

June 1, 1937.

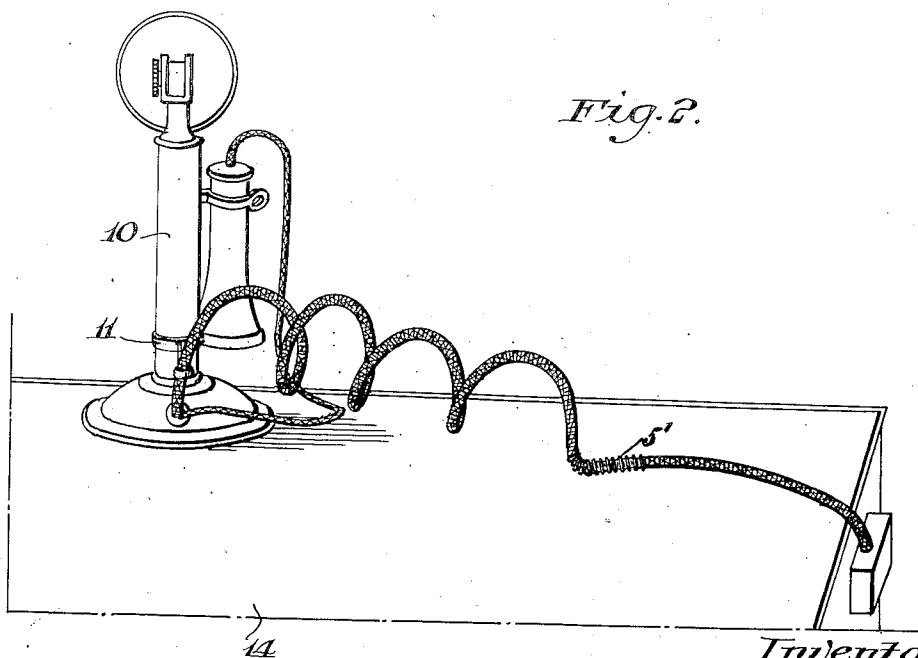
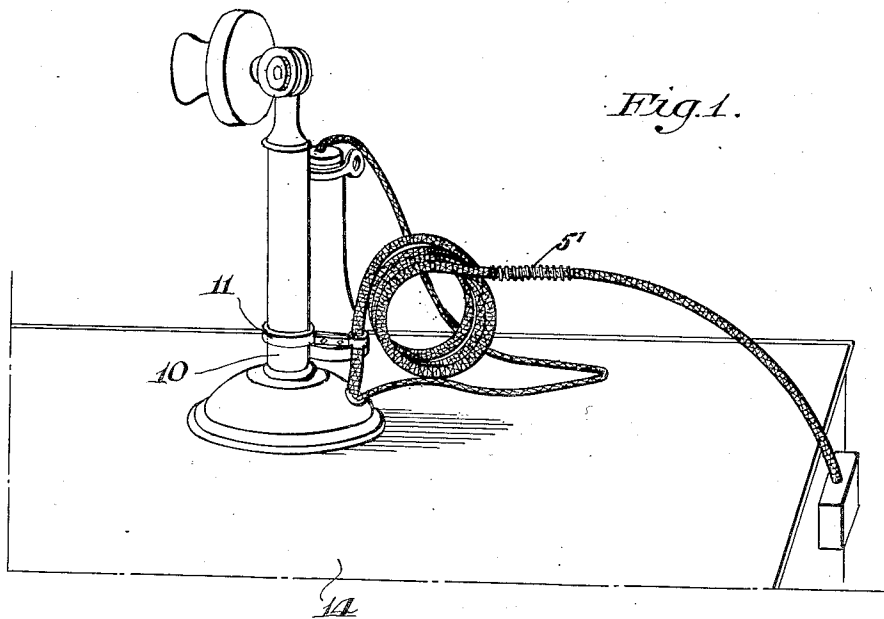
H. M. HAY

