July 23, 1963 J. E. CAVENEY 3,098,271

WIRING BINDER

Filed Aug. 4, 1959 2 Sheets-Sheet 1

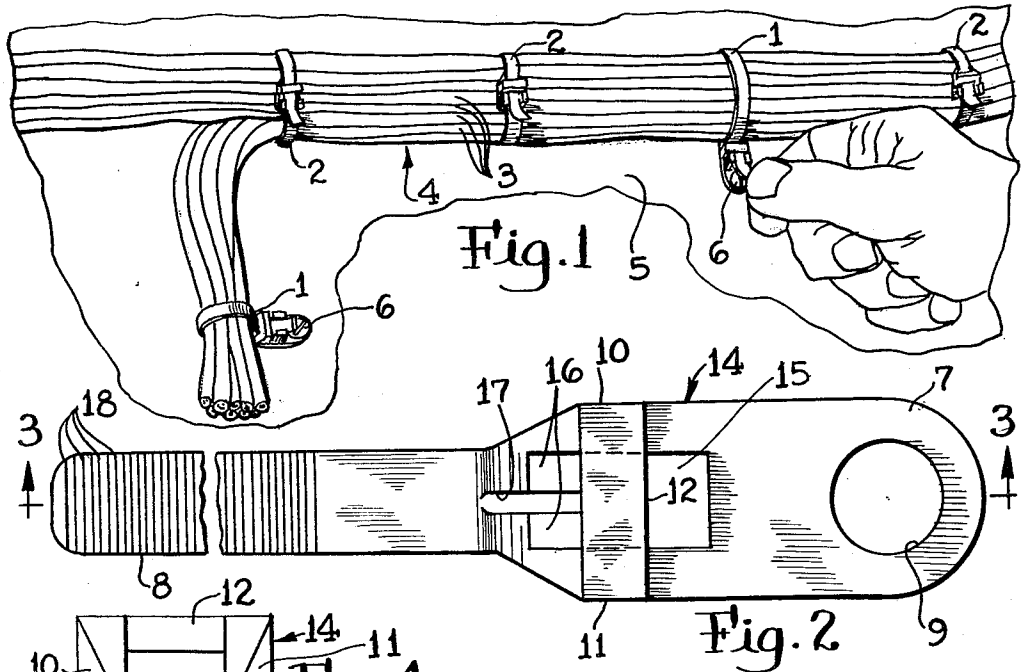

Fig. 1

Fig. 2

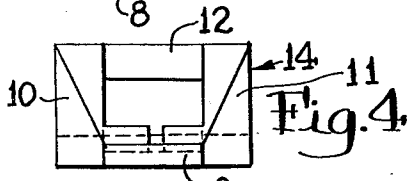

Fig. 4

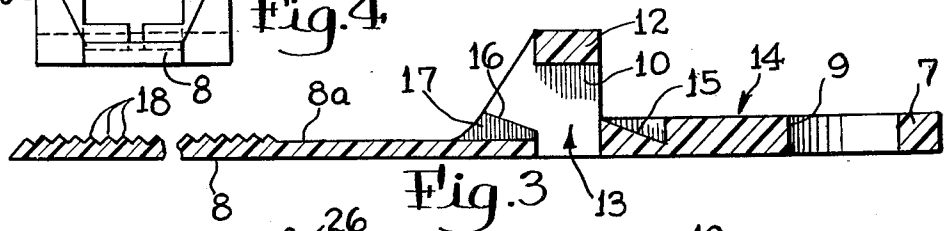

Fig. 3

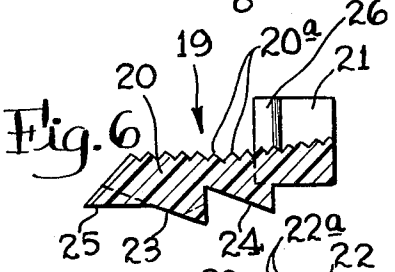

