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CABLE TIE

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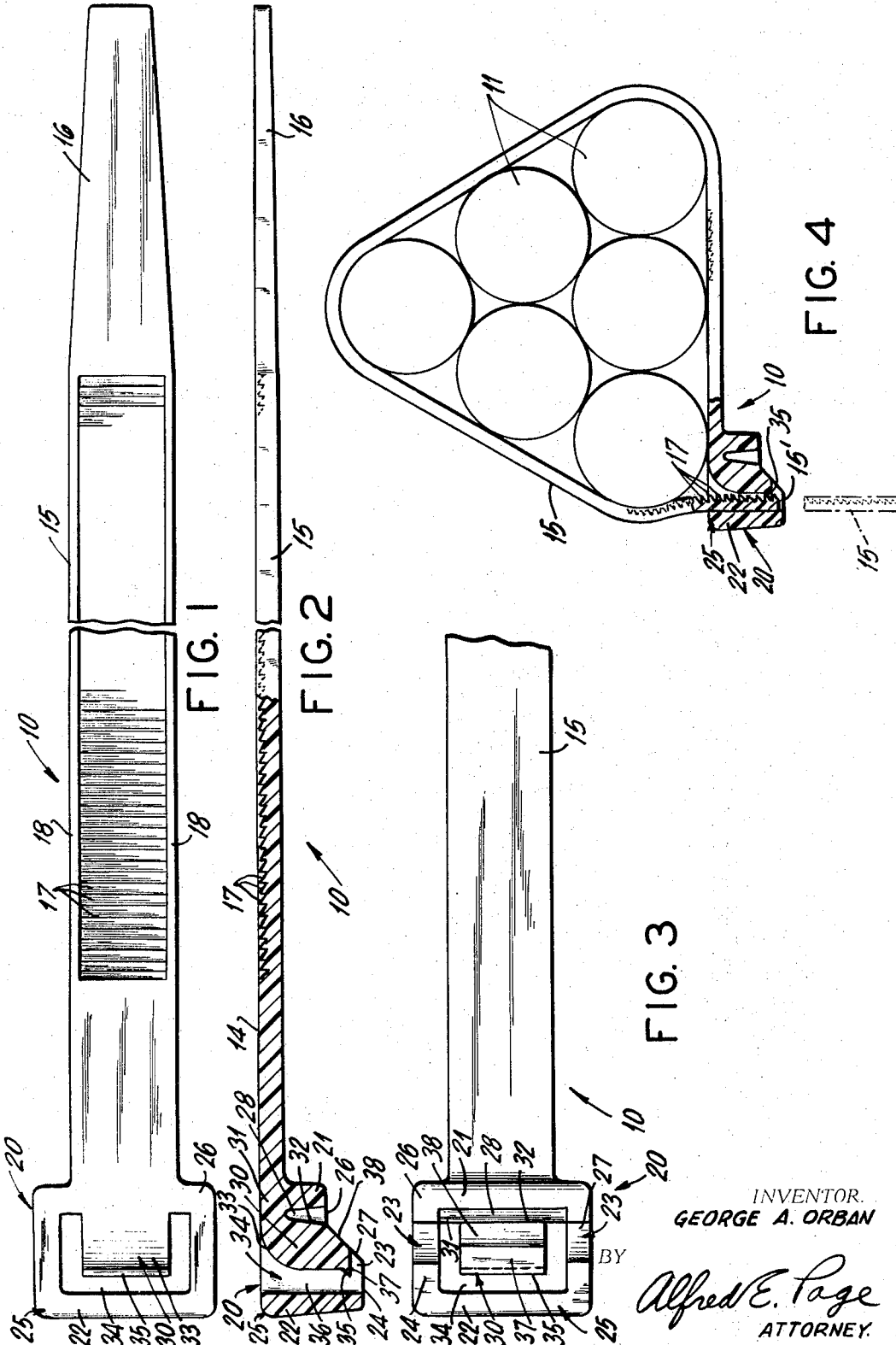


FIG. 3

FIG. 4

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3,368,247  
CABLE TIE

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## ABSTRACT OF THE DISCLOSURE

A cable tie or bundling strap is disclosed as including an elongated tongue and a substantially rectangular open frame at one end of the tongue. This frame has pivoted therein a relatively thick pawl defining, with the frame, a curved entry throat for insertion of the free end of the cable tie into the frame. The exit end of the pawl is disposed substantially inwardly of the exit surface of the frame, and the pawl and a surface of the tongue are formed with ratchet means interengageable upon insertion of the tongue through the entry throat to prevent withdrawal of the tongue through the passage through the rectangular frame. The recessing of the exit or free end of the pawl substantially inwardly of the exit surface of the open frame allows the projecting portion of the drawn tongue to be nipped off to provide a cut edge which is disposed inwardly of the exit end of the frame.