2,081,928

COILING CORD

Filed Dec. 21, 1929

3 Sheets-Sheet 1



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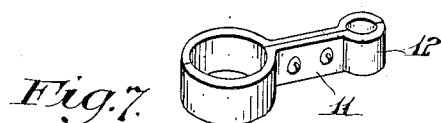
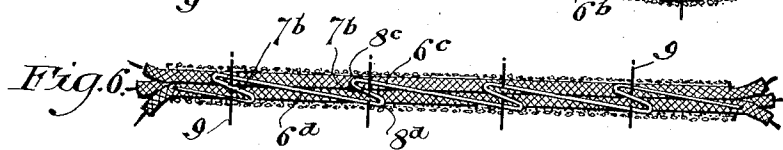
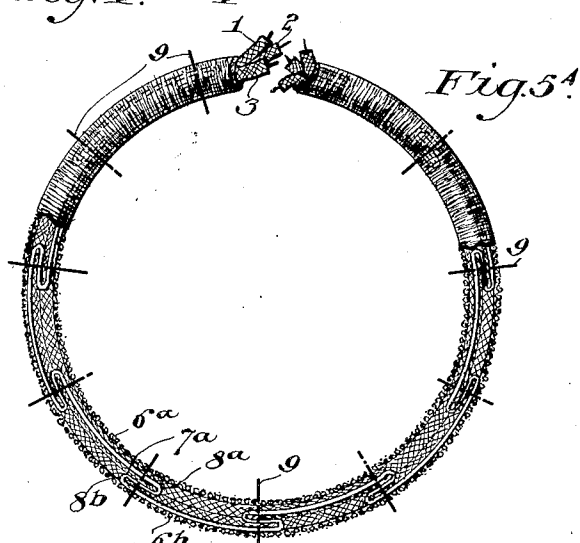
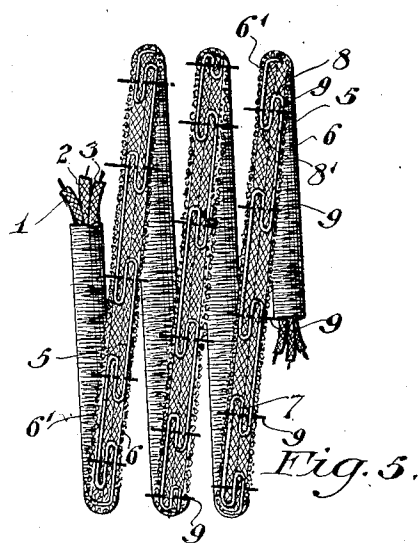
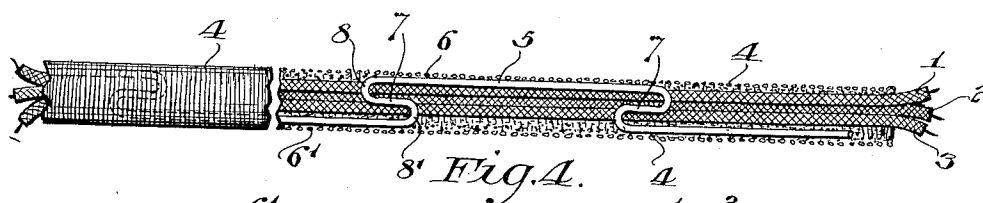
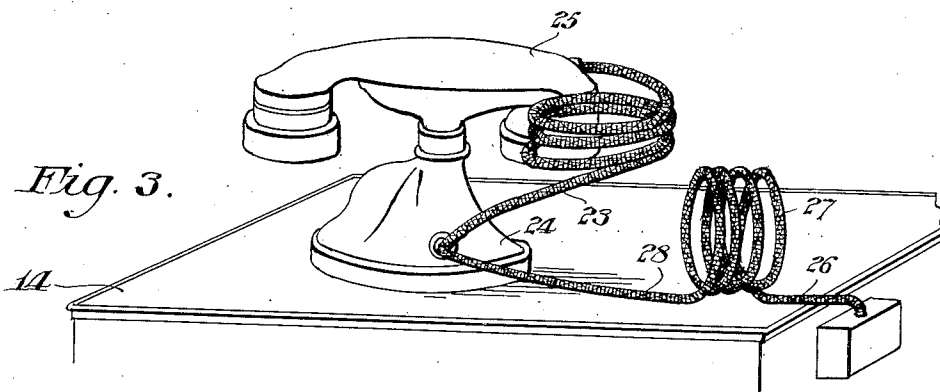
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H. M. HAY
COILING CORD

2,081,928

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3 Sheets-Sheet 2



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June 1, 1937.

