

This invention relates to a binding tool wherein such binding band as a cable tie made of a plastic for binding electric cables and other materials is fastened as tensioned under a predetermined strength and is then cut off at the free end under a reduced tension by once relaxing the pulling force just before the band is cut off.

Generally pistol-type binding tools are known; for example a typical pistol-type binding tool provided with a pulling and cutting mechanism is disclosed in the gazetter of Japanese Patent Publication No. 16833/1966 claiming priority based on U.S. Patent Application No. 474,563 of 26th July 1965 of Jack E. Caveney et al. Another pistol-type binding tool is provided with a pulling and cutting mechanism so that the pulling mechanism is driven through an operating mechanism without contacting the cutting mechanism until a fixed tension is obtained. The tool is then driven via a toggle link device contacting the cutting mechanism when the fixed tension is obtained to operate the cutting mechanism, this is disclosed in the gazette of Japanese Laid Open No. 116399/1977 filed claiming priority based on U.S. Patent Application No. 656,489 of

9th February 1976 of Joseph Romeo Paradis. These conventional binding tools have defects in that generally, the band is cut off at the free end at the peak of the band fastening tension and is pulled out of a socket part containing a ratchet mechanism formed at one end of the band as engaged by the pulling/cutting shock or will be so abnormal in the engagement with the socket part as to be likely to be disengaged even if not pulled out.

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10 The present invention has it as an object to engage a band with a socket part by once momentarily relaxing the pulling force just before cutting the band, after fastening and pulling it, to prevent the return of the band when cut and
15 to securely bind it.

Another object of the present invention is to make the remaining length after cutting the band adjustable to further securely engage the band.

20 Further, another object of the present invention is to make the manufacture easy with a simple structure and to improve and rationalize workability.

25 The present invention relates to a binding tool comprising a trigger part given a returning force and connected to a pistol-type body capable of being fitted with a pad plate at the tip, a sliding member operatively connected to the trigger

part, a push-up member taper-contacting the rear
end portion of the sliding member and given a
push-up force, a pulling member connected to the
push-up member and provided at the tip with ratchet
5 pawls engaging the free end portion of a binding
band, a rocking member provided at the tip with
a cutter so as to slide with the above mentioned
pad plate and a push-down member slidable on the
upper surface of the rear end portion of the
10 rocking member and having a sloped surface, the
push-down member being pressed and pushed down
between the above mentioned sliding member and
tensioning member.

In one mode of the present invention, the
15 above mentioned push-down member is arranged
with a gap from the pressing surface of the
sliding member and in tapered contact with the
pulling member.

Following is a description by way of
20 example only of methods of carrying the invention
into effect.

In the drawings:-

Figure 1 is a perspective view of a vicinity
of a tip portion;

25 Figure 2 is a general sectioned view on line

A-A in Figure 1;

Figure 3 is a general sectioned view on line B-B in Figure 1;

5 Figure 4 is an elevation of a pad plate to be fitted to the tip;

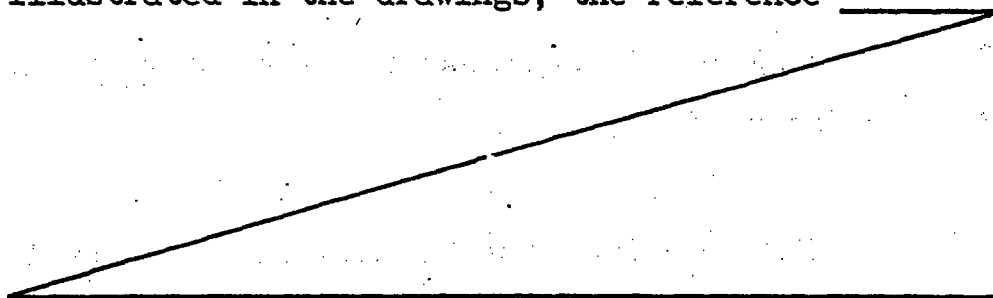
Figure 5 is a magnified view of a part of the tip portion in Figure 3;

10 Figure 6 is a perspective view showing the relation between a sliding member and push-up member;

Figure 7 is a binding band fastening state explaining view;

Figures 8A to 8D are explanatory views showing operating states.

15 In the embodiment of the present invention illustrated in the drawings, the reference



numeral 1 denotes a pistol-type body in which a pad plate 2 can be fitted to the tip and a trigger part 4 given a returning force by a resilient, for example, plastic, spring 3 is pivoted with a pin 5 as a fulcrum. As exemplified in Figs. 4 and 5, the pad plate 2 is provided with a hole portion 2A accomodating the free end portion of the binding band. The upper inside of the hole portion 2A may be blade-shaped. Further, by varying the thickness of the pad plate 2 as indicated by the two-point chain lines, the cut remaining length projecting out of the socket part of the band when cut can be adjusted.

As exemplified in Fig. 2, the plastic spring 3 is set as somewhat compressed and deformed within the body 1 and contacts at the tip with the trigger part 4 as strengthened in the returning force. Further, the rear end portion of the plastic spring 3 is split. As in the illustration, both split end portions are provided respectively with tapered parts contacting each other so that a force strongly pushing up the tapered surfaces will be given by the elastic deformation and will reinforce the force returning the trigger part 4 to the original position.

The tapered contact surfaces of the plastic spring 3 are constrained so as not to be overdeformed and so to slip off each other.