Fig. 6

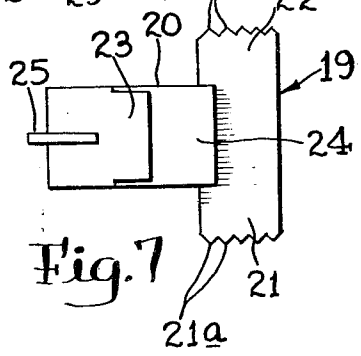

Fig. 7

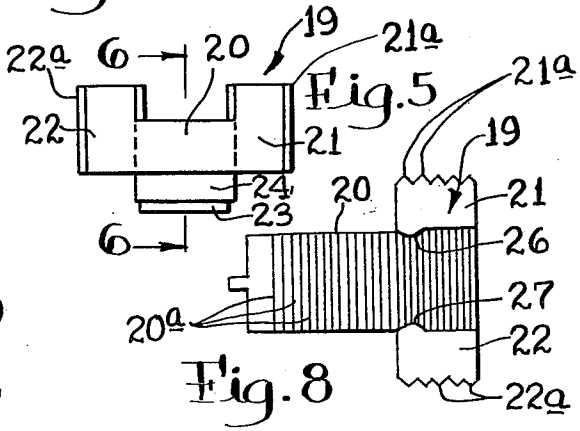

Fig. 5

Fig. 8

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WIRING BINDER

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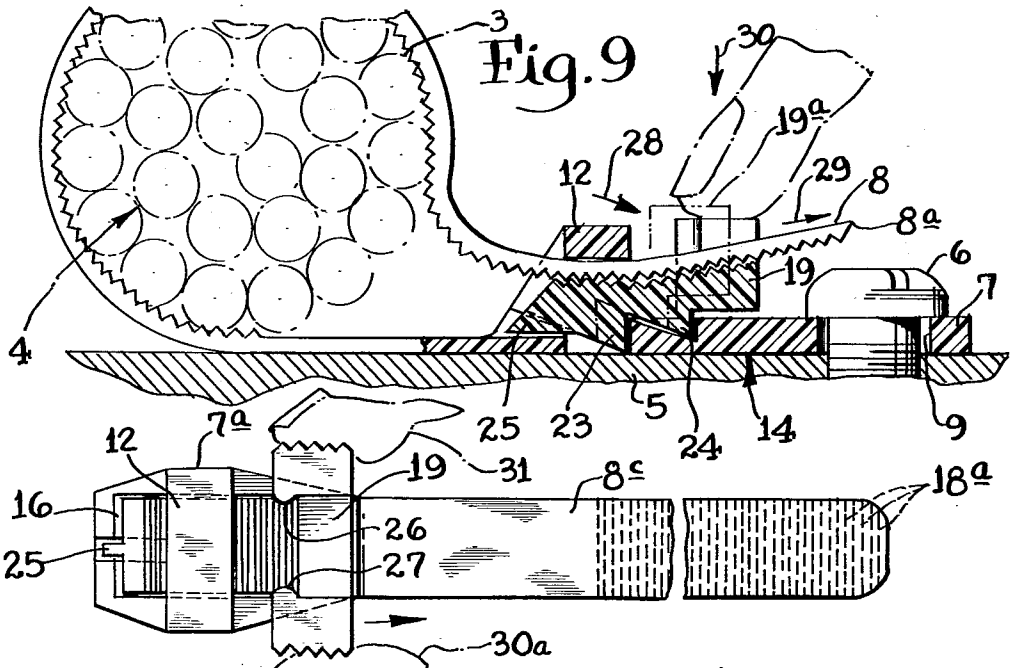

