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⑤④ **Automatic tie gun.**

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Description

This invention relates to a tool for automatically applying ties.

DE—A—2723651 discloses a tool for automatically applying around an elongate roll or bundle, a flexible tie having a flat tail and an apertured head at one end of the tail, the tool feeding from a supply of said ties and the tool comprising an indexing arrangement for indexing each of successive ties into a tail-forward, ready position within the tool, a mechanism for driving tail-first from the tool the tie which is in the tail-forward, ready position, a guiding arrangement at the forward end of the tool for guiding the tie tail around the bundle to be tied as the tie is driven from the tool and arranged so that the free end of the tail passes through the apertured head to interlock therein, a mechanism for engaging the free end of the tail (once passed through said apertured head) and driving it lengthwise of itself to tension the tie around the bundle being tied, a knife for cutting the tail behind the head and a tension-sensing device for actuating said knife when a predetermined tension is reached.

The ties are contained in a cartridge into which they must be packaged one-by-one in presumably a manual operation: firstly moreover, the ties must be separated individually after they are formed by injection moulding. Thus, provision of the supply of ties for the tool is time consuming and complicated.

Our invention is characterised in that the supply of ties for the tool is in the form of a belt in which the ties are disposed side-by-side with each other with their tails disposed flat in a common plane and with adjacent ties integrally interconnected at or adjacent both their heads and tail free ends, in that the indexing arrangement of the tool engages the successive ties along their lengths to advance the belt so as to step each of the successive ties laterally of itself (in the plane of its flat tail) into the tail-forward, ready position within the tool, in that the tool comprises a cutting mechanism for separating the successive ties from their neighbouring ties at or adjacent both their heads and tail free ends, and in that means are provided for expelling as waste bridging pieces which serve to integrally interconnect the adjacent ties at least adjacent their tail free ends.

In this arrangement, provision of the supply of ties is particularly simple. A plurality of ties can be directly moulded side-by-side, integrally interconnected: successive sets of such ties can be interconnected (as by welding) to form a belt of considerable length. Thus there is no requirement for the ties to be separated individually after moulding them, nor for individually packaging the ties into a carriage. Conveniently, the indexing arrangement serves to advance the belt so that each tie is stepped laterally of itself (in the plane of its flat tail) into the ready position within the tool; by contrast in the tool of

DE—A—2723651, the ties are stacked with the flat tail of one tie disposed flat upon the flat tail of the preceding tie, and each tie is stepped into the ready position by displacement of that tie in the direction perpendicular to its flat tail. Thus the tool of DE—A—2723651 is not capable of feeding from the belt of ties proposed by our invention and in any event does not incorporate any cutting mechanism for cutting each of the successive ties from the belt.

DE—A—2 837 101 relates to the field of tags and describes a tool for applying such tags. This is a distinctly different field from the tie field of the present invention and the tags are of considerably less sophistication than the ties and work in accordance with completely different principles, necessitating only a relatively simple and straightforward form of application tool. The tags serve as temporary fastenings which do not have to resist any significant force tending to separate the elements fastened together: the ties could not be manufactured, to their required standard of precision, on continuous moulding apparatus as shown for the tags in Figure 10—12 of DE—A—2 837 101. Not only is the tag a simple and unsophisticated product, so too is the tool for applying the tag: it comprises essentially a slotted piercing needle and one side member of the tag is engaged into the rear end of this needle, with a cross-link of the tag projecting out of the slot in the needle; then the one side member of the tag is simply pushed along the needle and through the elements to be fastened (which have been pierced by the needle). The tag admits readily to a bandolier principle, because they can be moulded easily with the side member of successive tags joined end-to-end and so that they can be separated without any waste pieces having to be disposed of. The advancing direction of the belt of tags is essentially the same direction as the tag is required to advance when being applied to the elements to be fastened: there is no requirement to position each successive tag accurately (by step-advancing the belt) prior to driving the tag out of the tool, because the tag is driven out of the tool in the same direction as the belt of tags is advanced. In that the tag and tool are so different in their principles from the tie and tie applying field which this invention relates, DE—A—2 837 101 is of no assistance to the tie applying field: in particular there is no apparent manner in which the teachings of DE—A—2 837 101 can be applied to the tool of DE—A—2 723 651 to develop the latter tool.