### Background of the invention

This invention relates to cable ties, such as used for tying together a plurality of insulated conductors into a cable, or for bundling other elements such as, for example, tubings. More particularly, the present invention is directed to a novel, inexpensive and simply applied cable tie or the like which is free of certain disadvantages of known cable ties of a similar nature.

In the installation of wiring harnesses in various applications, such as in the wiring of aircraft, automobiles, switch boards, and the like, several insulated conductors have been tied together at spaced points, or have been laced together, to form a multi-conductor cable which can be mounted, at spaced points therealong, on a supporting surface or on other supporting means. While the conductors can be grouped together into a cable merely by tying them with a cord at spaced points therealong, or by wrapping a wire therearound and twisting the ends together, such more or less non-permanent and time consuming tying means have been generally unsatisfactory in practice, for various reasons. Accordingly, there has been a long-felt need for a simple, inexpensive cable tie for tying together a group of insulated conductors.

A known type of cable tie which has been used in practice is shown in Emery, U.S. Patent No. 3,127,648, issued Apr. 7, 1964. The cable tie of this Emery patent comprises an elongated tongue, a head at one end of the tongue and adapted to receive into engagement therewith the other end of the tongue, and at least one ratchet element mounted relative to said head and adapted to cooperate therewith to allow passage of the tongue in one direction through the head while preventing withdrawal of the tongue from the head in the opposite direction.

More specifically, in the Emery cable tie the head is an open rectangular frame into which there projects a pawl or the like having a chisel edge spaced closely adjacent the inner surface of one wall of the frame, and the "free" portion of the tongue is formed with a series of transversely extending serrations or grooves which, when the free end of the tongue is inserted through the head, cooperate with the chisel edge to prevent withdrawal of the tongue from the head.

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In the Emery cable tie, the outer or exit surface of the pawl, having the chisel edge thereon, is initially substantially flush with the outer surface of the frame of the head portion. In practice, after the tongue has been drawn through the head portion to a cable tightening position, the projecting end of the tongue is severed as by cutting. This generally leaves a small portion of the tongue projecting from the head portion, and this is unsatisfactory for many applications. With the Emery cable tie, it is not possible to cut the tongue off flush with the outer surface of the head frame or the pawl, as to do so would result in release of the serrations of the tongue portion from the chisel edge of the pawl. Consequently, a small length of the tongue portion must be left projecting from the head portion and extending beyond the outer surface of the frame of the head portion and the outer surface of the pawl.

An object of the present invention is to provide a cable tie of the general type mentioned above but in which, after severing of the extra length of tongue projecting from the frame of the head portion, the cut edge of the tongue does not project beyond the outer surface of the frame, so that no cut end edge of the cable tie projects outwardly beyond the frame of the head.

Another object of the present invention is to provide a cable tie of the type just mentioned including constructional features improving the effectiveness of the interengagement between the pawl and the serrations of the tongue.

A further object of the invention is to provide a cable tie of the type just mentioned in which the pawl has only one chisel edge or ratchet tooth engageable with the serrations on the tongue of the cable tie.

Still another object of the invention is to provide a cable tie of the type just mentioned which is simple and inexpensive in construction.

For an understanding of the principles of the invention reference is made to the following description thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is an enlarged partial plan view of one surface of a cable tie embodying the invention;

FIG. 2 is a partial longitudinal sectional view of the head of the cable tie;

FIG. 3 is an enlarged partial plan view of the opposite surface of the cable tie; and

FIG. 4 is an elevation view, partly in section, of the cable tie as applied to bundle a group of insulated conductors into a cable.

Referring to the drawings, the cable tie, which is generally indicated at 10, is a substantially flat and elongated flexible strip which is molded from a suitable plastic composition material or synthetic resin. For example, tie 10 may be molded from a nylon resin.

The tie 10 includes a relatively elongated tongue 15 having a head 20 at one end. The opposite end of tongue 15 is gradually reduced in thickness and in width, as indicated at 16, to form a tapered end portion for a purpose to be described hereinafter. Beginning at substantially the inner end of tapered end portion 16, the inner surface of tongue 15 is formed with a series of relatively deep transversely extending serrations 17, and the series of serrations 17 extends nearly to head 20.