Fig. 9

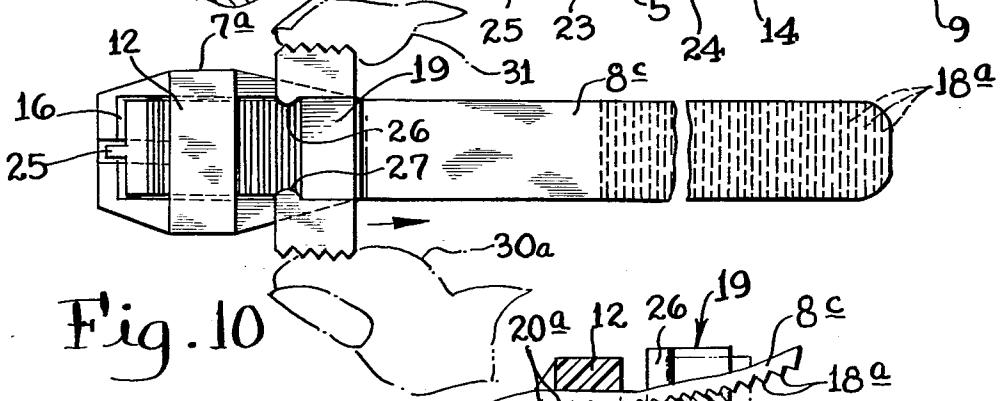

Fig. 10

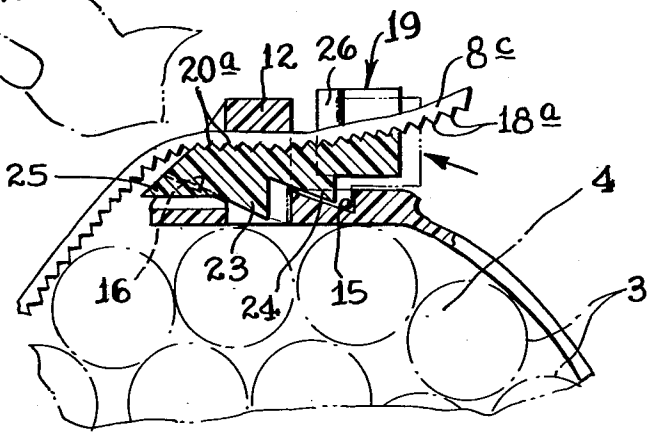

Fig. 11

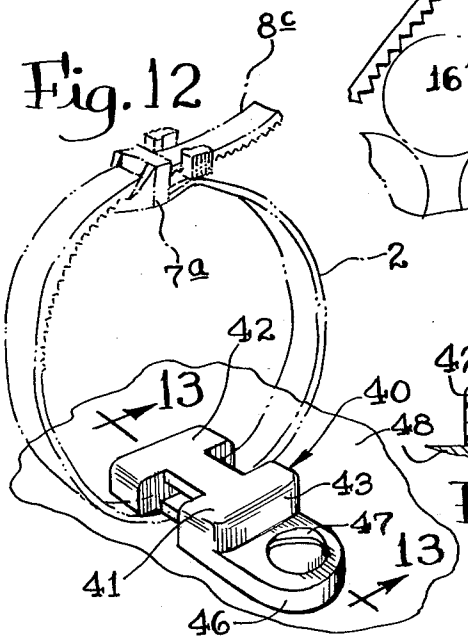

Fig. 12

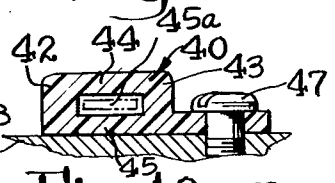

Fig. 13

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WIRING BINDER

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7 Claims. (Cl. 24—16)

This invention relates to the art of wrapping and binding wires or cables and particularly to a wire or cable tie or binder having improved qualities which adapt it for versatile use in wiring systems ordinarily employing wiring harnesses generally.

