United States Patent

Pearson

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[45] **July 18, 1972**

[54] SPRING LOADED HINGE

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[73] Assignee: **The Gillette Company,** Boston, Mass.

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[21] Appl. No.: **9,652**

[52] **U.S. Cl.**.....**24/2.52 HC,** 24/67.5, 24/67.7, 132/48, 16/171, 16/180

[51] **Int. Cl.**.....**A44b 21/00**

[58] **Field of Search**.....24/252 R, 252 HC, 252 CP, 24 HC, 24/67.5, 67.7, 137 A; 132/48; 220/31 S; 16/171, 180, 181, DIG. 13

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Assistant Examiner—Peter A. Aschenbrenner
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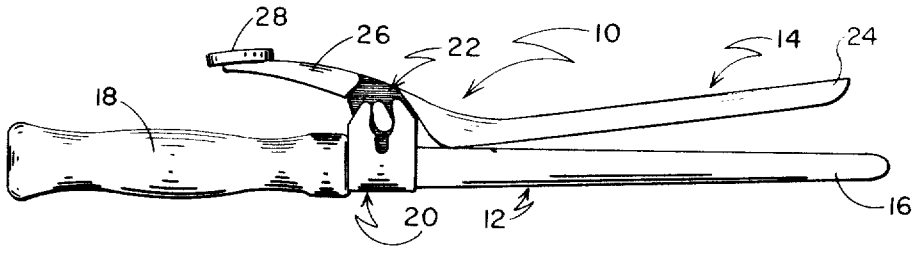
[57] **ABSTRACT**

A pair of members hingedly connected together for relative rotation about an axis, one of the members including a stud extending outwardly therefrom generally coaxially with the axis, the other member defining a socket for receiving the stud, and the stud and socket being so sized and shaped that relative rotation of the two in one direction produces forces tending to cause relative rotation in the opposite direction.

