

Nov. 15, 1927.

1,649,310

E. A. JOLINE

FLEXIBLE SHAFT

Filed Sept. 23, 1924

FIG. 1.

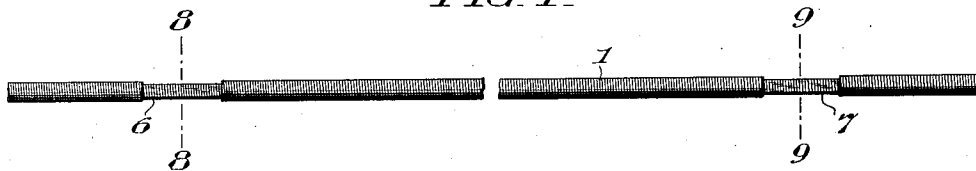


FIG. 2.

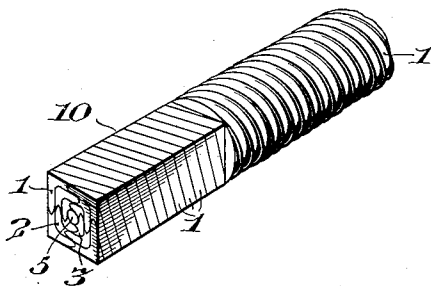


FIG. 3.

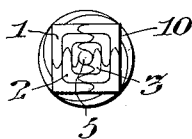


FIG. 4.

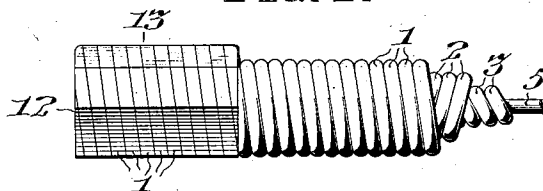
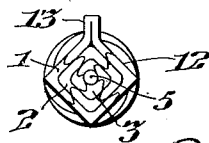


FIG. 5.



Inventor

Emmet A. Joline,

By *Clifton C. Hallowell*

Attorney

Patented Nov. 15, 1927.

1,649,310

UNITED STATES PATENT OFFICE.

EMMET A. JOLINE, OF TOTTENVILLE, NEW YORK, ASSIGNOR TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

FLEXIBLE SHAFT.

Application filed September 23, 1924. Serial No. 739,270.

My invention relates particularly to that class of flexible shafts that are formed by coiling or twisting together, a plurality of strands of wire preferably wound closely about a core, and is especially directed to the terminal tips of the individual cut lengths of such shaft, which not only serve to prevent untwisting of the coils of the shaft, but which may also serve to provide convenient means of attachment of the driving or driven elements which said shaft is adapted to connect.

It has been common practice in the manufacture of such flexible shafts, to prevent the uncoiling or separating of the coils forming the shaft, by the application of solder adjacent to the extremities of the individual lengths of the cable to which a fitting, having a spline or key may be secured to provide an attachment for the connecting elements.

The principal objects of my invention are to provide a flexible shaft with terminal tips that will efficiently prevent the accidental displacement of the strands of the fabricated shaft, and that will tend to greatly decrease the cost of production of such shaft.

Other objects of my invention are to provide a flexible shaft having its terminals so distorted and shaped as to afford a convenient attaching means, without the necessity of employment of a separately provided ferrule or sleeve providing an attaching tip.

My invention includes a flexible shaft having its extremities swaged to provide a terminal tip with a fin or projection formed in unitary relation with the body of said shaft, and affording a spline or key for the convenient engagement of connecting elements.

The form of my invention, as hereinafter described, comprises shafting preferably formed in continuous length, and having regions at predetermined distances apart, swaged to compress the strands into such interlocked relation that when cut lengths are severed through said swaged region, the strands at the severed ends will be so inter-engaged as to cling together and remain inert.

My invention also includes all of the various novel features of construction and arrangement as hereinafter more definitely specified.

In the accompanying drawings, Figure 1 is a fragmentary side elevational view of a

continuous length of coiled wire shafting, swaged at predetermined distances apart in accordance with my invention; Fig. 2 is a fragmentary perspective view of the end of a cut length of said shaft which has been severed through the swaged region, and which affords a terminal tip; Fig. 3 is an end elevational view of the tipped shaft shown in Fig. 2; Fig. 4 is a side elevational view of a shaft wherein the swaged terminal tip is provided with a fin or spline forming a key; and Fig. 5 is an end elevational view of the shaft shown in Fig. 4.

