

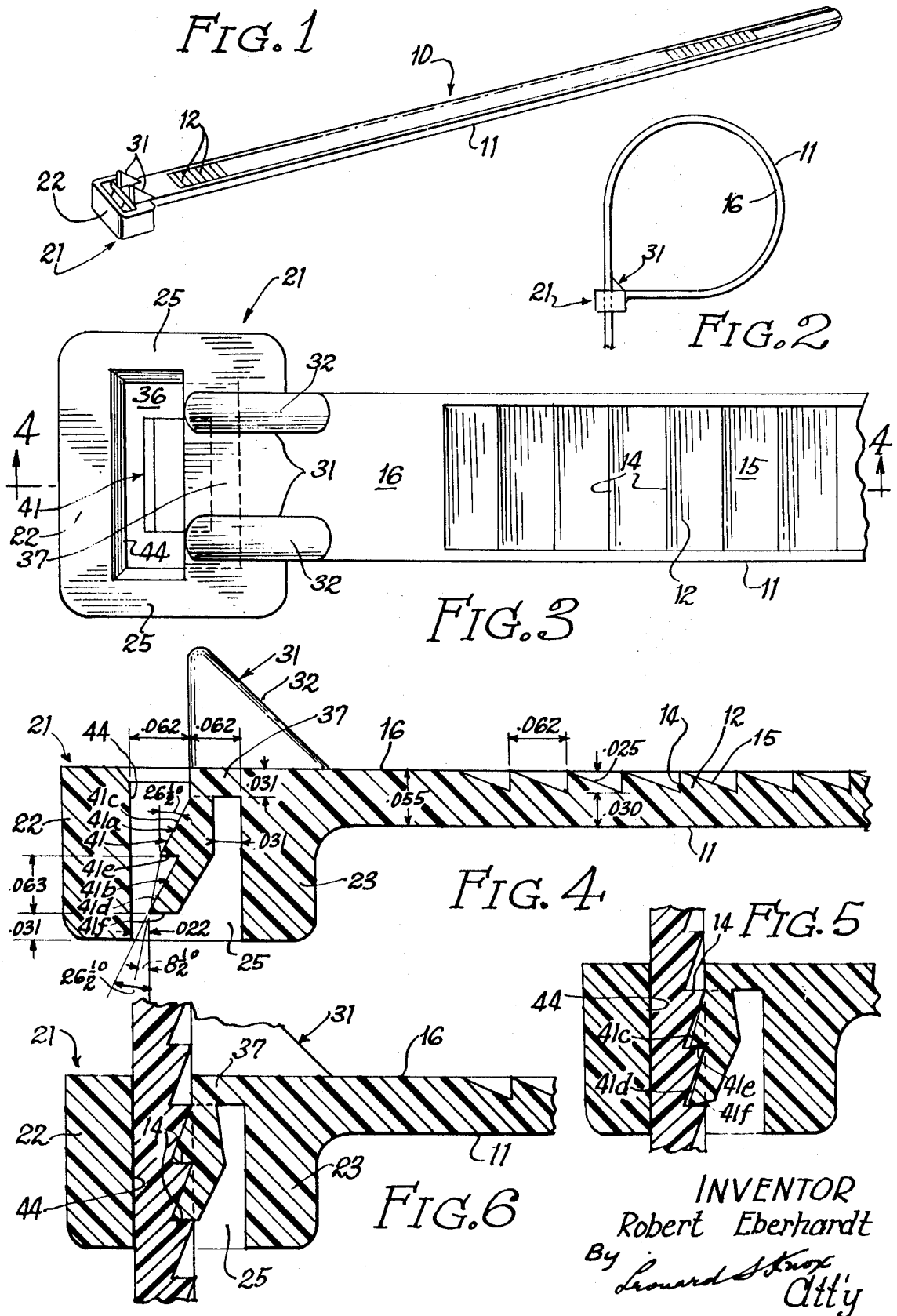
Sept. 20, 1971

R. EBERHARDT

3,605,199

BUNDLE TIE

Filed Jan. 8, 1970



1

3,605,199

BUNDLE TIE

Robert Eberhardt, Chicago, Ill., assignor to All States Plastic Manufacturing Co., Inc., Chicago, Ill.

Filed Jan. 8, 1970, Ser. No. 6,013

Int. Cl. B65d 63/00

U.S. Cl. 24—16PB

4 Claims

ABSTRACT OF THE DISCLOSURE

A tie of the type comprising a toothed strap having an apertured head at one end, the other end of the strap being threaded through the head and locked therein by a pawl. The present disclosure relates to improvements in the pawl to obtain a more reliable locking action on the strap.