Serrations 17 are in the form of ratchet teeth, and extend between side ledges 18 of tongue 15. The outer edges of serrations 17, in the example illustrated, terminate below the surfaces at ledges 18. This provides a smooth surface, comprising ledges 18, engageable with the bundled conductors or the like. However, in some instances it may be desirable to have the outer edges of serrations 17 flush with ledges 18 or even to project

slightly therebeyond. The purpose of the serrations 17 will be described more fully hereinafter.

The head 20 includes a substantially rectangular frame and a pawl 30. Frame 25, which is flush with the outer surface of tongue 15, includes a relatively shallow inner wall 21, and a relatively thicker or deeper outer wall 22 which tapers in thickness and has a sloping inner surface, walls 21 and 22 being interconnected by side walls 23, 23. Each wall 23 has one edge surface substantially flush with the smooth inner surface 14 of tongue 15. The outer edge of each side wall includes an outer edge surface 24 which is substantially flush with the adjacent outer edge surface of outer wall 22, an inner edge surface 26 which is substantially flush with the adjacent edge surface of inner wall 21, and a sloping edge surface 27 joining the edge surfaces 24 and 26. However, the side walls 23 may be rectangular, if desired. Edge surfaces 24 and 26 may have lengths of the same order, and edge surfaces 27 may extend, for example, at about a 45° angle with respect to edge surfaces 24 and 26.

Pawl 30 has lateral dimensions less than the inside lateral dimensions of frame 25, and is substantially rectangular in plan. The width of pawl 30 is not greater than the length of serrations 17. The pawl is joined to inner wall 21 of frame 25 by a neck portion 31 which is, in essence, a continuation of tongue 15. At its juncture with pawl 30, strip 31 forms the bottom of a recess 28 further defined by the inner surface of inner wall 21 of frame 25 and the wall 32 of pawl 30. Recess 28 tapers in width inwardly, as best seen in FIG. 2.

The "entrance" surface of pawl 30 adjacent the smooth outer surface 14 of tie 10 is preferably curved longitudinally of the tie, as clearly illustrated at 33, to form an "entrance" throat 34 for a purpose to be described. Surface 33 terminates in spaced relation to the inner surface of frame outer wall 22 and, from this termination of surface 33, pawl 30 extends substantially parallel to the inner surface of frame outer wall 22 to form a passage 36. This latter surface 35' of pawl 30, at its exit end, is formed with a chisel edge or ratchet tooth 35 which has one surface sloping toward throat 34.

In accordance with the improvement of the present invention, the surface 35' of pawl 30 terminates substantially short of the edge surfaces 24 of side walls 23 of frame 25, and pawl 30 has an "exit" surface 37 extending substantially parallel to the surfaces 24 and 26. Surface 37 of pawl 30 is joined to surface 32 thereof by a sloping surface 38 which, in the rest position of pawl 30, is substantially parallel to and flush with the bevelled edge surfaces 27 of frame side walls 23.

The manner in which the tie is used will be clear from FIG. 4. Referring to this figure, tie 10 is used to join several insulated conductors 11 into a cable bundle. For this purpose, the tie is wrapped around the conductors with the smooth outer surface of tongue 15 outward, and the tapered portion 16 of tongue 15 is inserted into throat 34 and through passage 36. Tongue 15 is then drawn through passage 36 with the serrations 17 sliding over ratchet tooth 35, until tie 10 is tightly wrapped about conductors 11.

Drawing of tongue 15 through throat 34 and passage 36 is facilitated by flexing of pawl 30 about neck 31. The ratchet tooth 35, engaging the serrations 17, prevents withdrawal of tongue 15 rearwardly through passage 36 and out through throat 34, so that tie 10 must be cut to be released from the conductors 11. After the tie 10 has been drawn tightly about conductors 11, the projecting portion of tongue 15 may be severed, outwardly of passage 36 but not outwardly of the edge surfaces 24 of frame side walls 23, so that the cut end edge 15' of tongue 15 does not project beyond the outer surface of frame 25 of head 20. Upon any attempt to withdraw tongue 15 from head 20, pawl 30 will tend to swing back about neck 31 and even more tightly press tongue 15 between tooth 35 and the inner surface of frame wall 22.

thus maintaining effective engagement between ratchet tooth 35 and serrations 17.