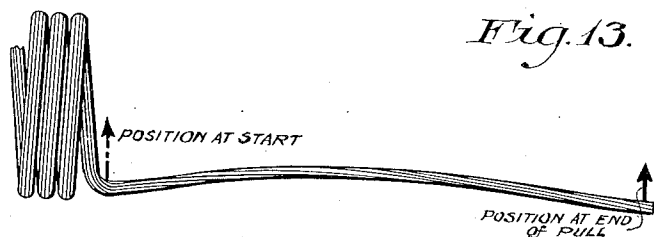
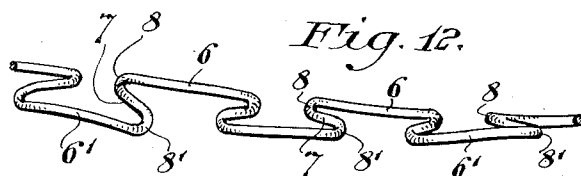
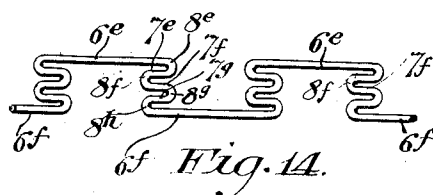
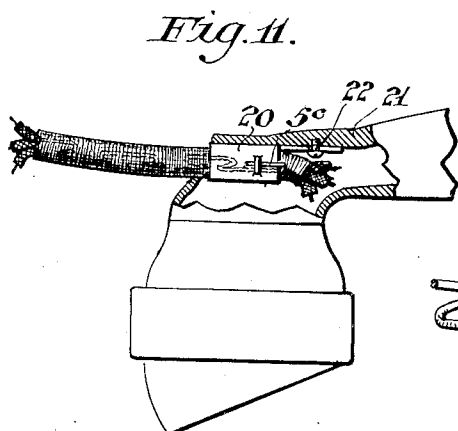
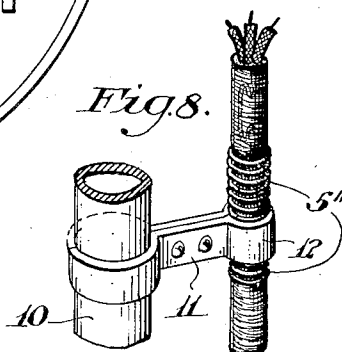
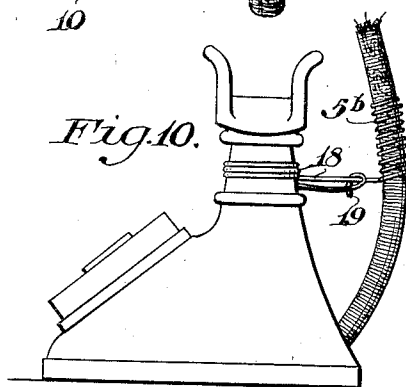
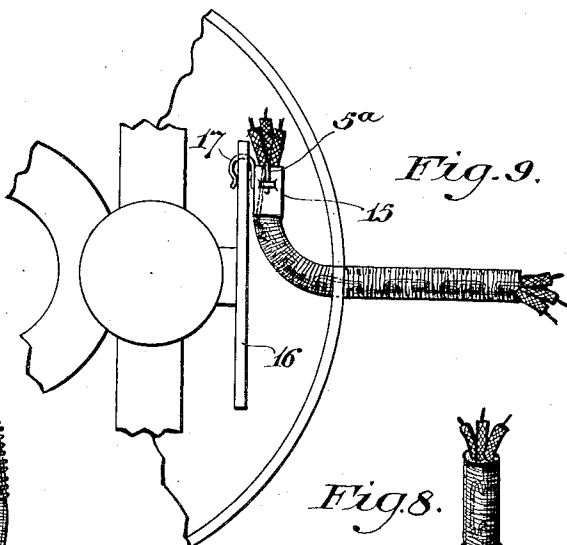
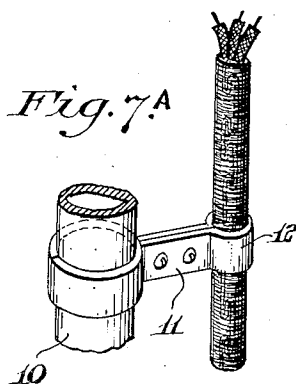
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2,081,928