Preferably in the tool of this invention, the indexing arrangement comprises a rotary drum rotatable about an axis parallel to the tie in the ready position, the rotary drum having longitudinal grooves in its periphery, which grooves accommodate successive ties of the belt to be advanced by stepped rotation of the drum and which grooves support and engage the ties substantially along the lengths of those ties. Indexing is facilitated in a simple and reliable manner.

A tool in accordance with the invention is now described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a section through an embodiment of the invention in the form of a tie gun;

Figure 2 is a plan view from above of the tie gun of Figure 1;

Figure 3 is a view in the direction of arrows A—A of the gun of Figure 1;

Figure 4 is a view of the ratchet mechanism which rotates the drum of Figure 1;

Figure 5 shows the preferred type of flexible tie;

Figures 6a and 6b show two alternative embodiments of support for a belt of flexible ties;

Figure 7 is a front perspective view of the tie gun of Figure 1;

Figures 8a and 8b are perspective and cross-sectional views of a preferred form of drum used in the invention;

Figure 9 shows a preferred mechanism for disconnecting the ties from the adjacent ties;

Figure 10 illustrates a volute by which in the preferred embodiment the ties are positioned;

Figures 11a, 11b and 11c show a lipped slot, along which, in the preferred embodiment, the tie is diverted;

Figure 12 shows a section through a threaded tie;

Figure 13 is a perspective view of the buckle of a tie;

Figure 14 illustrates a bundle of cables bound by flexible ties;

Figure 15 illustrates a belt of flexible ties, Figure 15b showing a preferred form of belt for use in conjunction with the tie gun of Figure 1;

Figures 16a and 16b are sectional views through a flexible tie;

Figure 17 illustrates an elongated belt of ties comprising several shorter belts joined together; and

Figures 18a to 18e show a modified form of low profile flexible tie.

The tie gun illustrated in Figure 1 is particularly adapted for binding cables together with flexible ties, the fastenings of which have a low profile when secured around the cable bundle. Operation of the gun is controlled by a pneumatic cylinder and the various stages in the operating cycle are indexed to the stroke of the piston of the cylinder. In the following description, before the detailed construction of the gun is described, the general sequence of its operation is outlined along with a brief description of the tie and the feed mechanism. Then the operating sequence is explained in more detail with reference to the drawings, and this is followed by a detailed description of the construction of the various units of the gun which perform specific functions which are referred to in the operating sequence, and also by a more detailed description of the flexible ties used in the gun.

Briefly, the operating sequence of the gun is governed by the piston of the pneumatic control cylinder which is linked to a ram so that during the inward and outward strokes of the piston,

which respectively produce forward and rearward strokes of the ram, flanges on the ram engage with and activate other parts of the mechanism. The piston is activated to move inwardly by depression of a trigger, whereupon a guide loop is closed about the bundle of cables which are to be bound and the tip of a flexible tie is pushed forward so that it passes around the cable via the guide loop and is threaded through a fastener in the form of an apertured head on the other end of the tie. Once the tie is threaded the piston commences its outward stroke and the tip of the tie is gripped, the tie pulled tight, and, once a predetermined tension is reached, the excess length of tie is trimmed off. Then, whilst the piston completes its outward stroke, another tie is advanced to the firing or ready position, the scrap trim is ejected and the guide loop is released from the bound cable. This completes an operating cycle of the ram initiated by a single depression of the trigger.

The feed mechanism by which the ties are advanced includes a cylindrical drum with longitudinal recesses which accommodate the tails of the ties as they are fed laterally into the gun from one side of the drum. The ties are advanced by rotation of the drum during the latter part of each outward stroke of the piston which brings successive ties to the topmost position ready for subsequent firing. In order to simplify the indexing of the ties into their respective recesses, in the correct orientation, the ties are joined together by bridging pieces to form a belt. Once a tie is in the firing position it is cut free from its bridging pieces by a cropping mechanism.

In order to achieve a low profile fastening, a tie may be employed in which the tail threads through a longitudinal aperture in the buckle so that the threaded portion lies along the portion of the tie adjacent to the buckle rather than projecting perpendicular to it. To thread this type of tie the buckle needs to be rotated through 180° (compared with when the tie is laid flat) to receive the tail which has been passed around the bundle of cables. Therefore, in addition to advancing successive ties to the firing position, the feed mechanism of the gun also rotates the buckle to the correct orientation for receiving the tail. This is achieved by the buckles of the ties, which overhang the rearward edge of the drum, abutting a volute which causes the buckle portion of the tie to be progressively bent outward and then back on itself as the drum is rotated, so that the 180° rotation has been completed by the time the tie is in the firing position.