The invention cable tie can be manufactured in a one piece operation and is simple and inexpensive in construction as well as being capable of easy application, for example, to bind a group of conductors 11 or a group of tubings into a bundle.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An integral one-piece cable tie, for binding plural insulated conductors or the like into a cable, comprising in combination, a relatively elongated substantially flat flexible tongue; a substantially rectangular open frame, having a thickness in excess of that of said tongue, said frame including an inner end wall integral with one end of said tongue; a pawl within said open frame and having an inner wall integrally connected, at a pivotal connection, to the inner surface of said inner end wall of said frame; said pawl having an opposite outer wall spaced from the inner surface of an outer end wall of said frame and substantially parallel to the latter; said pawl having a thickness in excess of that of said strip but less than that of said frame; said pawl having a third wall forming a substantial continuation of one surface of said tongue and curving inwardly to define, with the inner surface of said frame outer end wall, an entry throat, said curved wall merging with said outer wall of said tongue; said throat being laterally defined by opposite and parallel side walls of said frame spaced and free from facing side walls of said pawl, and which also laterally define a passage extending from said throat between the inner surface of the outer end wall of said frame and the outer wall of said pawl; the outer wall of said pawl terminating short of an outer edge surface of said outer end wall of said frame, whereby the corresponding outer surface of said pawl is spaced a substantial distance inwardly of the outer edge surface of said frame at the exit of said passage; the outer wall of said pawl and the opposite surface of said tongue being formed with ratchet means interengageable upon insertion of said tongue through said entry throat into said passage for drawing of said tie about plural insulated conductors or the like, and preventing withdrawal of said tongue through said passage; whereby said tie may be wrapped around plural insulated conductors or the like and said tongue drawn through said head to wrap said tie tightly about the conductors or the like, the projecting portion of the tongue then being cut off outwardly of the outer surface of said pawl and inwardly of the corresponding outer edge surface of said frame so that the cut edge of said tongue does not project beyond the outer edge surface of said frame.

2. A cable tie, as claimed in claim 1, in which said outer wall of said pawl is formed with at least one projecting ratchet tooth extending thereacross and forming part of said ratchet means.

3. A cable tie, as claimed in claim 2, in which said ratchet means further includes serrations on a surface of said tongue engageable with said ratchet tooth.

4. An integral one-piece cable tie, for binding plural insulated conductors or the like into a cable, comprising, in combination, a relatively elongated substantially flat flexible tongue; a substantially rectangular open frame, having a thickness in excess of that of said tongue, said frame including an inner end wall integral with one end of said tongue; a pawl within said open frame and having an inner wall integrally connected, at a pivotal connection, to the inner surface of said inner end wall of said frame; said pawl having an opposite outer wall spaced from the inner surface of an outer end wall of said frame

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and substantially parallel to the latter; said pawl having a thickness in excess of that of said strip but less than that of said frame; said pawl having a third wall forming a substantial continuation of one surface of said tongue and curving inwardly to define, with the inner surface of said frame outer end wall, an entry throat, said curved wall merging with said outer wall of said tongue; said throat being laterally defined by opposite and parallel side walls of said frame which also laterally define a passage extending from said throat between the inner surface of the outer end wall of said frame and the outer wall of said pawl; the outer wall of said pawl terminating short of an outer edge surface of said outer end wall of said frame, whereby the corresponding outer surface of said pawl is spaced a substantial distance inwardly of the outer edge surface of said frame at the exit of said passage; the outer wall of said pawl and the opposite surface of said tongue being formed with ratchet means interengageable upon insertion of said tongue through said entry throat into said passage for drawing of said tie about plural insulated conductors or the like, and preventing withdrawal of said tongue through said passage; whereby said tie may be wrapped around plural insulated conductors or the like and said tongue drawn through said head to wrap said tie tightly about the conductors or the like, the projecting portion of the tongue then being cut off outwardly of the outer surface of said pawl and inwardly of the corresponding outer edge surface of said frame so that the cut edge of said tongue does not project beyond the outer edge surface of said frame, the inner end wall of said frame having a thickness substantially less than that of the outer end wall of said frame, said

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frame side walls having respective edge surfaces forming continuations of the corresponding edge surfaces of said inner and outer end frame walls and joined by a sloping edge surface; said pawl having an exit surface extending from its outer surface substantially perpendicular to the inner surface of the outer end wall of said frame and joining a bevelled surface substantially parallel to said first named bevelled edge surface and substantially flush therewith in the normal position of said pawl.

5 5. A cable tie, as claimed in claim 4, in which said pivotal connection is a neck having substantially the thickness of said tongue, and having an outer surface substantially flush with said one surface of said tongue and an inner surface forming the bottom of a recess defined by the inner surface of the inner frame end wall and an inner surface of said pawl extending inwardly from said bevelled surface of said pawl.

10 6. A cable tie, as claimed in claim 1, comprising an integral one-piece construction molded of a plastic composition material.

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