18 Claims, 12 Drawing Figures



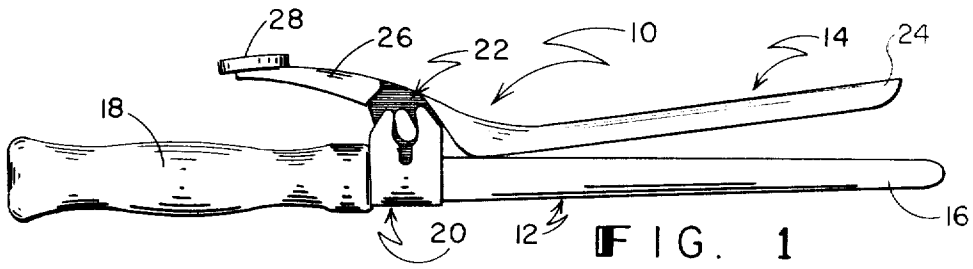


FIG. 1

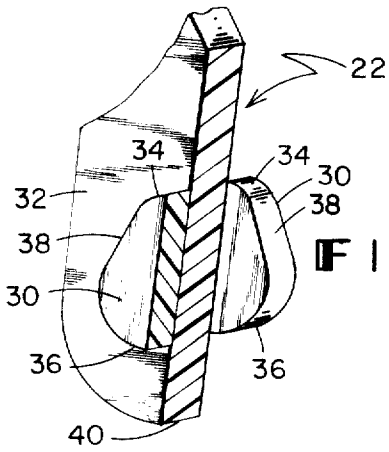


FIG. 2

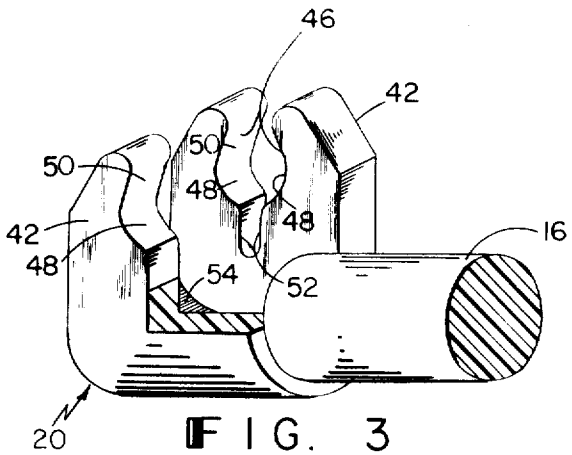


FIG. 3

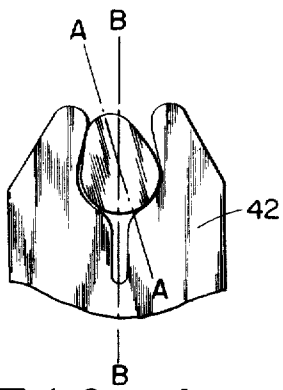


FIG. 4

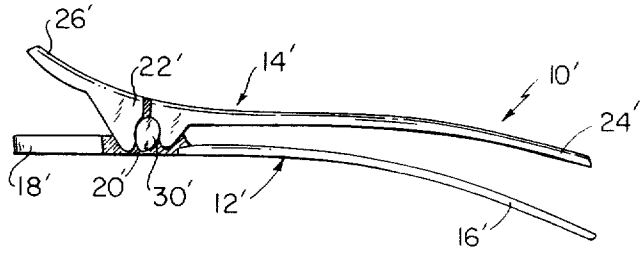
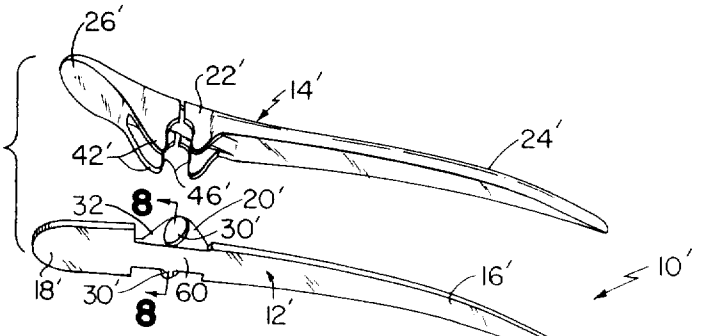