Referring now to Figure 1, the tie gun is shown generally as 1, and has a spring return trigger 2. A guide loop 3 is provided at the end of barrel 4 of the gun, and can be closed about a suitable bundle of cables adjacent to which the end of the barrel 4 has been placed. Trigger 2 is provided with an inclined surface 5 which abuts an inclined surface on the spool 6 of a valve 7 so that upon a depression of the trigger the spool 6 is lifted and air is provided to one end of a pneumatic cylinder 8 which, as may be seen from Figures 2 and 3, is

disposed in the barrel 4 of the gun with its piston rod free to extend into rear portion 9 of the gun 1. Spool 6 is held in its lifted position by detent 10 and the extended piston of the pneumatic cylinder retracts moving a ram 11, which is connected to the piston, to the left as viewed. Ram 11 is provided with a flange 12 at its end remote from the barrel which abuts a flange 13 on a biased rod 14, so that as flange 13 moves leftwards it permits rod 14 to move left under the influence of spring 15, which closes guide loop 3. The barrel end of ram 11 acts as a pusher for a tie 16, whereby said ram may more generally be referred to as a push rod. As it advances it pushes the buckle 17 of a tie 16 into a pair of spring loaded jaws 18, which are mounted on the forward end of the barrel of the tool, the tail end of the tie being pushed down a lipped slot 19, around the guide loop 3 and through the buckle. Ram 11 is now in its most leftward position, and the piston is fully retracted. In this position an inclined surface 20 on flange 12 has engaged with a corresponding upper inclined surface 21 on spool 6 and pushed down the spool, which is then retained in its down position by detent 10, which causes the action of the pneumatic cylinder 8 to be reversed.

On the outward stroke of the piston the tail of tie 16, which is gripped by a clamp 22, is pulled, the buckle being retained by jaws 18 until a predetermined tension is sensed by a cut-off unit 23, whereupon a rod 24 is moved to the right causing knife 25 to sever the tail of the tie 16 close to the buckle 17. The release of tension caused by cutting the tail resets the cut-off unit which retracts the knife 25, and also causes the piston to continue to extend at an increased speed. A scrap release trigger 26 which is spring loaded upwards but depressed during the passage of the ram rod 11 over it, is then released as it is cleared by the end of ram 11, and this trigger then engages clamp 22 so that the tail is released, the tail being impelled into scrap bottle 27 partly under its own momentum and partly by pneumatic ejection. A projection 28 on ram rod 11 engages a bell crank 29 to advance a feed ratchet 30 which rotates drum 31 and aligns a new tie with the end of the ram 11 ready for the next cycle. Figure 4 shows the feed ratchet 30 and bell crank 29 in detail. Bell crank 29 is sprung so that it can move to the next ratchet position, when it is released on the inward stroke of the piston, ready to rotate the drum 31 during the subsequent outward stroke. Precise positioning of the drum may be achieved by a rotation detent in which a sprung member indexes with notches in the drum once it has been rotated by the bell crank and ratchet. Whilst the outward stroke of the piston continues further, a flange on the ram rod 11 engages with a forked lever 32, the other end of which engages a flange 33 on cut-off rod 24 to ensure that the cut-off unit is properly reset, and finally, flange 12 of ram rod 11 pushes flange 13 to the right which opens the guide loop 3 and releases the bound cable.

Figure 5 shows the construction of a suitable low profile buckle with the threaded portion of the

tail lying parallel to the end of the tie adjoining the buckle. The ties, which may be made of injection moulded plastics, are fully described hereinafter with reference to Figures 12 to 18. Figures 6a and 6b show two alternative forms of support for a belt of ties, in the simplest case one or more pairs of curved supports 34 are used, or, if it is undesirable to have the belt left waving, a magazine 35 in which the belt can be coiled is used. The belt of ties is fed into the gun 1 via a slot 36 which can be seen in the front perspective view of the gun in Figure 7. Having passed through the slot the belt passes around drum 31 which is recessed as shown in Figure 8 with longitudinal grooves 37 for the ties and circumferential grooves 38 for the bridging pieces between the ties. Longitudinal grooves 37 are deeper than circumferential grooves 38 so that the ties are supported on the drum 31, by the bridging pieces, above the base of the longitudinal grooves 37. The longitudinal grooves may also serve, at one end, as the notches into which the sprung member of the rotation detent indexes. When a tie has passed around the drum 31 and is aligned with the ram rod 11, it is cut free from its bridging pieces by reciprocating action of crops 39, which are actuated via lever linkage 40 and projection 28 on ram 11 during the outward stroke of the piston in the cycle of operation of tying the immediately preceding tie. Figure 9 schematically shows the action of crops 39; the action is synchronised to take place immediately after the tie has been rotated into position by feed ratchet 30, both the feed ratchet 30 and the crops 39 being activated by projection 28. The scrap bridging pieces drop into a waste chute 41 and are exhausted into waste bottle 27.

