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3,123,913

ORTHODONTIC ARCH WIRE

Filed June 30, 1961

FIG. 1

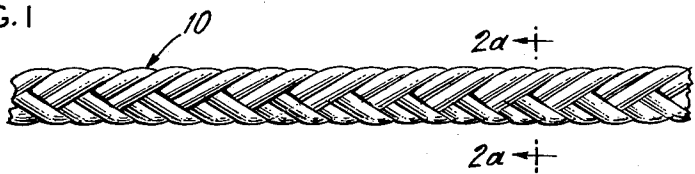


FIG. 2a

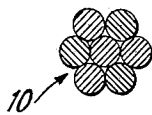


FIG. 2b

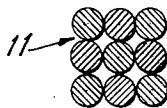


FIG. 2c

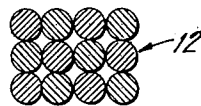


FIG. 3

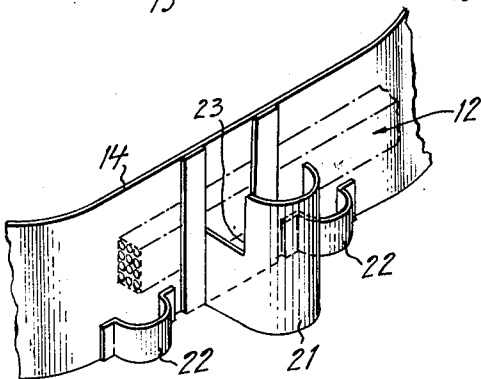
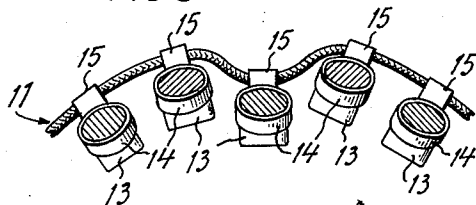
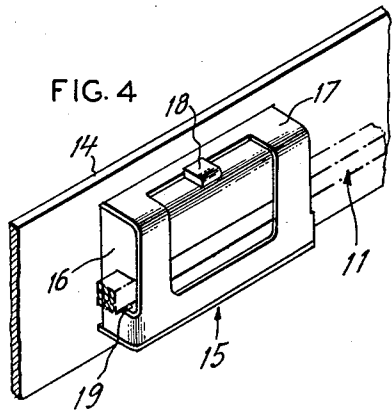


FIG. 5

FIG. 4



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ORTHODONTIC ARCH WIRE

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2 Claims. (Cl. 32-14)

This invention relates to a novel orthodontic arch wire construction and to novel methods of using same. More particularly, the invention relates to a braided orthodontic arch wire, and is more particularly directed to the use of differently configured braided wire as an orthodontic arch wire.

Orthodontic arch wires are well known in the art and have been constructed from solid stock of varying shapes and sizes. Orthodontists have used light arch wires, heavy arch wires, a combination of light and heavy arch wires, ribbon or flat arch wires, rectangular arch wires, and other combinations and configurations in search for the most desirable arch wire. Twisted strands of wire have also been used. These arch wires are engaged by brackets attached to a patient's teeth and exert forces in the proper direction to correct malocclusions or otherwise straighten crooked teeth. The most desirable arch wire from both the viewpoint of the orthodontist and the patient would be the smallest possible wire that would exert the necessary restoring or straightening force on the teeth and one that would be easily handled by the orthodontist.

It is known in the heavy spring art that a coil spring may be made of a plurality of braided wires which are hardened or tempered subsequent to braiding. Such a spring proved advantageous to construct since the wires could be more evenly tempered when composed of a plurality of lighter-gage wires as opposed to a single, heavy-gage wire. However, the prior art was not concerned with the resiliency of extremely small-gage wires. In making the invention disclosed herein, it was found that the resiliency of solid wire varies inversely with the cross-section of the wire. Thus, an orthodontic arch wire composed of a plurality of spring-temper, small cross-section wires would have a greater resiliency than a solid wire of the same material having the same total cross-section, thereby allowing a smaller total cross-section to be used to accomplish the same result.

Accordingly, it is an object of this invention to provide a braided arch wire having greater resiliency than a solid wire of same material having an identical total cross-section.

A further object of the invention is to provide a resilient braided wire which can be woven into any desired cross-sectional configuration.

Another object of the invention is to provide an orthodontic arch wire of high resiliency.

A further object of the invention is to provide a small cross-sectional area arch wire having high resiliency as compared with its size.

A still further object of the invention is to provide an orthodontic arch wire which will have high distortion and fatigue limits.

Still another object of the invention is to provide a method for straightening teeth utilizing an arch wire of minimal cross-section.

Other and further objects of the invention will be obvious from the specification.

Generally speaking, in accordance with this invention, small gage spring temper wires are braided or woven together to provide a resilient wire for use as an arch wire. The wire may be woven into any desired cross-section, such as square, round or rectangular. The wire may be used for straightening teeth in conjunction with other orthodontic appliances.