COILING CORD

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,081,928

COILING CORD

Howard M. Hay, Wenonah, N. J.

Application December 21, 1929, Serial No. 415,634

6 Claims. (Cl. 173—367)

My invention is designed to provide improved means for coiling cords to prevent the entanglement and breakage thereof and the disturbance of papers or other objects thereby. It is applicable primarily to electric cords, such as are used in connection with telephones, electric irons, or other portable apparatus utilizing electric current, and the coiling device may be utilized as a portion of an electric circuit or may be electrically insulated therefrom.

In a preferred embodiment of my invention, the cord is coiled by a helical spring preferably housed within the cord covering or sheath which conceals and insulates the coiling device. The coiler is preferably composed of a plurality of relatively short elastic sections connected together by spring members extending transversely thereto, so that the torsional stresses resulting from the uncoiling of the helix by an axial pull thereon is taken up by flexing the members longitudinally at the bends thereof instead of by disrupting the molecular arrangement of the wire metal by rotation of the wire metal on the axis of the wire, such as commonly occurs when a helix is unwound by a pull thereon. The torsional stresses resulting from the unwinding of the helix are moreover preferably distributed throughout the length of the coiling device by anchoring one or both ends thereof against rotation, and one or both ends of the coiler may be projected through and wound around the sheath to provide a sleeve or housing preventing sharp bends of the conductors or abrasion of the sheath. My improvements conduce to the life and elasticity of the coiling device as well as of the cord, and avoid twisting of the cord which has heretofore resulted in deterioration and breakage of the cords when used with coiling devices.

It is not, of course, necessary that all of the features of my invention be incorporated in every embodiment thereof, as the advantages of the separate characteristic structural features may be separately used, although they are preferably all utilized where the cord and its coiling device are designed for arduous service.

Features of my improvements are applicable both to wholly or partly sheathed coilers and to coiler attachments applied exteriorly to cords, as, for instance, by bending members of the coil-

ers partly or wholly around the cords, and in each type of application I provide a plurality of relatively short spring sections connected together by members extending transversely relatively thereto and forming a coiler combined with an anchorage for non-rotatably securing a portion of the coiler. Should the anchorage of the coiler be unnecessary for certain purposes, the sheathing of all or a portion of the coiler having offset individual spring sections and the provision of a cylindrical housing or collar at one or both ends thereof provides a more efficient, as well as more economical and presentable device than has been hitherto available.

The characteristic features and advantages of my improvements will further appear from the following description and the accompanying drawings of illustrative embodiments of my improvements.

In the drawings, Fig. 1 illustrates the application of my invention to the mounting cord of a usual desk set type of telephone instrument having a transmitter stand normally held or moved by the user and a receiver connected therewith by a relatively short cord; Fig. 2 shows the instrument illustrated in Fig. 1 with the coiled mounting cord partly elongated; Fig. 3 is a perspective view illustrating the application of my improvements to a "continental" or hand set type telephone having the transmitter and receiver mounted upon a hand piece connected by a relatively long cord with a base or stand which is normally not held by the user, but may be connected with the terminal block or bell box by a mounting cord similar to that shown in Fig. 1 or by an uncoiled cord; Fig. 4 is an enlarged view of a straightened section of cord embodying one form of my improvements and having the covering sheath partly removed to show the interior construction; Fig. 5 is a part sectional peripheral view of a detached coil having a preferred form of coiling means, the provision of fulcrum points by the cord sheath threads for the several sections of the coiling spring being diagrammatically indicated; Fig. 5A is a part sectional axial view of a coil similar to that shown in Fig. 5, but with the offset portions of the coiler bent at right angles to their position in Fig. 5, and the action of the cord sheath threads in forming fulcrums for the