Whilst drum 31 is progressively rotated, the buckle end of the ties are gradually bent over by a voluted surface, as shown in Figure 10, so that the buckle is eventually bent through 180° with respect to the tail. Depression of trigger 2 causes the tie to be advanced in this bent over condition by the advancing ram 11, the buckle engaging with buckle clasp 18, and the tip being directed down the S-bend of lipped slot 19, around the cable and through the buckle. The lips of slot 19, shown in Figure 11a, retain the tie within the slot during its passage down the S-bend (Figure 11b), but once the tensioning operation commences the tie can be pulled free as shown in Figure 11c.

Drum 31 is provided with cutaway apertures 43 in the circumferential groove 38, each of these being arranged so as to be covered by the bridging pieces of the belt of ties (see Figure 8) when there is a tie in the respective preceding longitudinal slot 37. An airline has an open end located such that after the last tie of a belt of ties feeding into the gun has been engaged, and the drum is rotated to the next position where it would otherwise have engaged the next tie, air from airline passes through the uncovered aperture 43 and causes a whistle indicating that a new belt of ties is required.

The cut-off unit 23 is shown in Figure 1; for

clarity it is illustrated displaced rearward from its correct position whilst Figure 2 shows the cut-off unit correctly positioned. As a tie is tightened around a bundle of cables, pressure in the pneumatic cylinder 8 rises in proportion to the tension in the tie. The cut-off unit is therefore responsive to the pressure in the pneumatic cylinder and can be adjusted such that the tightened tie is cut-off at a predetermined tie tension. A line 45 connects the cut-off unit to the pneumatic cylinder, so that the pressure applied to the left (as viewed) of a poppet 46 is equal to that driving the piston of the pneumatic cylinder 8. The poppet 46 is held in position by a spring 47, until the applied air pressure exceeds the pressure exerted by the spring 47, whereupon the poppet is unseated and moves to the right moving cut-off rod 24 and actuating knife 25. Release of the tie tension once the tail has been cut, and the drop in air pressure in the cut-off unit due to sudden expansion of air when the poppet is unseated, enables the poppet 46 to be pushed left again by spring 47. Meanwhile the piston of pneumatic cylinder 8, also relieved of the tension of the tie, completes its stroke and lever 32 engages flange 33 and ensures that the poppet 46 is resealed in its original position. Different tie tensions may be obtained by adjusting knob 48 which changes the compression in spring 47.

Referring to Figures 5, 12 and 13, the buckle 17 has a longitudinal aperture 49 through which the tail can be threaded so that ratchet serrations 50 on one surface of the tail engage with a pawl 51, which prevents the tail from being pulled back out of the aperture 49 but enables it to be advanced through to tighten the loop 52 formed by the tail. A slot 53 is provided beneath pawl 51 which enables it to be resiliently depressed by the serrations 50 for ease of advancement of the tail through the aperture 49.

Figure 14 shows a bundle of cables bound by flexible ties illustrating the low profile fastening achieved by the flexible ties used in the tie gun. A low profile tie of this type may, as well as being visually appealing, be particularly advantageous for example when the bound cables are to be inserted through restricted apertures, or into confined spaces, such as may occur when fitting wired looms. In the drawings the tie is illustrated with serrations on the tail of the tie such that when the tie is threaded the serrations are on the inside of the loop. Although this configuration is often preferred because the serrations can also act to grip the cables or other items about which the tie is wound, the serrations may alternatively be formed so that they are on the outside of the loop, and in this case the pawl is formed extending down from the upper surface (as viewed) of the buckle 17.