FIG. 5

FIG. 6



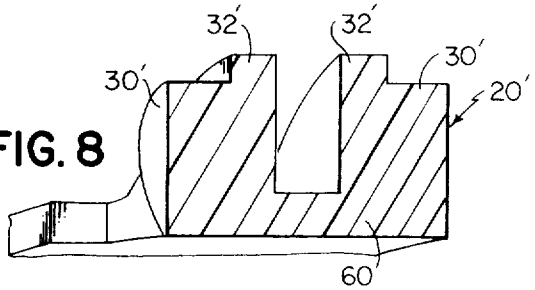


FIG. 8

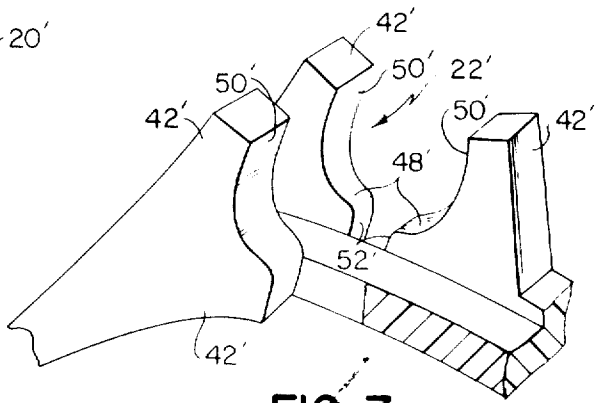


FIG. 7

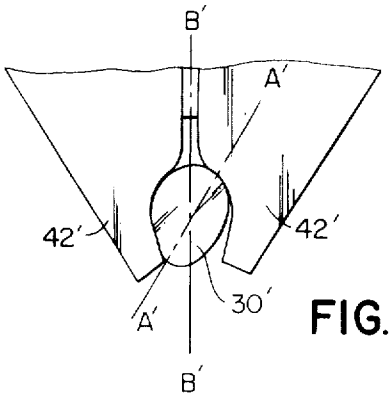


FIG. 9

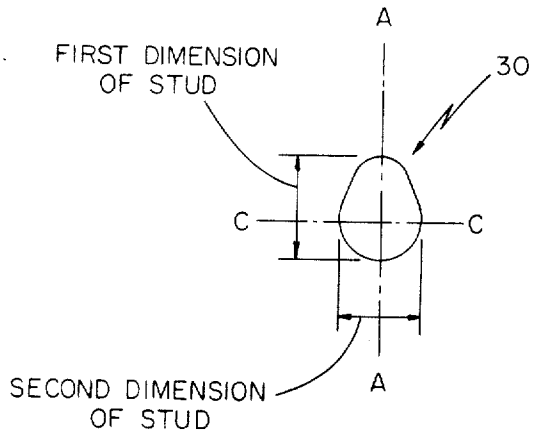


FIG 10

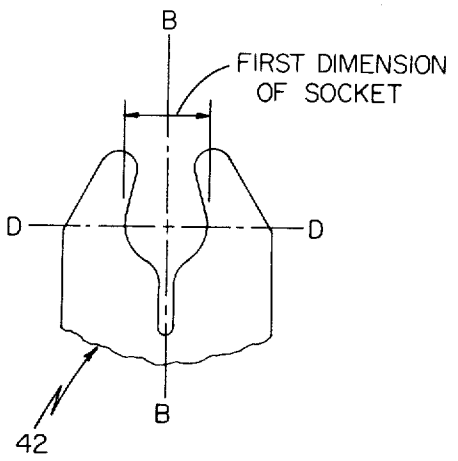


FIG 11

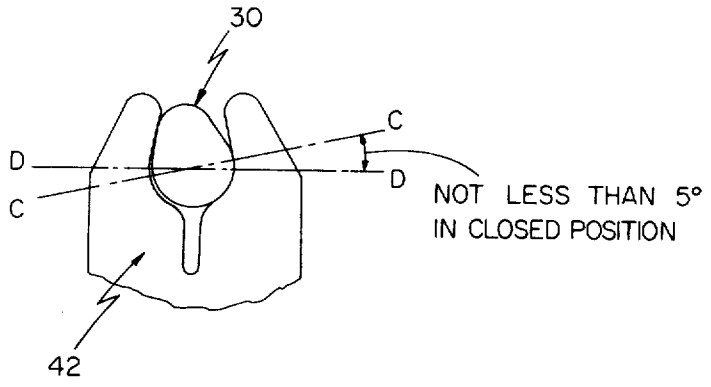


FIG 12

SPRING LOADED HINGE

This invention relates to hinge constructions and, more particularly, to hair clip hinge structures.

It is a principal object of the invention to provide a two-piece, spring-loaded hinge construction. Other objects include providing hinge constructions of the type mentioned which are easily assembled, have a spring action and tension equal or better than that of more complex existing constructions, and which provide a constant tension for gripping in the closed position.

The invention features a pair of members hingedly connected together for relative rotation about an axis, one of the members including a stud extending outwardly therefrom generally coaxially with the axis, the other member defining a socket for receiving the stud, and the stud and socket being so sized and shaped that relative rotation of the two in one direction produces forces tending to cause relative rotation in the opposite direction. In preferred embodiments in which the members are of resilient organic plastic and form a hair clip, one member includes two symmetric eccentric studs, the other member defines two, symmetric sockets, open at the top and including a lower relief slot, and the lines of symmetry of the studs form an acute angle with the lines of symmetry of the sockets when the clip is closed, thereby exerting a positive gripping force.

Other objects, features and advantages will appear from the following detailed description of preferred embodiments of the invention, taken together with the attached drawings in which:

FIG. 1 is a side view of a hair clip embodying the present invention;

FIGS. 2 and 3 are perspective views, partially in section, of portions of the clip of FIG. 1;

FIG. 4 is a plan view of a portion of the clip of FIG. 1;

FIG. 5 is a side view of a second hair clip embodying the invention;

FIG. 6 is a perspective, exploded view of the clip of FIG. 5;

FIGS. 7 and 8 are perspective views, partially in section, of portions of the clip of FIG. 5;

FIG. 9 is a plan view of a portion of the clip of FIG. 5 and,

FIGS. 10 through 12 are diagrammatic views of the clip of FIG. 1.

Referring more particularly to FIGS. 1–4, there is shown a hair clip, generally designated 10 and having an overall length of approximately 6½ in., consisting of two pieces, base 12 and closure 14, of molded synthetic plastic. The general overall configuration of clip 10 is similar to that of the well-known Marcel curling iron and, with the exception of its hinge construction, will be described only briefly.

Base 12 includes, in spaced, generally coaxial alignment, a gripping portion comprising a tapering rod 16, a handle 18 having an undulating peripheral handling surface, and an intermediate hinge structure 20. Closure 14 includes a central hinge structure 22 and, on opposite ends thereof, a gripping portion comprising a rod engagement portion 24 and an operating handle 26. Rod engagement portion 24 is generally semi-circular in transverse cross-section and is adapted for overlying and engaging rod 16 of base 12 when the base and closure are assembled. Operating handle 26 is angularly offset relative to rod engagement portion 24 and has, at its free end, a circular button 28.