spring sections being diagrammatically indicated; Fig. 6 is a part sectional view of a straightened section of a cord provided with coiler having a modified form of bend, the engagement of the cord sheath threads to form fulcrums for the coiler sections being diagrammatically illustrated; Fig. 7 is a detached view of a form of anchorage for positioning the mounting cord coiler relative to a base or stand of an instrument such as a telephone; Fig. 7A shows the anchorage illustrated in Fig. 7 clamped to a stand and clamping a cord; Fig. 8 is a view similar to Fig. 7A but having the coiler projected through the cord sheath and forming a cylindrical cord housing engaged by the clamp; Fig. 9 is an enlarged view illustrating the anchorage of a coiler to the stand of a "continental" type phone; Fig. 10 shows a modified form of anchorage for supporting the coiler upon the base of an instrument such as a "continental" type telephone; Fig. 11 is an enlarged view illustrating a modified form of anchorage by which the coiler may be attached to and supported by the hand piece of a "continental" type telephone; Fig. 12 illustrates diagrammatically how the torsion resulting from pulling on a helix is converted into normal bending movements adjacent to the fulcrum sections of the offset wire sections of coilers embodying my improvements; Fig. 13 illustrates diagrammatically how the pulling a helix imposes torsional stress upon a straight wire about the axis thereof tending to disrupt the molecules; and Fig. 14 is a fragmentary view of a straightened coiler section having its members connected by multiple bends.

In the preferred embodiment of my invention, an electric cord, preferably composed of a plurality of relatively insulated strands, has housed within the braided sheathing thereof a coiling device consisting of a helically coiled spring having sections offset from one another and united preferably by reverse bends or curves normally lying substantially in a plane common to the sections united thereby.

As illustrated in Figs. 4 and 5, the insulated conductors 1, 2 and 3 have braided thereto by the sheathing 4 a coiler 5 consisting of spring wire bent in the form of a helix and having relatively offset sections 6 and 6' united to one another by fulcrum forming members 7 connected with the members 6 and 6' by bends or curves 8 and 8'. The coiling device 5 is electrically insulated from the conductors 1, 2 and 3 by the insulation thereon, and may, if desired, be utilized as a portion of an electric circuit, as for instance a ground wire. The braiding of the sheathing about the strands and coiler forms a composite cord in which the members 7 are anchored by the sheath threads and act as though fulcrumed at substantially the points 9, so that pull upon the cord in the direction of the axis of the helix distributes the bending substantially throughout the length of the coiling device. By securing the bending of each of the individual sections 6 and 6' relative to the points 9 the fatiguing of any portion of the wire is avoided and the coiler returns to its initial helical form.

It is of primary importance in coiling devices to avoid fatigue or permanent set of the wire, which quickly occurs where the helical coil is formed of straight wire. Where the helical spring is provided with offset portions necessitating in their formation an axial, as well as a bending, twist of the wire, there is a tendency to fracture due to the shearing effect resulting from

accentuating the axial twist or to bending transversely the wire section containing such axial twist. If, however, the offsets in the wire are provided by bends or loops made in the direction of the grain of the metal and without setting up torsional strains therein by axial twists, the stresses resulting from the straightening of the helix are so distributed that the coil has great durability and will return to its original condition even after many elongations.

While it is ordinarily preferable to use a complete reverse loop lying parallel to the plane of the periphery of the helically coiled cord, the coiler may, if desired, be bent, as illustrated in Fig. 5A, with offset portions 6a and 6b at right angles to the position occupied thereby in Fig. 5 and lying substantially normal to the axis of the helix. In such form, as illustrated in Fig. 5A, the fulcrum forming section 7a is united to the offset sections 6a and 6b by the loops 8a and 8b, which are bent in accordance with the grain of the wire, and the sections 6a and 6b are disposed at different distances from the axis of the helix.

