Sept. 27, 1966 C. E. PILE 3,274,658

CLAMPING DEVICES

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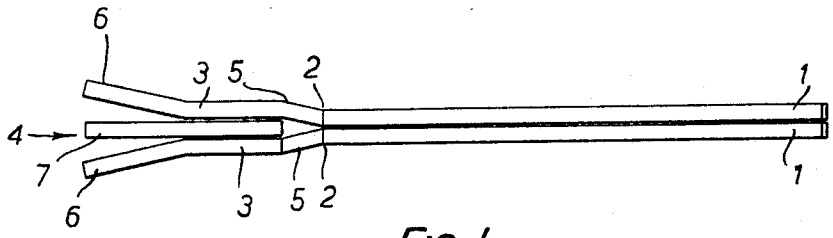

FIG. 1.

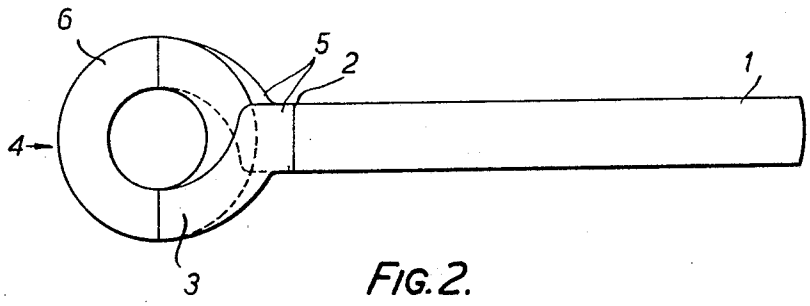

FIG. 2.

INVENTOR
C. E. Pile
BY
Holcomb, Wetherill & Brisebois
ATTORNEY

United States Patent Office

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CLAMPING DEVICES

Charles Edward Pile, Greenford, Middlesex, England, assignor to Down Bros. and Mayer & Phelps Limited, Mitcham, England, a British company

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This invention relates to clamping devices which include clamping members that are continually resiliently urged towards the clamping position, for example, by means of a spring.

The invention provides a clamping device which comprises a pair of clamping members and a coil spring (as hereinafter defined) having at least three superposed coils, one end of one clamping member being secured to one of the outer coils of the spring at, or at a point towards, the free end of the outer coil, and one end of the other clamping member being secured to the other outer coil of the spring at, or at a point towards, the free end of the outer coil, in such a position that the two clamping members cooperate with one another in the closed position, at least a portion of at least one, and preferably both of the outer coils being inclined outwardly from the plane of the or an inner coil to form a lever, the arrangement being such that when the inclined portion is brought towards the adjacent coil the clamping members are separated against a restoring force arising at least in part from torsion in the inner coil or coils.

The term "coil spring" is used throughout this specification to mean not only springs having circular coils but also springs havings coils of other shapes, for examples, coils of elliptical of polygonal shape. Advantageously, however, the coils are circular and preferably the spring has only three coils but the number of coils will, in any particular case, be determined by the clamping pressure desired in the device. Preferably, each coil of the spring is in contact with the adjacent coils over at least a part of its length.

The clamping members are advantageously attached to the outer coils at the free ends thereof and, in this case, the free end portions of the outer coils may be inclined away from the axis of the spring into the direction in which the clamping members extend. The clamping members may be made from a material that is the same as or different from the material from which the spring is made and may, in the former case, be formed integrally with the spring.

The whole of one or both outer coils may be inclined away from the plane of the or an inner coil or only a portion of one or both outer coils need be so inclined provided that sufficiently good leverage for separating the clamping members can be obtained. When portions of both outer coils are inclined outwardly from the plane of the or an inner coil, the two portions are corresponding portions of each coil and the inclined portions are advantageously that half of each outer coil that is remote from the clamping member secured thereto, for example, the outer coils may each be bent at the two ends of the diameter that is perpendicular to the direction in which the clamping members extend. The maximum separation of the clamping members will depend on the angle at which the portions of the outer coils are inclined away from the plane of the or an inner coil as well as on the points of bending and therefore this angle will be governed by the opening desired for the clamping members. The leverage obtained will depend on the projection of the inclined portions of the outer coils on the plane of the or an inner coil and is therefore dependent both on the length of the inclined portion and on the angle of inclination of the inclined portion to the plane of the or an inner coil. As the angle of inclination decreases, the leverage obtained increases so that the increase in the couple required to separate the clamping members is counteracted, at least in part.

The clamping device of the invention is especially suitable for use as a surgical clamp, for example, as an aneurism clip or a scalp clamp, but it may also be used in any application for which a clip having clamping members which are constantly urged towards the clamping position is required, for example, clothes pegs or hair curlers. The exact configuration of the clamping members will depend on the use to which the clamping device is to be put.

