Sept. 3, 1935. K. HERKENBERG 2,013,211

PROCESS FOR THE PRODUCTION OF EXTENSIBLE ELECTRIC CONDUCTORS

Filed Oct. 9, 1933 2 Sheets-Sheet 1

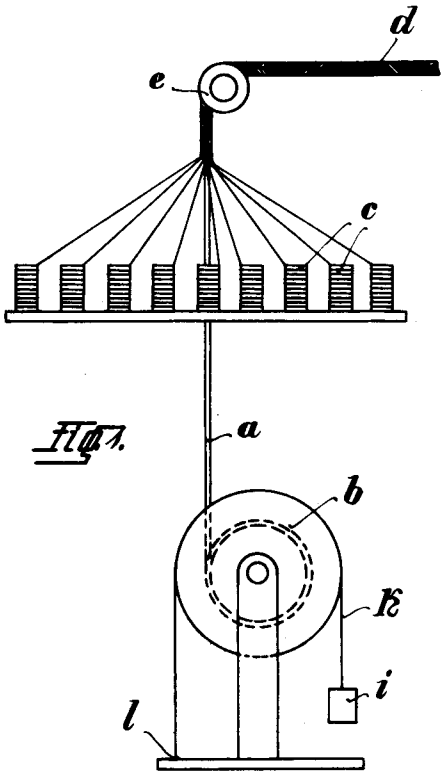


Fig. 1.

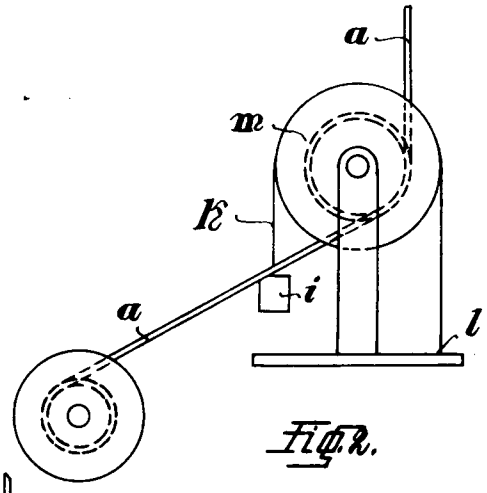


Fig. 2.

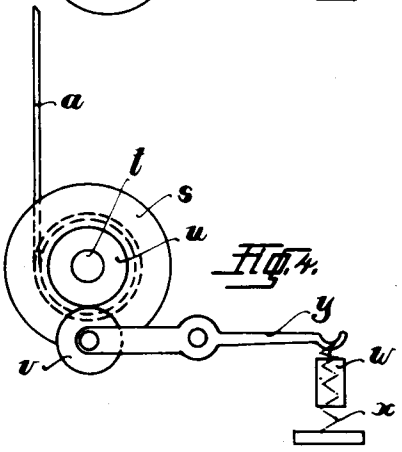
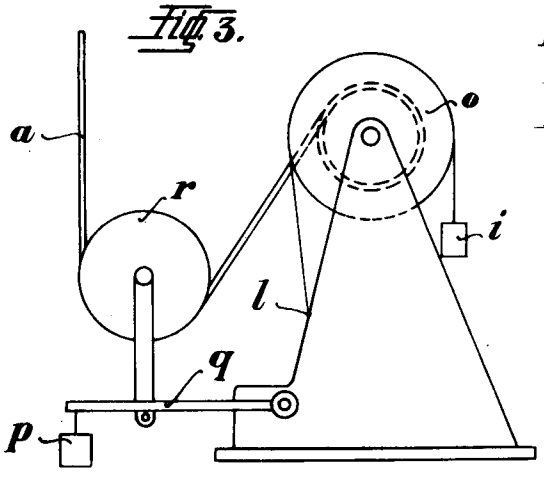


Fig. 4.

Fig. 3.



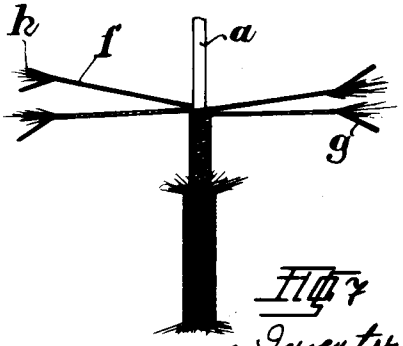


Fig. 7

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PROCESS FOR THE PRODUCTION OF EXTENSIBLE ELECTRIC CONDUCTORS

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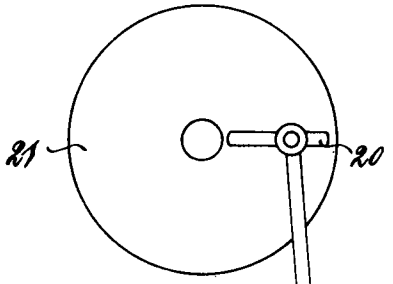

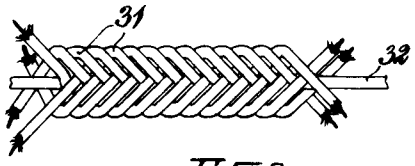

Fig. 8.