For a better understanding of the invention, reference

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is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out with particularity in the appended claims.

In the drawing:

FIG. 1 is a view showing a length of wire constructed in accordance with the invention;

FIG. 2a is a sectional view taken along line 2a-2a of FIG. 1 showing a section of wire having circular cross-section;

FIG. 2b is a sectional view showing an alternate form of braiding construction providing a wire having a square cross-section;

FIG. 2c is a sectional view showing an alternate form of braided construction providing a wire having a rectangular cross-section;

FIG. 3 is a sectional view of five adjacent teeth interconnected by a length of braided wire;

FIG. 4 is a perspective view of an arch wire engaging bracket securing a section of braided wire having a square cross-section;

FIG. 5 is a perspective view of a ligating bracket engaging a length of braided wire having a rectangular cross-section;

Referring now to FIGS. 1 and 2a, a length of braided wire 10 is constructed from seven strands of tempered wire braided together to provide a single length of wire having a circular cross-section. Assuming that each wire has a .010" diameter, braided to form a wire having a .070" diameter, the resiliency of the braided wire would be far greater than the resiliency of a .070" diameter solid wire of the same material and having the same temper as the smaller wires. After braiding, the wire may be stress relieved thereby providing a resilient wire having better fatigue properties than a solid wire of the same size, the fatigue properties of the braided wire being akin to those of the much smaller individual strands. Depending upon the use contemplated for the resilient wire, a fewer number of larger diameter strands may be braided where only a small motion or deflection of the wire is desired and, for greater movement, a larger number of smaller diameter strands may be braided together.

Referring now to FIG. 2b, it is seen that nine wires, for example, may be braided together to form a resilient wire 11 having a square cross-section. In FIG. 2c, 12 wires, for example, are braided together to form a resilient wire 12 having a rectangular cross-section.

Referring now to FIG. 3, five teeth 13 each have a band 14 attached therearound. An arch wire engaging bracket 15 is attached to each of the bands 14 and a length of braided wire 11 is secured in each of the bands. The resilient wire 11 is secured so as to exert a force on the middle tooth 13 to cause it to move into proper position with relation to the other teeth.

Since this orthodontic appliance is in the patient's mouth, it is desirable to have the hardware as small as possible to effect the smallest possible amount of discomfort to the patient. The braided arch wire, having greater resiliency than a solid wire of the same cross-sectional area, can be made smaller than an equivalent solid wire exerting the same force required to straighten the tooth. By allowing use of a smaller wire, the bands 14 and the engaging brackets 15 may also be of reduced size resulting in additional comfort to the patient without any loss of effectiveness of the arch wire.

Referring now to FIG. 4, a band 14 having one form of arch wire engaging bracket 15 attached thereto secures resilient wire 11 as intended. The arch wire engaging bracket 15 is of novel construction and is fully described in co-pending United States application Serial No. 89,469 now Patent No. 3,091,857, filed February 15, 1961, by James M. Rubin et al. Briefly, the engaging bracket 15 has a body portion 16 and a cover portion 17 which is

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hinged to the body portion and latched by a latch 18. A groove 19 running the length of body portion 16 accommodates the arch wire 11, and the arch wire is secured once the cover portion is latched. It is easily seen that if the body portion 16 is provided with a square shaped groove 19 and the arch wire 11 has a square cross-section, the arch wire will be locked in the groove when the cover is latched.

Referring now to FIG. 5 and an alternate form of arch wire engaging bracket, a band 14 has a bracket 21 attached thereto. Two hooks 22 are also attached to band 14. The bracket has a cut-out 23 therein which accommodates a length of resilient wire 12 having a rectangular cross-section. The wire 12 is secured by means of ligating wires (not shown) which lash the resilient wire to hooks 22.

Many other types of arch wire engaging brackets are in use today, and the braided resilient wire of this invention may be successfully used with any of them. The brackets shown in FIGS. 4 and 5 are for purposes of illustration only.

The application has particularly pointed out and distinctly claims the part, improvement or combination claimed as the invention or discovery and there has been explained the principles thereof and best modes contemplated for applying those principles so as to distinguish this invention from other inventions.

While there has been shown and described preferred embodiments of the invention, it will be understood that modifications may be made without departing from the spirit and scope thereof, as will be clear to those skilled in the art.

What is claimed is:

1. In a device for straightening teeth comprising tooth bands attached to a group of teeth, at least one of which

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requires straightening, wherein each of said tooth bands has an arch wire bracket attached thereto with a length of orthodontic arch wire secured by said brackets, the improvement comprising said arch wire being composed of a plurality of braided-together, spring-tempered, light-gage wires.

2. In a device for straightening teeth comprising tooth bands attached to a group of teeth, at least one of which requires straightening, wherein each of said tooth bands has an arch wire bracket attached thereto with a length of orthodontic arch wire secured by said brackets, the improvement comprising said arch wire being composed of a plurality of braided-together, spring-tempered, stress-relieved, light-gage wires.

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