Reference is now made to FIG. 2 wherein the hinge structure 22 of closure 14 is illustrated in greater detail. As there shown, hinge structure includes a pair of identical, axially aligned, eccentric studs 30 projecting outwardly (perpendicular to the axis of rod engagement portion 24) from the opposite sides of a rectangular in transverse cross-section central support 32. Each stud is approximately one-eighth in. long, is symmetrical about a central transverse plane A—A (see FIG. 4) extending along its axis of rotation. Each stud has dimensions, measured in a plane perpendicular to its axis of rotation, such that its first dimension, measured along A—A, is greater than its second dimension measured perpendicularly thereto along line C—C (FIG. 10). In the specific embodiment shown, the periphery of each stud is defined by an upper cylindrical surface 34 (radius 0.63 in.) and a lower cylindrical surface 36 (radius 0.93 in.), connected by a pair of relatively inclined tangential planar surfaces 38. The first dimension (overall height) of the stud is 0.250 in.; its second dimension (overall width) is 0.186 in. The thickness of central support 32 is 0.140 in. Its lower surface 40 is defined by a cylinder, coaxial with cylindrical surface 36 and having a radius of 13/64 in.

Referring now to FIG. 3, the hinge structure 20 of base 12 includes a pair of identical, parallel, transversely spaced lugs 42 extending upwardly, 0.155 in. apart, from an intermediate support. Each lug 42 is 0.090 in. thick and one-half in. long and includes a socket 46 for receiving one of studs 30 extending through the thickness thereof. Each socket 46 is open at the top and symmetrical about transverse (to clip 10) vertical plane B—B (see FIG. 4) extending through the center of both sockets. The periphery of each socket 46, which is everywhere either planar or concave, is in major part defined by a lower cylindrical surface 48 (3/32 in. radius) and a pair of upwardly converging planar surfaces 50 whose lower ends are tangential to surface 48 and whose upper ends (0.112 in. vertically above the axis of cylindrical surface 48) are 9/64 in. apart. Each socket consequently have a width, (first dimension) measured along line D—D (FIG. 11) in a plane perpendicular to the center line through both sockets, and in a direction generally transversely to plane B—B and to the open top of the socket, which is less than the height of the studs. Each lug 42 also defines a relief slot 52 (0.60 in. wide) extending vertically downwardly from the bottom of socket 46 to a point 0.200 in. below the axis of cylindrical surface 48. The upper surface 54 of the intermediate support is defined by a cylinder of 9/32 in. radius coaxial with cylindrical surface 48.

Studs 30 and sockets 46 are so sized relative to each other that each stud will fit snugly within a socket with axes A—A of the studs and axes B—B of the sockets aligned. If the studs and sockets are rotated relative to each other so that axis A—A forms an acute angle with axis B—B, the eccentric shape of studs 30 forces the portions of lugs 42 defining sockets 46 apart. The inherent elasticity of the plastic material defining sockets 46 causes the inner surfaces of the sockets in turn to bear against the studs, and the resultant forces tend to cause relative rotation of the studs and sockets in the direction which will decrease the divergence between axes A—A and B—B.

In practice, clip 10 is assembled by placing central support 32 of closure 14 between lugs 42 of base 12 and snapping studs 30 into sockets 46. With reference to FIG. 12, the clip is so constructed that, with the clip in its closed position with rod engagement portion 24 of closure 14 overlying and engaging rod 16 of base 12, i.e., with no hair between the two, there is a positive angle of divergence of not less than 5° between lines C—C and D—D along which, respectively, the second dimension of stud 30 and the first dimension of socket 42 are measured. Axes A—A and B—B, of course, form an equal angle (see FIG. 4). This positive angle of divergence, which in the disclosed preferred embodiment is approximately 15°, provides a positive gripping force between portion 24 and rod 16.

When clip 10 is in closed position, in the embodiment shown, portion 24 is in contact with rod 16 throughout substantially its entire length in the absence of any hair between the two parts. However, it may be desirable in some cases to have these parts contact each other only adjacent the tips of their free ends, so that more uniform pressure can be exerted on a hair tress of uniform thickness and of substantial width disposed along the length of rod 16. In either case, when the clip has been opened so that portion 24 has been separated even slightly from rod 16, base 12 and closure 14 are in contact with each other only through lugs 42 and studs 30.