Where less elasticity and durability are required than are provided by complete reverse bends, such as illustrated in Figs. 5 and 5A, the wire may be bent, as illustrated in Fig. 6, to form offset sections 6c and 6d connected by the angularly disposed sections 7b by curved sections 8c and 8d, so as to give to the wire a saw tooth outline. The wires so bent may be coiled into the form of a helix with the teeth projecting either radially or axially.

It will be understood that when the coilers illustrated in Figs. 5, 5A and 6, are incorporated in a cord, the members 7, 7a and 7b function as fulcrums for the offset sections 6, 6', or 6a, 6b or 6c, 6d respectively, so that bending resulting from an axial pull on the helix is distributed throughout the cord. The torsional action resulting from axial pull on the helix is converted into bending movements in the line of the grain of the wire and primarily in the sections 7, 7a and 7b and the bends connecting them with the members 6, 6', or 6a, 6b, or 6c, 6d respectively, with consequent avoidance of any substantial torsional stress on the wire or twisting of the wire on the axis thereof.

The difference between the molecular action of a coiler embodying my improvements and of a coiler formed of straight wire is indicated graphically in Figs. 12 and 13. As illustrated in Fig. 12, when a coil such as illustrated in Fig. 5 is pulled axially, the members 6 and 6' rock relatively to one another on a fulcrum point in the section 7, and the torsional effect is taken up primarily by the bending of such sections 7 and the curves 8, 8' connected therewith. Since the bending is widely distributed and does not involve molecular displacement resulting from twisting of the wire on its own axis, the coiler is not fatigued and will recoil to its original shape indefinitely. On the other hand, when a helically coiled straight wire is pulled, the elongation of the helix results in imposing a complete axial twist in the wire for each loop of the helix pulled out, as indicated by the longitudinal lines in Fig. 13. Such torsional strain weakens and fatigues the wire and results in the ready fracture thereof or a permanent set preventing restoration to the original helical form.

When a cord having a fixed anchorage is provided with a coiler, there is a tendency to concentrate the axial or torsional twist resulting

from the straightening of the helix in the portion of the cord between its anchorage and the end of the coiler. In accordance with my invention, this difficulty is overcome by anchoring the coiler at one or both ends thereof, thereby not only preventing twisting and deterioration of the cord, but also providing a support by which the cord is maintained out of contact with the surface upon which the portable device associated therewith is supported.

As illustrated in Figs. 1, 2 and 7A, the stand 10 of a desk type telephone instrument has fixed thereto a bracket 11 providing clamping jaws 12 non-rotatably engaging the mounting cord having therein a coiling device, so that the coiled cord is supported clear of the surface 14 on which the telephone stand rests. When the instrument is moved, the expanded helix is disposed sufficiently above the instrument supporting surface to avoid frictional contact therewith or disturbance of papers or the like thereon.

As illustrated in Figs. 1 and 2, the unanchored end of the coiler opposite the bracket 12 may be projected through the cord sheath and wound into a cylindrical housing 5' for the cord to prevent sharp bending of the cord at the junction between the coiled and uncoiled portions thereof. The maintenance of the coiled cord at an elevation above the base also avoids the tendency to kink the cord resulting from a complete rotation of the instrument on its vertical axis, since such rotation results in visibly wrapping the coil around the instrument and thereby directs attention to the improper manipulation thereof.

As illustrated in Fig. 8, the end of the coiler to be clamped also may be brought out through the cord sheath, wound in a cylindrical coil or housing 5'' on the exterior of the cord and non-rotatably engaged in the clamp 12, thereby avoiding any wear on the cord sheath due to the pressure of the clamp as well as preventing sharp bending adjacent to the anchorage.

As illustrated in Fig. 9, the end 5a of a coiler encased within a cord may be projected from the end thereof and bent backward and fixed to a clip on the metal collar 15 encircling the end of the cord, which metal collar is non-rotatably secured to the bracket 16 in the base of the telephone instrument. Such attachment may be made by means of a hook 17 or in any other suitable manner.

As illustrated in Fig. 10, the end 5b of the coiler may be projected through the sheath of the cord and bent into a loop 18 and looped around the neck of the standard of the telephone stand and latched by means of a hook 19.