The ties may be connected by integrally moulded bridging pieces as shown in Figure 15a. However in order that the fasteners may be bent outwards by the voluted surface 42 without requiring previous separation, the ties are preferably fabricated, as shown in Figure 15b, with the

heads separate and the two bridging pieces 54 between the tails of adjacent ties. To ease the tooling requirements the belt of ties may be moulded with the tail bent through 90° near the buckle 17, as is shown in section in Figure 16. These bent belts can be pressed flat for packing, and when used the preformed bend facilitates turning the buckle into the position shown in Figure 16b for threading by the end of tail. In order to achieve a longer belt than can be conveniently moulded, individually moulded belts may be connected into a continuous longer belt as shown in Figure 17. To minimise jamming of the gun when used with such a continuous belt, joints 55 between the individually moulded belts should be made as smooth as possible.

Figures 18a to 18e show a modified form of low profile tie. This tie is illustrated with serrations which will be disposed on the outside of the loop when the tie is threaded. The serrations engage with similarly profile teeth 56 extending from the upper surface of the buckle. Channels 57 are provided in the buckle which accommodate ridges 58 along the edges of the tail.

The gun mechanism may be housed in a die-cast body, one half acting as a chassis onto which the component parts of the mechanism may be mounted, and the other half acting as a cover. A suitable type of pneumatic cylinder is a Martonair Midget M/6010 which has a 10 mm bore, 4 mm diameter rod and 130 mm stroke; a suitable type of valve is a Martonair M/1555/1.

Claims

1. A tool for automatically applying, around an elongate roll or bundle, a flexible tie (16) having a flat tail and an apertured head at one end of the tail, the tool feeding from a supply of said ties and the tool comprising an indexing arrangement (28—31) for indexing each of successive ties into a tail-forward, ready position within the tool, a mechanism (11, 7, 8) for driving tail-first from the tool the tie which is in the tail-forward, ready position, a guiding arrangement (3) at the forward end of the tool for guiding the tie tail around the bundle to be tied as the tie is driven from the tool and arranged so that the free end of the tail passes through the apertured head to interlock therein, a mechanism (22) for engaging the free end of the tail (once passed through said apertured head) and driving it lengthwise of itself to tension the tie around the bundle being tied, a knife (25) for cutting the tail behind the head and a tension-sensing device (23) for actuating the said knife when a predetermined tension in the tie is reached, characterised in that for use of ties in the form of a belt in which the ties (16) are disposed side-by-side with each other with their tails disposed flat in a common plane and with adjacent ties integrally interconnected at or adjacent both their heads and tail free ends, the indexing arrangement (28—31) of the tool is arranged to engage the successive ties along their lengths to advance the belt so as to step each of the suc-

cessive ties laterally of itself (in the plane of its flat tail) into said tail-forward, ready position within the tool, in that the tool comprises a cutting mechanism (39) for separating the successive ties from their neighbouring ties at or adjacent both their heads and tail free ends, and in that means (41) are provided for expelling waste bridging pieces (54) which serve to integrally interconnect the adjacent ties at least adjacent their tail free ends.

2. A tool as claimed in Claim 1, characterised in that the indexing arrangement comprises a rotary drum (31) rotatable about an axis parallel to the tie in the tail-forward, ready position within the tool, the rotary drum having longitudinal grooves (37) in its periphery, which grooves accommodate successive ties of the belt to be advanced by stepped rotation of the drum and which grooves support and engage the ties substantially along the lengths of those ties.

3. A tie-applying tool in combination with a supply of flexible ties for said tool, the tool serving for automatically applying successive said ties (16) around an elongate roll or bundle, each tie having a flat tail and an apertured head at one end of the tail, and the tool comprising an indexing arrangement (28—31) for indexing each of successive ties into a tail-forward, ready position within the tool, a mechanism (11, 7, 8) for driving tail-first from the tool the tie which is in the tail-forward, ready position, a guiding arrangement (3) at the forward end of the tool for guiding the tie tail around the bundle to be tied as the tie is driven from the tool and arranged so that the free end of the tail passes through the apertured head to interlock therein, a mechanism (22) for engaging the free end of the tail (once passed through said apertured head) and driving it lengthwise of itself to tension the tie around the bundle being tied, a knife (25) for cutting the tail behind the head and a tension-sensing device (23) for actuating the said knife when a predetermined tension in the tie is reached, characterised in that said supply of ties is in the form of a belt in which the ties (16) are disposed side-by-side with each other with their tails disposed flat in a common plane and with adjacent ties integrally interconnected at or adjacent both their heads and tail free ends, in that the indexing arrangement (28—31) of the tool engages the successive ties along their lengths to advance the belt so as to step each of the successive ties laterally of itself (in the plane of its flat tail) into said tail-forward, ready position within the tool, in that the tool comprises a cutting mechanism (39) for separating the successive ties from their neighbouring ties at or adjacent both their heads and tail free ends, and in that means (41) are provided for expelling waste bridging pieces (54) which serve to integrally interconnect the adjacent ties at least adjacent their tail free ends.