On electrical installations such as on electric control panels, automobiles, aircraft and others, where a plurality of electrical units are wired together in different ways, it has become customary to direct adjacent wires along coincident paths for neatness and for facility of visual location by binding them together with string, straps, tape or other forms of wiring binders. Although some binders, clamps or other wire tie forms have proven satisfactory for some applications, all of them have displayed certain shortcomings which have limited their use and application. Among the disadvantages are lack of adjustability to accommodate a wide enough range of wire bundle sizes so that many different size clamps or binders must be available to meet every need. In other types, the binders or clamps are non-releasable. Once they are secured on the wire bundle, they can only be removed with great difficulty or destruction. In cases where releasability is provided, it is inconvenient and cannot be accomplished with ease. Further, on releasable types, the increment of adjustment is ordinarily too large to guarantee a tight harness connection in all cases.

It is the principal object of this invention to provide an improved wire binder which obviates the major difficulties and disadvantages of prior art devices. In order to accomplish this, it is another object to provide an improved wire binder which can be manufactured in a single size and is adjustable in fine increments to accommodate a very wide range of wire bundle sizes, and which is conveniently releasable for removal itself or for the insertion or removal of wires to or from the bundle with facility and speed.

It is another object to provide an improved wire binder which can be manufactured economically in a simple manner, preferably of molded plastic such as nylon.

It is another object to provide an improved wire binder having an improved strap check and release mechanism which insures a firm strap grip in its check position and is likewise easily and completely released in its release position.

It is another object to provide an improved wire binder having an improved strap check which is self-energized and which is insured of proper operation in spite of dimensional manufacturing variations.

It is another object to provide an improved wire binder having an improved strap check which is so easily released that it can be performed by only slight pressure of a single finger of the worker, thus availing his remaining fingers for grasping wires and generally simplifying and speeding up the wiring job.

It is still another object of the invention to provide improved wiring binders which can be used as merely a means to bundle wires together or, in addition, can be used to secure a wrapped bundle in a fixed position.

It is another object to provide an improved wire binder having special means for preventing misthreading of the free strap end through the strap check portion when forming the binder strap into a closed loop about a wire bundle.

It is still another object of this invention to provide

an improved wire binder which can be bound onto or removed or loosened from a wire bundle entirely by hand without need for the use of any tools whatsoever. It is important to note that some presently marketed wire binders require special tools having for their only use the installation of the particular wire binders.

Other objects and advantages of the invention should be apparent upon reference to the accompanying drawings in which

FIG. 1 shows a perspective view of a wire bundle secured together by a plurality of the wire binders of this invention;

FIG. 2 shows a top plan partially cutaway view of the main body portion of the wire binder of this invention;

FIG. 3 shows a sectional view as viewed along the line 3—3 of FIG. 2;

FIG. 4 shows a left end view of FIG. 3;

FIG. 5 shows an end view of the strap check pawl used to complement the main body portion of the wire binder shown in FIGS. 2 to 4;

FIG. 6 shows a sectional view along the line 6—6 of FIG. 5;

FIG. 7 shows a bottom view of the strap check pawl of FIG. 6;

FIG. 8 shows a top plan view of the same strap check pawl;

FIG. 9 shows a sectional view of the assembled wire binder embodying both the main body portion and the strap check pawl of FIGS. 2 to 8 as it appears securing a bundle of wires together.

FIG. 10 shows a top plan view of a modified form of assembled wiring binder;

FIG. 11 shows a partial sectional view of the modified wiring binder as it appears securing a bundle of wires together;

FIG. 12 shows a perspective view of the modified form of binder secured to a mounting board with an improved mounting means; and

FIG. 13 shows a sectional view along the line 13—13 of FIG. 12.

As shown in FIG. 1, the binders 1 and 2 of this invention are used to bind or secure together a plurality of wires 3 into a bundle 4. The binders 1, in addition, can be secured in a fixed position to a mounting board 5 by means of screws 6.