In said figures, the shaft as shown is formed by coiling several layers of wire strands 1, 2, and 3 in alternately opposite directions about a wire strand mandrel or core 5, whereby continuous or long lengths of shafting may be fabricated, from which cut lengths for commercial purposes may be severed.

As shown in Fig. 1, the shaft is swaged at predetermined distances apart to provide constricted regions 6 and 7, formed by so compressing the body of the shaft by the swaging operation, as to so mash or crush the wire strands into such a compact mass as to distort and interlock them, and thereby so disturb their continuity as to cause them to cling together and remain inert, without the necessity of being retained by solder or bound by a collar or ferrule, whereby said shaft may be severed through said constricted regions on the dot and dash lines 8-8 and 9-9 to form cut lengths, the terminal of one of which is shown in Fig. 2.

As shown in Fig. 2, the shaft terminal thus formed affords a polygonal terminal tip 10 which as shown is square, but which obviously, may be of any other configuration, and which serves as a convenient means of attachment with the connecting elements of driving or driven devices which said shaft may connect.

As shown in Figs. 4 and 5, the shaft formed of the wire strands 1, 2, 3, and 5, has its terminal tip 12 so swaged as to provide the fin or spline 13, which may serve to engage in a complementary groove or slot in the connecting element.

My invention is advantageous, in that the shaft constructed in accordance with my invention may be severed without the employment of solder or other extraneous means to retain the cut ends of the wire strands, and

the terminal tips thus provided afford adequate means of connection with the connecting elements. Thus the expense of soldering or brazing, and the consequent necessity of grinding, or the attendant rusting caused by the use of flux, is eliminated. Furthermore, a shaft so constructed may be employed without connecting means other than the formed terminal tips which are integral with the shaft as shown, to engage directly with the connecting elements of the driving or driven device.

Although I have shown for illustration, terminal tips of square formation, said tips may be otherwise polygonal, or may be cylindrical in form if desired, and therefore, I do not desire to limit my invention to the precise details of construction and arrangement as herein specified, as it is obvious that various modifications may be made therein without departing from the essential features of my invention as defined in the appended claims.

Having thus described my invention, I claim:

1. A coiled wire flexible shaft having its terminals swaged, and the wire strands forming the shaft so distorted and interlocked thereby as to of themselves maintain said terminals inert and the shaft intact.

2. A coiled wire flexible shaft having its terminals swaged into polygonal form to provide sharply defined angular corners, and thereby so set the individual strands as to of themselves prevent their relative displacement, and afford means of attachment for connecting devices.

3. As an article of manufacture, a coiled wire flexible shaft having its terminals swaged to form a spline, and to so distort and interlock the wire strands, as to prevent their relative displacement.

4. The method of forming terminal tips on coiled wire flexible shafts, which consists in producing a distortion of the shaft, by swaging the coiled wire strands of the shaft body by dies contacting directly therewith.

5. A coiled wire flexible shaft having its terminals reduced by swaging, and the wire

strands so distorted and interlocked thereby as to prevent their displacement and to afford a shoulder between the distorted and undistorted portions forming a stop against which a separate removable connecting element may engage.

6. The method of producing lengths of flexible shaft which comprises winding wire strands into a flexible cable of indefinite length, swaging said cable at predetermined regions, and cutting through said swaged regions to form individual shaft lengths.

7. A wound cable of indefinite length provided with polygonally swaged regions through which said cable may be severed to form shaft sections having inert reduced polygonal terminals for engagement with a separate connecting element.

8. As an article of manufacture, a coiled wire flexible shaft having its terminals swaged by direct contact of the wire strands with the swaging dies, and so reduced thereby as to afford flattened outer surfaces on the outer strands and to effect such interlocking of the outer and inner strands as to of themselves render the terminals of said shaft inert and thereby prevent uncoiling of said strands.

9. A coiled wire flexible shaft built up by a plurality of layers of wire strands alternately laid in different directions, and having stresses between said layers tending to relatively shift the wire strands of the respective layers, and having its terminals swaged and the individual strands so distorted thereby as to effect such embedding of the relatively crossed strands into each other as to prevent any relative slipping or uncoiling of said strands.

10. As an article of manufacture, a coiled wire flexible shaft having its terminals swaged to so distort and interengage the wire strands as to prevent uncoiling, and to form the outer strands into attaching means for engagement with a separate connecting element.

In witness whereof, I have hereunto set my hand this 18th day of Sept., A. D., 1924.
EMMET A. JOLINE.