As illustrated in Figs. 3 and 11, the coiler has its end 5c projected from the end of the cord and bent back thereon into engagement with a clip or loop on the metal collar 20 encircling the cord and such collar is non-rotatably secured to the hand piece 21 by means of a screw 22 or in any other suitable manner.

It will, of course, be understood that the various anchorages illustrated may be used in conjunction with or separately from one another, and that many other means for non-rotatably supporting the coiler may be utilized, depending upon the character of the apparatus with which the cord and coiler are used.

When the cord 23 of the handpiece of the telephone is provided with a coiler, as illustrated in Fig. 3, it is frequently desirable to retard the pull exerted on the base 24 from lifting the handpiece

25 by providing a mounting cord 26 with a coiler wound into a helical loop 27 but having a straight section 28 between the helical winding and the base of the instrument. The two coil sections of the cords are thereby maintained sufficiently apart to prevent entanglement with one another and the resistance to unwinding by the helix 27 checks the movement of the base 24 across the surface 14 when the helical section of the cord 23 is unwound in using the handpiece 25.

There are many uses for my improvements aside from the application thereof to telephone cords, and when the coiler is subjected to heavy duty by embodiment in a heavy cord it is sometimes desirable to provide a plurality of members between the offset sections, as illustrated in Figure 14. In such constructions, the offset portions 6e and 6f are connected to one another by means of the fulcrum-forming sections 7e, 7f and 7g which are united to offset sections and to one another by the bends or loops 8e, 8f, 8g and 8h.

As used herein, the term "helix" or "helical spring" is to be understood as to referring not only to the curve formed on a cylinder by a right line in a plane that is wrapped around the cylinder, as an ordinary screw thread, but also to a line formed by a point that moves around an axis while continuously receding from or approaching it, such as the shape of an ordinary watch spring, and to comprehend any type of coiled spring.

Having described my invention, I claim:—

1. A cord coiler comprising a coiled spring having sections connected with one another by substantially S-shaped bends.

2. A cord coiler comprising a coiled spring having a plurality of relatively straight sections overlapping one another at the ends thereof and bent members connecting the overlapped ends of adjacent sections.

3. The combination with an electric conductor and a sheath therefor, of a coiling wire housed within said sheath and normally lying in juxtaposed circumvolutions, each of said circumvolutions containing a plurality of sinuous bends each making a turn of approximately 180 degrees within a distance transverse to the axis of the sheath materially less than the inner diameter of the sheath of the cord, said circumvolutions being separable from one another upon pulling the ends of said conductor and the separation of such circumvolutions flexing the coiler at the sinuous bends in each circumvolution and thereby minimizing the application of torque to said wire about its own axis.

4. The combination with a plurality of electric conductors and a sheath housing all of said conductors, of a coiling wire housed within said sheath and normally lying in juxtaposed circumvolutions, each of said circumvolutions containing a plurality of sinuous bends each making a turn of approximately 180 degrees within a distance transverse to the axis of the sheath materially less than the inner diameter of the sheath of the cord and a substantially cylindrical collar encircling said conductors, an end of said wire being connected with and anchored by said collar.

5. The combination with a plurality of insulated conductors arranged in parallel, a sheath housing said conductors, of a coiling wire lying between said parallel conductors and housed within said sheath, said coiling wire normally lying in juxtaposed circumvolutions, each of said circumvolutions containing a plurality of sinuous bends each making a turn of approximately 180 degrees with-

in a distance transverse to the axis of the sheath materially less than the inner diameter of the sheath of the cord, said circumvolutions being separable from one another upon pulling the ends
5 of said conductors, and the separation of such circumvolutions flexing the coiler at the sinuous bends in each circumvolution and thereby minimizing the application of torque to said wire about its own axis.

10 6. The combination with an electric appliance

cord of a circumvoluting coiler therefor, and means for securing the ends of said coiler to said cord and comprising a collar having a recess for the reception of the end of said coiler said recess being formed by an integral bight of said collar, and said coiler passing with said cord through
5 said collar and having an end bent backward over the outer surface of such collar and engaged in said recess by said bight.

HOWARD M. HAY. 10