As shown in FIGS. 2, 3 and 4, the main body portion 14 of a binder 1 consists of an enlarged connector end 7 connected to a narrower strap end 8 which is of a length necessary to encircle the largest bundle of wires to be bound with a certain amount of extra length. The connector end 7 is provided with a mounting hole 9 through which one of the screws 6 passes when the binder is secured to a mounting board 5 or the like. This connector end 7 is also provided with two marginal uprights 10 and 11 which connect to a transverse bridge portion 12 which extends over an opening 13 extending entirely through the connector end 7. Adjacent one side of the uprights 10 and 11 is an incline 15 depressed into the connector end 7. The incline extends from the entire width of the opening 13 which itself is as wide as the strap end 8. Adjacent to the other side of the uprights 10 and 11 is another incline 16 which is as wide as the incline 15, but is divided into two halves by a groove 17 whose bottom surface is coincident with the upper surface 8a of the strap end 8. The greater length of the surface 8a is provided with parallel raised teeth 18 which extend transversely for the width of the strap end 8. Although the strap end 8 is shown broken, it should be understood that its length can be in the order of about eight or nine times the length of the connector end 7 in the ordinary case.

As shown in FIGS. 5 to 8, the strap check pawl 19

consists of a body portion 20 having at one end two laterally extending uprights 21 and 22 with raised teeth 21*a* and 22*a* on their margins. The upper surface of the body portion 20 is provided with sharp teeth 20*a* which are substantially identical to the teeth 18 on the strap end 8 of the main body portion 14 of the binder. On the underside of the body portion 20 are provided two downwardly extending wedges 23 and 24 which have the same downward slope as each other and as the inclines 16 and 15 of the main body portion 14. Forward of the wedge 23 and depending from it is a narrow blade-like projection 25 having the width of the recess 17 of the main body 14. On the inner surfaces of the uprights 21 and 22 are inwardly curved pads 26 and 27.

When the binder 1 is used, the main body portion 14 is assembled with the strap check pawl 19 in a manner indicated in FIG. 9 with the wedge 24 resting on the incline 15, the wedge 23 in the opening 13, and the forward end of the body portion 20 bridging the opening 13 below the transverse bridge 12 with the projection 25 in the groove 17. By having the distance from the bottom surface of the bridge 12 to the upper corner of the incline 15 slightly less than the thickness of the strap check pawl 19 measured from the lower corner of the wedge 23 to the upper edge of the teeth 20*a* directly above it, the check pawl 19 will ordinarily remain assembled to the main body portion 14 approximately as shown in FIG. 9. The assembly of these parts will remain even though the strap end 8 is not positioned as shown.

The usual sequence of operation concerned with the use of the binder 1 is to secure the main body portion 14 by means of a screw 6 to a panel board 5 or the like in a position where it is desired to locate a bundle 4 of wires 3. The bundle 4 is placed over the strap end 8 which is wrapped around the bundle as shown in FIG. 9. The leading end 8*a* is passed between the teeth of the check pawl 19 and the lower surface of the bridge 12 until it emerges beyond the end of the check pawl 19. As it is passed, the teeth 18 on the strap end frictionally engage the teeth 20*a* on the check pawl 19 and urge movement of the check pawl 19 in the direction of the arrow 28 which moves the wedges 23 and 24 down their respective inclines 16 and 15 to lower the pawl 19 away from the bridge 12 and provide a large enough opening for the easy passage of the strap end 8. The deliberate concave curve of the path of the teeth 20*a* on the pawl insures engagement of the two sets of teeth 18 and 20*a* because it causes the strap end 8 to assume a corresponding curve path, which forces it into engagement with the pawl 19 in spite of possible dimensional variations ordinarily obtained during manufacture.

With the projection 25 in the groove 17, this prevents the possibility of mis-threading the strap end 8 between the wedge 23 and the incline 16. This feature is very important because the opening 13 in the connector extends entirely through the bottom of the connector end 7 opposite the bridge 12. The reason for this is that the opening 13 for the reception of the strap end 8 can be manufactured easier and cheaper in an injection molding device if this type opening is provided. If this threading feature embodying the projection 25 would not be provided, the opening 13 shape which is a manufacturing advantage would be a use disadvantage.