BACKGROUND OF THE INVENTION

Devices of the type referred to in the abstract are well-known. Present commercial versions employ a resilient, tenacious plastic composition, e.g. nylon. However, customers' specifications have become increasingly stringent in that the device, after being applied to the bundle, must resist an unlocking force considerably greater than that heretofore found acceptable. Accordingly, it will be understood that maximum engagement of the pawl with the tooth becomes a paramount requirement. Devices heretofore available, while meeting the foregoing requirement in some degree, leave much to be desired. In general, the principal deficiency lay in less than optimum engagement of the pawl and strap so that the tension exerted on the strap by the bundle frequently resulted in dislodgment of the strap.

SUMMARY OF THE INVENTION

Broadly regarded, the invention has reference to a one-piece bundle tie of resilient, but generally shape-retaining material including a strap portion provided with a plurality of buttress-shaped teeth, at least two of which are engaged by a pawl carried within a box-like head or frame at one end of the strap. The dimensions and configuration of the head in relation to the strap, the strap teeth and the pawl are so chosen that the free end of the strap, when applied around the bundle, may be threaded through the head and past the pawl, this latter meanwhile being sprung to one side and, when the strap has been adequately tensioned around the bundle, the pawl will be caused to engage the nearest teeth in a reliable manner. This object is obtained by providing a novel form of pawl which, when in locking relation and subjected to the tension in the strap will result in greatly enhanced reliability. To this end the pawl has at least two teeth which, in the initial condition of the device, i.e. as molded, present acutely-angled working faces spaced at different distances from the wall of the head aperture against which the un-toothed face of the strap bears. By reason of this arrangement of the pawl teeth, the non-sloped faces of the strap teeth are in face-to-face abutment therewith, with substantially improved resistance to unlocking force on the strap.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a bundle tie in accordance with the invention;

FIG. 2 is a side elevation of the device in position around a bundle of wires, the latter being omitted;

FIG. 3 is a top plan view, greatly enlarged, showing the left-hand end portion of the device of FIG. 1, including the head;

FIG. 4 is a cross section taken on the line 4—4 of FIG. 3;

FIG. 5 is a view similar to FIG. 4, but with the free

2

end of the strap threaded through the head but not in fully locked position; and

FIG. 6 is a view similar to FIG. 5, but showing the strap fully locked.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to the drawing there is shown (FIG. 1) a bundle tie 10, preferably molded in one piece from a plastic composition, e.g. nylon, having some degree of resilience as dictated by its function but of generally shape-retaining character, i.e. relatively rigid. The device includes an elongated strap 11 of rectangular cross section having, on one face, a plurality of buttress-shaped teeth 12, viz, with one face 14 at right angles to the longitudinal axis of the strap and an inclined face 15 (FIGS. 3 and 4). In the example, the crest of the teeth is flush with the top surface 16 of the strap; the pitch of the teeth is 0.062"; the depth is 0.025" and the thickness of the strap is 0.055", subject to conventional tolerances.

At one end of the strap there is a frame-like formation or head 21, comprising a left wall 22, an opposite right wall 23 and opposite side walls 25—25. In particular, the wall 22 is designed to present a comparatively rigid abutment for the bottom face 11 of the strap when the device is locked about the bundle in order that the force exerted by interaction of the strap teeth and pawl may be adequately opposed and undesired unlocking precluded.

A pair of lugs 31—31 is located on the surface 16 and these have an inclined face 32 (see FIG. 2) which prevents any of the wires in the bundle from being wedged into a sharp corner and possibly damaged.

The walls 22, 23 and 25—25 define a through aperture 36. Across the aperture 36, in a transverse direction, is a ledge 37 from the inner, horizontal face of which depends a pawl 41. It will be seen that the sides of the pawl are separated from the walls 25—25 (FIG. 3). The pawl comprises two teeth 41a and 41b which, at their respective crests are acutely-angled. It will be seen that the faces 41c and 41d are at an angle to a vertical plane and that, in the example, these faces, when inactive, are parallel and at an angle to the vertical of 26½°. Further, that the faces 41e and 41f are horizontal. The apex of each tooth lies in a plane at an angle of 8½° to a vertical plane. It is pointed out that the dimensions shown in FIG. 4 are exemplificative only, the primary desideratum being that, when the strap 10 is passed through the aperture 36 and locked by the pawl, the relationship is as shown in FIG. 6, i.e. with the active faces 41e and 41f in face-to-face abutment with the related faces 14—14. The means by which said relationship is attained will now be described.