One form of clamping device constructed in accordance with the invention will now be described in greater detail by way of example with reference to the accompanying drawings in which:

FIG. 1 is a side elevation; and

FIG. 2 is a plan view.

Referring to the drawings, the clamping device has a pair of clamping members **1**, which are secured at **2** to the two outer coils **3** of a coil spring, which is indicated generally by the reference numeral **4**. The two free end portions **5** of the spring **4** are inclined away from the axis of the spring **4** into the direction in which the clamping members **1** extend and the clamping members **1** are secured to the ends **5** of the spring **4**. The two outer coils **3** of the spring **4** each have a portion **6** which is inclined away from the plane of the inner coil **7**, a bend being made at opposite ends of the diameter which is perpendicular to the direction in which the clamping members **1** extend.

A force applied to the bent portions **6** of the outer coils **3** to bring them towards one another pivots each outer coil **3** and the attached clamping member **1** about the line on which the coil **3** is bent and causes the clamping members **1** to separate. The torsion created in the spring **4** opposes the separation of the clamping members **1** so that when the force on the outer coils **3** is released the clamping members **1** spring back to the clamping position.

I claim:

1. A clamping device comprising a pair of co-operating clamping members and at least three superposed coils forming a coil spring, one of the outermost of said coils being secured, in the region of the free end of said outermost coil, to one end of one of said clamping members, and the other of the outermost of said coils being secured, in the region of the free end of said other outermost coil, to one end of the other of said clamping members, at least a portion of at least one of said outermost coils being inclined outwardly from a plane parallel to the plane of the adjacent coil of said spring to form a lever that, when brought towards said adjacent coil, causes said clamping members to separate against a restoring force arising at least in part from torsion in the portion of the spring between the said outermost coils.

2. A clamping device comprising a pair of co-operating clamping members and at least three superposed coils forming a coil spring, one of the outermost of said coils being secured, in the region of the free end of said outermost coil, to one end of one of said clamping members, and the other of the outermost of said coils being secured, in the region of the free end of said other outermost coil, to one end of the other of said clamping members, at least a portion of each of said outermost coils, said portions being corresponding portions, being inclined outwardly from a plane parallel to the plane of any of the other coils of said spring to form levers that when brought towards one another cause said clamping members to separate against a restoring force arising at least in part from torsion in that portion of the spring between said outermost coils.

3. A clamping device according to claim 2, wherein said spring comprises at least three circular coils.

4. A clamping device comprising a pair of co-operating clamping members and three superposed circular coils forming a coil spring, one of the outer coils being secured, in the region of the free end of said coil, to one end of one of said clamping members and the other of the outer coils being secured, in the region of the free end of said other coil, to one end of the other of said clamping members, at least a portion of each of said outer coils, said portions being corresponding portions, being inclined outwardly from the plane of the inner coil to form levers that when brought toward one another cause said clamping members to separate against a restoring force arising at least in part from torsion in said inner coil.

5. A device according to claim 4, wherein said inner coil is in contact with said outer coils over a portion of its length.

6. A clamping device comprising a pair of co-operating clamping members and three superposed circular coils forming a coil spring, one of the outer coils being secured at its free end to one end of one of said clamping members and the other of the outer coils being secured at its free end to one end of the other of said clamping members, at least a portion of each of said outer coils, said portions being corresponding portions, being inclined away from the plane of the inner coil to form levers that when brought towards one another cause said clamping members to separate against a restoring force arising at least in part from torsion in said innermost coil.

7. A device according to claim 6, wherein the free end

portions of said outer coils extend radially outward away from the axis of said spring into the direction in which the clamping members extend.

8. A device according to claim 7, wherein said clamping members are formed integrally with said spring.

9. A device according to claim 8, wherein only a portion of each of said outer coils is inclined outwardly from the plane of said inner coil, said inclined portion being that half of each outer coil that is remote from the clamping member secured thereto.

10. A clamping device comprising a pair of co-operating clamping members and three superposed circular coils forming a coil spring, one of the outer coils being secured at its free end to one end of one of the clamping members, and the other of the outer coils being secured at its free end to one end of the other of said clamping members, the half of each of said outer coils that is remote from the clamping member secured thereto being inclined outwardly from the plane of the inner coil to form levers that when brought towards one another cause the clamping members to separate against a restoring force arising at least in part from torsion in said innermost coil.

References Cited by the Examiner

UNITED STATES PATENTS

2,888,938	6/1959	Hilaire	24—259 X
2,928,152	3/1960	Henneberry	294—99 X

GERALD M. FORLENZA, *Primary Examiner.*

G. F. ABRAHAM, *Assistant Examiner.*