Reference is now made to FIGS. 5–9 wherein is illustrated another form of hair clip, generally designated 10', constructed according to the present invention. Portions of clip 10' that are similar to corresponding portions of clip 10 will be

identified by the same reference numerals used in describing clip **10** but with a prime (') added. As shown, the clip consists of a base **12'** and a closure **14'** of molded plastic. Base **12'** includes a longitudinally curved and tapering, substantially rectangular in transverse cross-section gripper **16**, a flat handle **18'** and an intermediate hinge structure **20'**. Closure **14** comprises a central hinge structure **22'** and, on opposite sides thereof, a longitudinally curved and tapering, substantially rectangular in transverse cross-section gripping portion **24'** and an angularly offset, operating handle **26'**. As shown, the adjacent surfaces of gripper **16'** and gripping portion **24'** are adapted engaging each other when the clip is closed.

The principal difference between the hinge structures of clip **10'** and clip **10** is that the studs and sockets of clip **10'** are part, respectively, of base **12'** and closure **14'**, while in clip **10** the reverse is true. Thus, hinge structure **20'** of base **12'** includes a pair of axially aligned, eccentric studs **30'**, each of which projects outwardly from an outer face of one of a pair of transversely spaced, upstanding supports **32'**. Each stud is symmetrical about a central transverse plane A'—A' and has a first dimension, measured along plane A'—A', greater than its second dimension extending perpendicularly thereto. The base of each support **32'** is secured to the flat portion **60** of base **12'** intermediate handle **18'** and gripper **16'**.

Hinge structure **22'** of closure **14'** includes four lugs **42'**, arranged in transversely spaced pairs and extending downwardly from an intermediate support. Each pair of lugs **42'** defines socket **46'**, open at the bottom and symmetrical about transverse plane B'—B', for receiving one of studs **30'**. The periphery of each socket **46'** is defined by an upper cylindrical surface **48'** and a pair of downwardly converging planar surfaces **50'** whose upper ends are tangential to surface **48'** and whose lower ends are spaced apart. A relief slot **52'** extends vertically upwardly from the top of socket **46'** to the top of closure **14'**. The first dimension or width of each socket **46'**, measured in a plane perpendicular to the center line through the center of both sockets and generally transversely to plane B'—B', is less than the first dimension of studs **30'**.

Studs **30'** and sockets **46'** are so sized relative to each other that each stud will fit snugly within a socket with axes A'—A' of the studs and axes B'—B' of the sockets aligned. If the studs and sockets are rotated relative to each other so that the axes form an acute angle, the eccentric shape of studs **30'** forces the portions of lugs **42'** defining sockets **46'** apart and the resultant forces tend to cause relative rotation in the direction which will decrease the divergence between the axes.

Clip **10'** is so constructed that, with the clip assembled and gripper **16'** and gripping portion **24'** in engagement, the angle between axes A'—A' and B'—B' (and also between the lines along which the second dimension of stud **30'** and first dimension of socket **42'**) is approximately 15°, thereby providing a positive gripping force between the engaged surfaces.

The hinge construction of the present invention is useful, not only for hair clips, but in many other devices in which a spring-biased, gripping hinge is desired. The hinge may be constructed of any synthetic plastic having good surface hardness, frictional wear properties, natural surface lubricity, fracture resistance, and plastic memory. Preferred plastic materials include cellulosics such as a cellulose acetate-propionate, acetals such as that sold by DuPont under its Delrin trademark, and polyamides, fluorocarbon, polymers, phenolic resins, vinyl polymers, polystyrene, and polypropylene.

Other embodiments within the scope of the following claims will occur to those skilled in the art.

What is claimed is:

1. In a hair clip comprising

first and second members, each of said members including a gripping portion and a hinge portion, said hinge portions being connected to provide relative rotation of said members about an axis between a first position wherein said gripping portions are in engagement and a second position wherein said gripping portions are spaced apart, said hinge portion of said first member including a pair of studs extending outwardly therefrom on opposite sides thereof generally coaxially with each other and said axis, and said hinge portion of said second member defining a pair of spaced sockets, each of said sockets being adapted for receiving one of said studs, that improvement wherein:

said first and second members are of resilient organic plastic;

each of said studs has a first dimension and a second dimension measured in a plane perpendicular to said axis, said second dimension being measured along a line generally perpendicular to the line along which said first dimension is measured and being less than said first dimension;