After threading, the strap end 8 is drawn tightly by manually pulling the strap end 8 in the direction of the arrow 29 until the binder 1 holds the bundle 4 securely enough. Then, upon release of the strap end 8, resilience of the bundle 4 causes reverse movement of the pawl 19 to a locked position about as shown at 19*a* with the teeth 20*a* tightly engaging the teeth 18 and urging the strap end 8 against the bridge 12. The spacing of the pads 26 and 27 from each other is a little less than the width of the strap end 8. Therefore, the strap end edges frictionally engage the pads 26 and 27 at this time and this assists in this reverse movement of the pawl 19. The material of the wire binder is preferably nylon or other similar resilient plastic material. This material provides the required resilience of the pads 26 and 27 so that they properly frictionally engage the strap end edges. By having the angularity of the engaging teeth 18 and 20*a* of a steepness or slope greater than that of the inclines 15 and 16, initial engagement of the teeth preferentially urges movement of the check pawl to increase teeth engagement rather than to permit the inclines to resist movement of the check pawl and cause slippage between the teeth.

When and if release of the strap end 8 is required, the check pawl 19 can be shifted in the direction of the arrow 28 to urge the teeth 20*a* away from those on the strap end 8. Then, the strap end can be reversely removed from the connector end 7. With the slopes of the wedges 23 and 24 and their respective inclines as shown, it has been found that slight finger pressure in the direction of the arrow 30 is sufficient to cause proper release. Such a one finger release operation leaves the other fingers available for grasping and holding wires or other binders in order to render the entire wiring operation more efficient.

A second embodiment of the invention is shown in the binder 2 of FIGS. 10 and 11. The basic difference is that there is no hole 9 provided for a mounting screw since this type of binder is to be used primarily as shown in FIG. 1 for binding a bundle only, not for securing it in location on a panel board. Because of its nature, the strap end 8*c* corresponding to 8 of the binder 1 extends from the opposite end of the connector end 7*a* and its teeth 18*a* are on its opposite surface. A study of its application to a bundle 4 of wires 3 makes the nature of its differences obvious. It has an advantage in that the connector end 7*a* lies flush on the bundles 4 rather than extends from it as does the connector 7 of the binder 1. Otherwise, the binder 2 is identical to binder 1 and like parts are so numbered.

In FIG. 10 is particularly shown the manner in which the thumb 30*a* and the forefinger 31 can be used to grip the strap check pawl 19 for releasing it. This applies to the release of the binder 1 as does the single finger release shown in FIG. 9 for binder 1 apply to binder 2.

As particularly shown in FIGS. 12 and 13, the binder 2 can be held in place on a panel board by means of a binder anchor 40 which is designed to hold the binder 2 in a perpendicular position relative to it as shown. It comprises a main body 41 having two spaced apart portions 42 and 43 joined together by two parallel horizontal walls 44 and 45 which define an opening 45*a* large enough to pass the strap end 8*c* of the binder 2 with a slight frictional fit. The portion 43 is provided with an ear 46 extending in line with the wall 45. This ear has a hole provided through which a screw 47 can be passed for mounting the binder anchor 40 to a panel board 48. The advantage of this anchor is that the connector end 7*a* of the binder 2 can be positioned practically anywhere around the periphery of the path of its closed loop as desired. This is desirable in particularly inaccessible places where the binder might be used.

From what has been shown and described, it should be apparent that the invention obviates the shortcomings mentioned of prior art devices and, in addition has new advantages, and although only certain particular embodiments of the invention have been shown, it should be understood that the invention can be made in other ways and with other variations without departing from the true scope of the invention as defined by the appended claims.