Further, the trigger part 4 is pivoted to one end of a connecting member 6 by the pin 5 and the connecting member 6 is pivoted at the other end to a sliding member 8 sliding within the body 1 by a pin 7. A tapered surface 8A is formed in the rear end portion of the sliding member 8 and is borne by a push-up member 9 having at the top end a tapered surface 9A contacting the tapered surface 8A and given a push-up force by a spring 10. This spring 10 is disposed between an adjusting screw 11 and a nut 12 screwed to the tip of it so that, by rotating the adjusting screw 11, the nut 12 will move vertically and the strength of the push-up force of the spring 10 will be able to be adjusted. Further, the above mentioned push-up member 9 and nut 12 are borne by the rear end portion 13A of a pulling member 13 moving within the body 1. The pulling member 13 is provided in the tip portion with ratchet pawls 15 having a spring 14 and a locking part 16 opposed to them.

Further, a rocking member 18 pivoted by a pin 17 is disposed below the above mentioned pulling member 13 and is provided at the tip with a cutter sliding on the inner

surface of the pad plate 2 fitted to the tip of the body 1 and with a compression spring 23. On the upper surface of the rear end portion of the rocking member 18, a push-down member 20 having a sloped surface 20A is movably vertically and slidably on the rocking member 18 and has a gap from a pressing surface 8B between the pressing surface 8B of the above mentioned sliding member 8 and a sloped surface 13B of the pulling member 13 and a sloped surface 20A is contacted with the sloped surface 13B formed in the pulling member 13.

In the drawings, the reference numeral 21 denotes a material to be bound, 22 denotes a binding band, 22A denotes a socket part and 22B denotes a free end portion.

In operation, when the binding band 22 is wound on such materials 21 as, for example, electric cables and is inserted with the free end portion 22B through the hole portion 2A of the pad plate 2 as in Figure 7 and the trigger part 4 is pulled as indicated by the arrow in Figure 2, the rear end portion 13A of the pulling member 13, that is, the pulling member 13 will be moved away from the tip of the body 1 as in Figure 8A through the connecting member 6 and sliding member 8 and thereby the ratchet pawls 15 provided in the tip portion of the pulling member 13 will engage the free end portion 22B of the band 22.

between them and the locking part 16 by the action of the spring 14. When the trigger part 4 is further pulled, the force exerted by the pulling member 13 to pull the band 22 and the force of the push-up member 9 subjected to the force of the spring bias so as not to be disengaged from the tapered surface 8A of the sliding member 8, will be unbalanced with each other so that the push-up member 8 will retreat, the movement of the pulling member 13 will stop, and the sliding member 8 will somewhat relax.

In such case, if a tensile stress acts on the band 22, the pulling member 13 will be momentarily somewhat pulled back, the band will perfectly engage with the socket part, the gap between the pressing surface 8B of the sliding member 8 and the push-down member 20 will contract and the stress acting on the band 22 will be relaxed. When the trigger part 4 is further pulled, the pulling member 13 will not move, the sliding member 8 will move, the pressing surface 8B will contact the push-down member 20 and the push-down member 20 will be compressed between the sliding member 8 and pulling member 13. However, as the push-down member 20 and pulling member 13 contact with each other in the tapered parts, the compressing force will act to push-down the push-down member 20 (Fig. 8B), therefore the rocking member 18 will be pushed down in the rear end portion,

will rock against the compression spring 23 with the pin 17 as a fulcrum, will push up the cutter 19 at the tip and will slide the blade-shaped portion of the pad plate to cut off the band 22 in the free end portion 22B (Fig. 8C).

When the trigger part 4 is released, the rocking member 18 will push up the push-down member 20 which returns to its original state by the action of the compression spring 23. Further, all the members of the mechanism will return to their original states because of the spring 3, and the cut free end portion 22B of the band 22 will be discharged from the tip (Fig. 8D).

By properly determining the thickness of the pad plate 2 at the tip of the body 1, the band 22 can be normally and positively engaged with the socket part 22A with some space in the projection out of the socket part 22A.

Further, in case the upper inside of the hole portion 2A of the pad plate 2 is blade-shaped, the cutter 19 will be able to be expected to operate more smoothly to cut accurately.

As described above, according to the present invention, as the pulling force is once relaxed just before the band is cut off after being fastened and pulled, the band will be prevented from returning and will be bound

positively. Further, as the cut portion of the free end of the band can be positively projected out of the socket part, the operation will be able to be improved and rationalized.



- 12 -

CLAIMS:

1. A binding tool comprising a trigger part
biased to a returned position and connected to
a pistol-type body, said body being capable of
being fitted with a pad plate at its operational
5 tip, a sliding member operatively connected to
said trigger part, a push-up member taper-contacting
the rear end portion of said sliding member and
upwardly biased, a pulling member connected to said
push-up member and provided toward the tip with
10 ratchet pawls to engage a free end portion of a
binding band; a rocking member provided at the tip
with a cutter so as to slide on the inner surface
of the pad plate and a push-down member slidable
on the upper surface of the rear end portion of
15 said rocking member and being provided with a
sloped surface, said push-down member being pressed
and pushed down between the above mentioned
sliding member and pulling member and the free
end portion of the binding band being cut off
20 under a reduced tension by once relaxing the force
exerted by the pulling member just before said free
end portion is cut off after the band is fastened.



- 13 -

2. A binding tool according to Claim 1 wherein the push-down member is provided with a gap between the pressing surface of the sliding member and the tapered contact surface of the pulling member.
3. A binding tool as claimed in Claim 1 or Claim 2 wherein a plastic spring disposed within the body provides the bias to return the trigger part, said spring being in contact at one end with the trigger part and being split at its rear end portion to provide a ring, both end portions of which terminate in contacting tapered surfaces.
4. A binding tool as claimed in any one of Claims 1 to 3, wherein the push-up member is spring biased and the pressing force of said spring is adjusted by an adjusting screw.
5. A binding tool substantially as herein described with reference to and as illustrated in the accompanying drawings.
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