It will be noted from FIG. 4 that the distance between the apex of the tooth 41b and the inner face 44 of the wall 22 is substantially less than the distance between the root of the strap teeth and the bottom face of the strap, namely, 0.022" as compared to 0.030". Accordingly, when the strap is threaded through the aperture 36, the teeth of the pawl are displaced to the right, the axis of bending being essentially in the plane where the pawl meets the ledge 37. Thus, when the pawl teeth first enter between respective pairs of strap teeth 12 (FIG. 5) the faces 41e and 41f are not horizontal. That is to say, the faces 14—14 are not in face-to-face contact with the faces 41e and 41f. However, it will be understood that, when the strap is drawn tightly about the bundle of wires and then released, the bundle will exert a counter-force on the strap which, due to the resilience of the strap material, will deform the pawl teeth unto the shape shown in FIG. 6, i.e. with the faces 41e, 41f and 14—14 in full face-to-face abutment. In this way maximum engagement of the pawl and strap teeth is realized. The result may be

3

better appreciated by noting that the greater the force acting to pull the strap out of the aperture 36, the greater the resistance. In effect such reverse force not only pivots the pawl clockwise about its base into more secure engagement with the strap teeth but tends to compress the active faces 41e and 41f into implemented engagement. In the example the angle at the crest of a tooth 12 is arc tan

$$\frac{0.062}{0.025} = 68^\circ$$

while the crest angle of a pawl tooth is

$$90^\circ - 26\frac{1}{2}^\circ = 63\frac{1}{2}^\circ$$

What is claimed is:

1. A bundle tie of resilient, yet generally shape-retaining material, adapted to be looped upon itself and around the bundle in adjustable self-locking relation including a strap having a plurality of longitudinally-spaced, transverse teeth substantially of buttress form, each said tooth having a working face normal to the longitudinal axis of the strap and said face defining an acute angle with the other face of said tooth, a head at one end of said strap, said head having walls defining an aperture to pass the strap, the interior face of at least one wall being flat for abutment by the other side of the strap when the strap is locked and a pawl having a plurality of teeth substantially of buttress form having an acutely angled crest, defined in part by a face adapted to abut the respective ones of the working faces of the strap teeth, said pawl being carried on the head by a neck portion and extending into the aperture, the pawl being swingable on said neck portion between strap-clearing and strap-engaging positions, the crest angle of the pawl teeth being less than the crest angle of the strap teeth whereby, when the strap is around the bundle, passed through the aperture and pulled tight and the reactive force of the compressed bundle applied to the strap, the active face of each pawl tooth is compressed into face-to-face relation with the respective face of a strap tooth.

2. The combination in accordance with claim 1 fur-

4

ther characterized in that the head includes a ledge to which said necked portion of the pawl is joined.

3. In a bundle tie of resilient, yet generally shape-retaining material adapted to be looped upon itself and around the bundle in adjustable, self-locking relation including a strap having teeth on one face defined by at least one face normal to the longitudinal axis of the strap, said strap having a head at one end having means defining a through opening for passage of the strap and a pawl to engage the strap teeth to lock the tie in embracing relation with the bundle, the improvement which comprises providing the pawl with a plurality of teeth to engage respective ones of the strap teeth, each pawl tooth having an edge defined by a sloping face and a face which in the non-engaged position of the teeth, is normal to the axis of the aperture, the edges of the pawl teeth lying in a plane having an acute angle with reference to the aperture axis, the acute angle confronting the entrance to the passage, the said normal face engaging the normal face of the strap teeth in face-to-face abutment when the strap is in locked condition, said passage having an interior face at least coextensive with the pawl teeth for abutment by the non-toothed face of the strap and the distance between the pawl edge closest to said passage interior face and said face being less than the distance between the root of the strap teeth and the un-toothed face of the strap, said pawl having a pivotal connection with the head adjacent the entrance to the passage.

4. The combination in accordance with claim 3 wherein the strap teeth are buttress-shaped, the working face of the teeth being substantially normal to the longitudinal axis of the strap.

References Cited

UNITED STATES PATENTS

3,009,220	11/1961	Fein	24—16PB
3,214,808	11/1965	Litwin	24—16PB
3,368,247	2/1968	Orban	24—16PB
3,484,905	12/1969	Eberhardt	24—16PB
3,486,201	12/1969	Bourne	24—16PB

DONALD A. GRIFFIN, Primary Examiner