I claim:

1. A wiring binder comprising a flexible strap having a connector at one end and a free strap end at the other, the connector having a base and two parallel spaced apart side walls extending from the base of the con-

nector and joined together by means of a bridge spaced from said base, said base, said two parallel side walls and said bridge defining an opening through the connector, a check pawl extending into said opening, said check pawl being provided with a toothed surface opposite said bridge and another surface opposite said toothed surface with a pair of saw tooth wedges depending therefrom, at least one of the wedges slidably engaging an incline in the base of the connector, the incline and wedges being positioned to guide the toothed surface of the check pawl either toward or away from the bridge depending upon which direction the check pawl is moved, a clear passage being provided through the opening between the bridge and the toothed surface of the check pawl when the check pawl is moved away from the bridge, said passage being provided for the reception of the free strap end which is provided with a toothed surface which ordinarily faces the toothed surface of the check pawl when the free strap end is formed into a loop and inserted into the passage, the passage being narrowed when the check pawl is moved toward the bridge to thereby urge the toothed surface of the check pawl into engagement with the toothed surface of the free strap end, the steepness of the teeth on both the free strap end and the check pawl being greater than that of the incline to preferentially urge movement of the check pawl on the incline rather than slippage between the teeth once they are engaged, and the toothed surface of the check pawl being curved concavely toward said bridge longitudinally to define a curved path for the free strap end in said passage.

2. A wiring binder comprising a flexible strap having a connector at one end and a free strap end at the other, the connector having a base and two parallel spaced apart side walls extending from the base of the connector and joined together by means of a bridge spaced from said base, said base, said two parallel side walls and said bridge defining an opening through the connector, a check pawl extending into said opening, said check pawl being provided with a toothed surface opposite said bridge and another surface opposite said toothed surface with a pair of saw tooth wedges depending therefrom, at least one of the wedges slidably engaging an incline in the base of the connector, the incline and wedges being positioned to guide the toothed surface of the check pawl either toward or away from the bridge depending upon which direction the check pawl is moved, a clear passage being provided through the opening between the bridge and the toothed surface of the check pawl when the check pawl is moved away from the bridge, said passage being provided for the reception of the free strap end which is provided with a toothed surface which ordinarily faces the toothed surface of the check pawl when the free strap end is formed into a loop and inserted into the passage, the passage being narrowed when the check pawl is moved toward the bridge to thereby urge the toothed surface of the check pawl into engagement with the toothed surface of the free strap end, the steepness of the teeth on both the free strap end and the check pawl being greater than that of the incline to preferentially urge movement of the check pawl on the incline rather than slippage between the teeth once they are engaged, and the relative shapes of the bridge and the toothed surface of the check pawl urging said strap end into a curved path convexly against said toothed surface of the pawl.

3. A wiring binder comprising a flexible strap having connector at one end and a free strap end at the other, the connector being provided with a loop through which the free strap end can be passed, and a check pawl slidable in the loop between two positions, the first position restricting the passage and the second position allowing the passage of the free strap end through the loop, said loop comprising an opening defined by a base portion of the connector and two approximately parallel side walls extending from the base portion of the connector and spaced apart from each other and joined together by means of a bridge spaced from said base portion, in the first position of the check pawl a surface of the check pawl engaging the strap end and urging it against the bridge to restrict passage of the strap end through the loop and in the second position the check pawl being moved away from said bridge to provide a clear passage for the strap end through the loop, said base portion having an opening all the way through it of the same size and shape as said bridge and located immediately opposite it.

4. A wiring binder comprising a flexible strap having a connector at one end, the connector being provided with a surrounding wall defining an opening through which the strap can be passed after being bent into a loop about a bundle of wires, said strap being drawn tight on the bundle by drawing the strap through the opening and shrinking the loop, a check pawl slidable on an incline formed on the bottom portion of the surrounding wall of the connector in the region of the opening, slidable movement of the check pawl up the incline causing the check pawl to engage the strap and press it against said wall and arrest its passage through the opening and slidable movement down the incline causing the check pawl to release the strap and provide clear passage of the strap through the opening, the engaging portions of both the check pawl and the strap having angular teeth to provide a secure grip between them when they are engaged, the slope of the angular teeth being steeper than the slope of the incline to preferentially urge movement of the check pawl on the incline rather than allow slippage between the teeth once they are engaged.