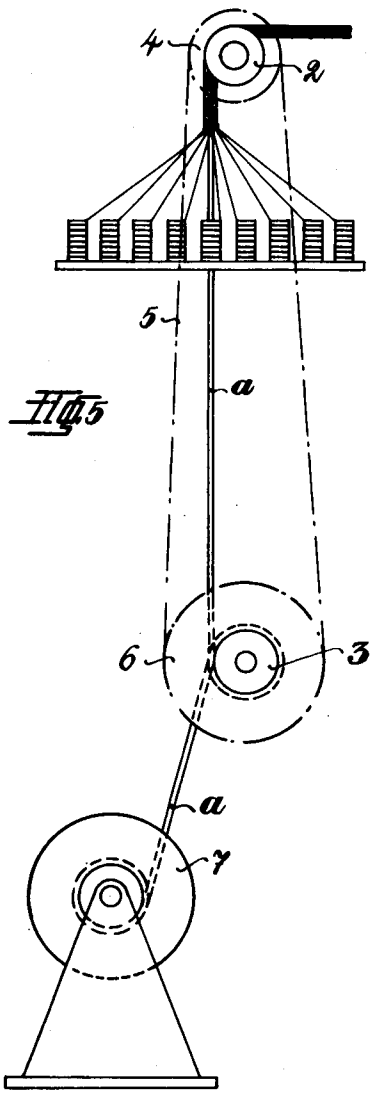

Fig. 5

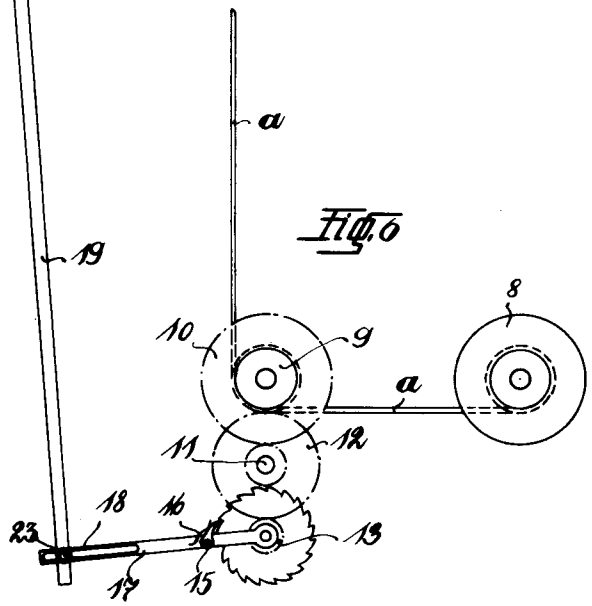

Fig. 6

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UNITED STATES PATENT OFFICE

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PROCESS FOR THE PRODUCTION OF EXTENSIBLE ELECTRIC CONDUCTORS

Karl Herkenberg, Oberbarmen-Heckinghausen, Germany

Application October 9, 1933, Serial No. 692,894
In Great Britain October 8, 1932

3 Claims. (Cl. 96—3)

(Granted under the provisions of sec. 14, act of March 2, 1927; 357 O. G. 5)

My invention relates to an extensible electric conductor having an elastic core braided round with conductive strands.

This invention consists in a process for the production of exceptionally extensible electric conductors, and the said process consists in maintaining the elastic core, for example the rubber thread, under strong tension during the operation of braiding round the same.

The process is suitable for the production of completely made telephone cords and hearing device cords, more particularly of wireless receiving apparatus, in which the great extensibility has the special advantage of enabling the normal length of these cords to be maintained comparatively less than was hitherto necessary. Firstly the conductive strands are braided round the elastic core whilst the core is extended, and as a simultaneous operation silk insulating threads can be laid by a similar braiding machine round the braided conductive strands, and also as a simultaneous operation, further silk insulating threads are preferably braided round the first named silk insulating threads, the silk insulating threads being applied whilst the core is still extended. The finished cord is then cut into the desired lengths and several of the lengths are also plaited together round an elastic core whilst the core is extended and provided in known matter with connecting pieces at the ends.

In the drawings

Figure 1 is a diagrammatic view of a braiding machine having a brake device for the bobbin from which the rubber thread is drawn.

Figure 2 is a side view showing another form of tensioning device for the rubber thread.

Figure 3 shows a means of guiding the rubber thread over a loaded tension roller.

Figure 4 shows a brake device for the run-off bobbin of rubber thread, having a loaded roller.

Figure 5 shows a view of a brake device which is regulated from the drawn-off roller of the braid-covered conductor.

Figure 6 shows a tension device for the elastic core, with ratchet drive.