each of said sockets has an open portion forming a throat having a width extending generally perpendicular to said axis and a first dimension measured in a line perpendicular to said axis and along a line generally parallel to the width of said throat, said first dimension of said socket being less than said first dimension of said stud and not substantially less than said second dimension of said stud;

the angle of divergence between the lines along which said first dimension of each of said sockets and said second dimension of the one of said studs associated therewith is not less than 5° when said members are in said first position whereby said studs and sockets urge said gripping portions toward each other with a positive force in said first position; and,

rotation of said studs relative to said sockets in a direction so as to move said gripping portions toward said second position and increase said angle of divergence causes portions of said second member defining said sockets to exert on said studs force tending to rotate said studs relative to said sockets in a direction so as to decrease said angle and move said gripping portions toward said first position.

2. The hair clip of claim **1** wherein said studs are symmetrical about a line extending generally parallel to the line along which said first dimensions thereof are measured and said sockets are symmetrical about a line extending generally perpendicularly to the line along which said first dimensions thereof are measured.

3. The hair clip of claim **2** wherein said lines of symmetry of said studs form acute angles with said lines of symmetry of said sockets when said gripping portions are in said first positions.

4. The hair clip of claim **2** wherein the periphery of each of said studs is at least in part defined by portions of cylinders of different radius having parallel, spaced axes.

5. The hair clip of claim **4** wherein the periphery of each of said sockets is at least in part defined by a portion of a cylindrical surface and planar surfaces tangential to said cylindrical surface and inclined relative to each other.

6. The hair clip of claim **5** wherein said second member defines a relief slot extending outwardly from the portion of each of said sockets opposite the throat thereof.

7. The hair clip of claim **6** wherein each of said sockets is defined by an upstanding lug and each of said lugs defines an opening extending upwardly from said relief slot through the full height of said each lug.

8. The device of claim **1** wherein when said gripping portions are in said second positions said members are in contact only at said studs and said sockets.

9. In a device including a pair of members, each of said members including a gripping portion and a hinge portion, said hinge portions being hingedly connected together for relative rotation about an axis, said hinge portion of one of said members including a stud extending outwardly therefrom generally coaxially with said axis and said hinge portion of the other of said members defining a socket for receiving said stud, that improvement wherein:

said stud has a first dimension and a second dimension measured in a plane perpendicular to said axis, said second dimension being measured along a line generally perpendicular to the line along which said first dimension is measured and being less than said first dimension;

said socket has a first dimension measured along a line perpendicular to said axis, said first dimension of said socket being less than said first dimension of said stud and not substantially less than said second dimension of said stud, and said stud fitting snugly within said socket with the lines along which said first dimension of said socket and said second dimension of said stud are measured in substantially parallel alignment;

one of the portions of said one member defining said stud and the portions of said other member defining said socket are of resilient organic plastic;

the surfaces of said socket engaging said stud are non-convex; and,

relative rotation of said members about said axis from a first position in which said gripping portions engage each other and the angle of divergence between the lines along which said socket first dimension and said stud second dimension are measured is not less than 5° toward a second position in which said gripping portions are spaced causes said socket to bear against said stud and exert thereon a force tending to rotate said members so as to decrease said angle of divergence.

10. The device of claim **9** wherein both of said portions are of resilient organic plastic.

11. The device of claim **9** wherein said one member includes a pair of substantially identical studs extending generally coaxially outwardly therefrom on opposite sides thereof and said other member defines a pair of substantially identical spaced sockets, each of said sockets being adapted for receiving one of said studs.

12. The device of claim **11** wherein each of said studs is symmetrical about a line extending parallel to the line along which said first dimensions thereof are measured.

13. The device of claim **12** wherein the periphery of each of said studs is in part defined by portions of cylinders having parallel, spaced axes.

14. The device of claim **13** wherein said cylinders are of different radii.

15. The device of claim **11** wherein each of said sockets is symmetrical about a line extending perpendicular to the lines along which said first dimensions thereof are measured.

16. The device of claim **15** wherein the periphery of each of said sockets is in part defined by a portion of a cylindrical surface and relatively inclined planar surfaces extending tangentially from said cylindrical surface.

17. The device of claim **15** wherein each of said sockets has an open portion forming a throat.

18. The device of claim **16** wherein said members are in contact only at said studs and sockets when said gripping portions are in said second position.

* * * * *