5. A wiring binder comprising a flexible strap having a connector at one end and a free strap end at the other, the connector having a base and two parallel spaced apart side walls extending from the base of the connector and joined together by means of a bridge spaced from said base, said base, said two parallel side walls and said bridge defining an opening through the connector, a check pawl extending into said opening, said check pawl being provided with a toothed surface opposite said bridge and another surface opposite said toothed surface with a pair of saw tooth wedges depending therefrom, at least one of the wedges slidably engaging an incline in the base of the connector, the incline and wedges being positioned to guide the toothed surface of the check pawl either toward or away from the bridge depending upon which direction the check pawl is moved, a clear passage being provided through the opening between the bridge and the toothed surface of the check pawl when the check pawl is moved away from the bridge, said passage being provided for the reception of the free strap end which is provided with a toothed surface which ordinarily faces the toothed surface of the check pawl when the free strap end is formed into a loop and inserted into the passage, the passage being narrowed when the check pawl is moved toward the bridge to thereby urge the toothed surface of the check pawl into engagement with the toothed surface of the free strap end, the steepness of the teeth on both the free strap end and the check pawl being greater than that of the incline to preferentially urge movement of the check pawl on the incline rather than slippage between the teeth once they are engaged.

6. A wiring binder comprising a flexible strap having a connector at one end and a free strap end at the other, the connector having a base and two parallel spaced apart side walls extending from the base of the connector and joined together by means of a bridge spaced from said base, said base, said two parallel side walls and said bridge defining an opening through the connector, a check pawl extending into said opening, said check pawl being provided with a toothed surface opposite said bridge and another surface opposite said toothed surface with a

pair of saw tooth wedges depending therefrom, at least one of the wedges slidably engaging an incline in the base of the connector, the incline and wedges being positioned to guide the toothed surface of the check pawl either toward or away from the bridge depending upon which direction the check pawl is moved, a clear passage being provided through the opening between the bridge and the toothed surface of the check pawl when the check pawl is moved away from the bridge, said passage being provided for the reception of the free strap end which is provided with a toothed surface which ordinarily faces the toothed surface of the check pawl when the free strap end is formed into a loop and inserted into the passage, the passage being narrowed when the check pawl is moved toward the bridge to thereby urge the toothed surface of the check pawl into engagement with the toothed surface of the free strap end, said passage having a narrow portion provided between the check pawl and the base of the connector, and a projection extending between the check pawl and said base which blocks the passage of the free strap end in the region between the check pawl and the base and thereby prevents mis-threading of the free strap end into the opening through the connector.

7. A wiring binder comprising a flexible strap having a connector at one end and a free strap end at the other, the connector having a base and two parallel spaced apart side walls extending from the base of the connector and joined together by means of a bridge spaced from said base, said base, said two parallel side walls and said bridge defining an opening through the connector, a check pawl extending into said opening, said check pawl being provided with a toothed surface opposite said bridge and another surface opposite said toothed surface with a pair of saw tooth wedges depending therefrom, at least one of the wedges slidably engaging an incline in the base of the connector, the incline and wedges being positioned to guide the toothed surface of the check pawl either toward or away from the bridge depending upon which direction the check pawl is moved, a clear passage being provided through the opening between the bridge and the toothed surface of the check pawl when the check pawl is moved away from the bridge, said passage being provided for the reception of the free strap end which is provided with a toothed surface which ordinarily faces the toothed surface of the check pawl when the free strap end is formed into a loop and inserted into the passage, the passage being narrowed when the check pawl is moved toward the bridge to thereby urge the toothed surface of the check pawl into engagement with the toothed surface of the free strap end, the check pawl being provided with two marginal uprights between which the free strap end must ordinarily pass when it is inserted into said passage, the two marginal uprights being provided with resilient pads which ordinarily frictionally engage the edges of the free strap end, said frictional engagement applying a force which assists in movement of the check pawl upon longitudinal movement of the free strap end.

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