until the entire sleeve has been straightened to an acceptable shape. It is to be noted that the offcenter disposition of the fulcrum pins 6 with respect to the flat portion 7 of the lever cam provides for selective reversal of the cam in order to straighten sleeves of different diameters.

The use of the lever cam in the above manner to straighten curved portions of the splice against the bottom of the channel produces a distributed rather than an impact stress, and thus minimizes any tendency to loosen the mechanical bond between the splicing sleeve and the conductors.

To reduce the stress concentration on the under surface of the splice during the straightening process, the bottom of the channel may be provided with a transverse arcuate groove 2d as illustrated in FIG. 8.

Although this invention has been described with specific reference to straightening of curved splicing sleeves, it is obvious that it can be used to straighten elongated objects of any material such as cables, rods, bars, pipes and tubes. The channel and lever cam may be made of any materials of adequate strength for suitably deforming the object to be straightened, but in the interest of minimizing the weight to be carried aloft by the lineman for the purpose of straightening badly curved splicing sleeves, these components are preferably respectively fabricated of materials having a minimum of weight consonant with the desired strength.

With respect to the embodiment illustrated in the drawing, it is to be understood that instead of the lateral edges of the channel being bent inwardly 180°, any degree of bending could be employed sufficient to form a suitable reaction ledge against which the fulcrum pins press. Similarly, the shape of the camming area need not be generally circular but may be of any shape adequate for the purpose and specifically suitable for a particular application.

We claim:

1. Apparatus for straightening an elongated ductile object, comprising:

- a. a generally U-shaped channel having an open top for receiving therein a bent portion of said object through said open top;
- b. said channel having a generally flat bottom surface;
- c. the lateral sides of said channel having along their tops inwardly extending ledges provided with downward fulcrum surfaces;
- d. a cooperating lever cam having an arcuate camming surface engageable with said object;
- e. oppositely extending lateral pins on said lever cam engageable respectively with said fulcrum surfaces;
- f. an operating handle on said cam extending perpendicu-

larly to said pins;

- g. said channel and said cam cooperating in such manner that when said object is engaged in said channel with a portion thereof spaced from the channel bottom, said cam is insertable in an end of the channel with its handle extending outwardly thereof, its pins engaging said fulcrum surfaces and its camming surface engaging said object at said portion spaced from said channel bottom and on the side away therefrom; and
- h. whereby rotation of said handle on an axis transverse to said channel will cause said cam to press said portion of said object toward said channel bottom to straighten said object.

2. The apparatus according to claim 1 wherein said object is of generally circular transverse shape and is longitudinally curved; and

a. said cam surface has:

1. a relatively flat portion for longitudinally engaging said object, and
2. a concave transverse shape for transversely generally engaging said object,
- b. whereby to distribute the cam pressure over a substantial portion of the surface of said object.

3. The apparatus according to claim 2 wherein the bottom of said channel is longitudinally grooved for general engagement with the contiguous surface of said object, whereby to distribute the reaction pressure from said channel over the contiguous surface of said object.

4. The method of straightening a curved splicing sleeve in an aerial conductor which comprises:

- a. placing about said sleeve a generally flat-bottomed open-top U-shaped channel which subtends at least a substantial portion of said sleeve, the sleeve curvature being convex with respect to the bottom of said channel and in such transverse orientation therewith that the plane of said curvature is perpendicular to the bottom of said channel, and the lateral sides of said channel having along their tops inwardly extending ledges provided with downward fulcrum surfaces;

b. inserting in an end of said channel and over said sleeve a cam having:

1. an arcuate surface conformable to and engageable with said sleeve;
2. opposed laterally protruding pins extending under and engageable with said fulcrum surfaces; and
3. a handle perpendicular to said pins, in such manner that said arcuate surfaces engage said sleeve, said pins engage said fulcrum surfaces and said handle extends outwardly of said channel;

c. rotating said cam in a longitudinal plane until said sleeve is gripped tightly enough between said cam and said channel so that said channel, said cam, said sleeve and the portions of the conductor adjacent each end thereof can be rotated as a unit in a transverse plane against the reaction of the conductor without slippage of said channel about said sleeve;

d. rotating said handle in said transverse plane until said handle is in a convenient position for further rotating said cam in said longitudinal plane to increase the pressure on said sleeve;

e. forcefully further rotating said cam in said longitudinal plane to deform said sleeve toward the bottom of said channel; and

f. reversing the rotation of the handle in the longitudinal plane to release the grip on said sleeve.

5. The method set forth in claim 4 including the steps of:

- a. inserting said cam farther into said channel to engage a new curved portion of said sleeve; and
- b. repeating the deforming operation at said new curved portion of said sleeve.