Figure 7 shows a view of the stretchable elastic core with the conductive strands braided round it.

Figure 8 shows a multiple conducting cord made in accordance with the process of the invention.

Referring to the drawings, in the construction shown in Figure 1, a rubber thread *a* passes from the bobbin *b* through the braiding arrangement *c* and after having conductive strands braided round it to form it into a conductor *d*, runs over a roller *e*. The braiding arrangement is well known and is not shown with particularity in the drawings. The conductive strands *f* are wound on the spools, and, as shown in Figure 7, may consist of metal ribbons *g* wound on cotton or silk threads *h*.

The rubber thread *a* is drawn from roller *b* which is braked by means of the weight *i* connected to a band *k* anchored at the opposite end.

In the construction shown in Figure 2 the rubber thread *a* runs over a guide roller *m* around which it is wrapped several times, and the guide roller *m* is braked by means of the weight *i* and the band *k*, the thread *a* being drawn from a separate bobbin *n*.

The elastic rubber thread *a*, in the construction shown in Figure 3, is drawn from a bobbin *o* and runs in loop form over a roller *r* loaded by a weight *p* and lever *q*. The roller *o* is braked by means of a weight.

In Figure 4, the braking of the roller *s* over which the rubber thread *a* runs is effected by means of a roller *u* which is secured to the shaft *t* of the roller *s* and has a roller *v* pressed against it by a lever *y* loaded by a weight *w* or a spring *x*.

In Figure 5, the conductor *d* comprising the core braided round with conductive strands, runs over a draw-off roller 2 which has exactly the same inner diameter as the guide roller 3. A sprocket wheel 4 is connected to the draw-off roller 2 and a sprocket wheel 6 is connected to the guide roller 3, whilst a sprocket chain runs over both sprocket wheels. Because the sprocket wheel 6 has a materially greater diameter than the sprocket wheel 4, the guide roller 3 must run considerably slower than the draw-off roller 2 and a predetermined tension is created in the rubber thread, which can be set as desired by a suitable choice of the diameters of the wheels 4 and 6. The elastic core is unwound from a bobbin 7.

The tension of the rubber thread or elastic core *a* is regulated in the construction shown in Figure 6 by a separately rotated disc 21. The disc 21 can be driven from any suitable place and its movement has a relationship to the movement of the draw-off roller 8. The disc 21 has a slot 20 in which a rod 19 is adjustably mounted. The rod 19 is held by a pin 23 in the slot 18 of a ratchet lever 17. The ratchet pawl 15 is pressed by a spring 16 into the teeth of the ratchet wheel 14, the shaft of which has a toothed wheel 13 secured to it. The toothed wheel 13 acts through driving wheels 12, 11 and 10 on the guide roller 9 of the elastic core *a* which is wound off the bobbin 8.

By changing the driving wheels 10 to 13, and adjusting the rod 19 in the slots 18 and 20, any desired tension of the elastic core *a* can be obtained with complete exactitude.

In the same operation, the extensible conductor thus formed can be finished by consecutively plaiting several sets of silk threads around the already covered elastic core whilst the tension of the core is maintained, whereupon the cord is cut to the required lengths. A number of these lengths may then be plaited together and be furnished at their ends with the usual connecting means as terminals or the like to make the multiple conductor ready for use as microphone cords, loud speaker cords and so forth.

Figure 8 shows such a multiple electric cord or elastic conductor which consists of individual cords 31 which are drawn together by the elastic insert 32. The assembled cords are not only extensible as a whole, but in addition thereto each separate cord is extensible in itself and therefore the whole structure receives a much greater extensibility.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The herein described process of making an extensible multiple electric conductor cord, consisting in making firstly a plurality of individually extensible conductors, each conductor being made by longitudinally stretching an elastic cord member and while stretching the same winding therearound a conductor element comprising a core of insulating threads and a metallic band helically wound around said core, and braiding around the conductive layer formed by the conductor element on said elastic core member an insulating cover; and then winding said extensible conductors around an elastic core while stretching the latter longitudinally.

2. The herein described process of making an extensible multiple electric conductor cord, consisting in making firstly a plurality of individually extensible conductors and then winding said extensible conductors around an elastic core while stretching the latter longitudinally, each conductor being made by longitudinally stretching an elastic core member and while stretching the same winding therearound a plurality of flexible conductor elements, and braiding around the conductive layer formed by said conductor elements on said elastic core member an insulating cover, each conductor element being composed of a core of insulating threads and a metallic band helically wound around said core.

3. The herein described process of making an extensible electric conductor, including the steps of longitudinally stretching an elastic core member of insulating material and while stretching the same winding therearound a plurality of flexible conductor elements and braiding around the conductive covering thus formed on said insulating core a flexible insulating cover, each conductor element consisting of a thin metallic band helically wound around a core composed of insulating threads.

KARL HERKENBERG.