4. A tie-applying tool and supply of ties as claimed in Claim 3, characterised in that the indexing arrangement of the tool comprises a rotary drum (31) rotatable about an axis parallel

to the tie in the tail-forward, ready position within the tool, the rotary drum having longitudinal grooves (37) in its periphery, which grooves accommodate successive ties of the belt to be advanced by stepped rotation of the drum and which grooves support and engage the ties substantially along the lengths of those ties.

Patentansprüche

1. Werkzeug zum automatischen Anlegen eines flexiblen Binders um eine langgestreckte Rolle oder ein langgestrecktes Bündel, wobei der Binder einen flachen Schwanzteil und einen mit einer Öffnung versehenen Kopf an einem Ende des Schwanzteils aufweist, und wobei das Werkzeug aus einem Bindervorrat beschickt wird und eine Einreihenanordnung (28—31) zum Einreihen jedes der aufeinanderfolgenden Binder in eine mit dem Schwanzteil nach vorne gerichtete benutzungsbereite Stellung innerhalb des Werkzeugs, einen Mechanismus (11, 7, 8) zum Vortreiben des mit dem Schwanzteil nach vorn gerichteten benutzungsbereiten Binders mit dem Schwanzteil voran von dem Werkzeug, eine Führungsanordnung (3) am vorderen Ende des Werkzeugs zum Führen des Schwanzteils des von dem Werkzeug vortriebenen Binders um das zu bindende Bündel herum, die so angeordnet ist, daß das freie Ende des Schwanzteils durch den die Öffnung aufweisenden Kopf bewegt wird, um darin verriegelt zu werden, einen Mechanismus (22), der mit dem freien Ende des Schwanzteils (sobald dieses durch den die Öffnung aufweisenden Kopf bewegt ist) zusammenwirkt und in seiner Längsrichtung vortreibt, um den Binder um das zu bindende Bündel herum zu spannen, ein Messer (25) zum Abschneiden des Schwanzteils hinter dem Kopf und einen Spannungsfühler (23) zum Betätigen des Messers, wenn eine vorher bestimmte Spannung in dem Binder, erreicht ist, umfaßt, dadurch gekennzeichnet, daß zur Verwendung von Bindern in der Form eines Gürtels, in dem die Binder (16) seitlich nebeneinander mit in einer Ebene flach angeordneten Schwanzteilen und einstückig miteinander bei oder benachbart ihren Köpfen und den freien Enden ihrer Schwanzteile verbunden sind, die Einreihenanordnung (28—31) des Werkzeugs so angeordnet ist, daß sie auf die aufeinanderfolgenden Binder längs ihrer Längen einwirkt, um den Gürtel vorzuschieben, so daß jeder der aufeinanderfolgenden Binder seitwärts zu sich selbst (in der Ebene seines flachen Schwanzteils) in die mit dem Schwanzteil nach vorne gerichtete, benutzungsbereite Stellung innerhalb des Werkzeugs schrittweise vorgerückt wird, daß das Werkzeug einen Schneidmechanismus (39) zum Trennen der aufeinanderfolgenden Binder von den ihnen benachbarten Bindern an oder benachbart ihren Köpfen und freien Enden der Schwanzteile umfaßt, und Mittel (41) zum Auswerfen der Abfallüberbrückungsstücke (54), mit denen die benachbarten Binder einstückig zumindest an den freien Enden ihrer Schwanzteile verbunden sind.

2. Werkzeug nach Anspruch 1, dadurch gekennzeichnet, daß die Einreihenanordnung eine rotierende Trommel (31) umfaßt, die um eine Achse parallel zum Binder in diesem mit dem Schwanzteil nach vorne gerichteten, benutzungsbereiten Stellung innerhalb des Werkzeugs drehbar ist, die Längsnuten in ihrer Umfangsfläche aufweist, die aufeinanderfolgende Binder des durch schrittweise Drehung der Trommel vorzuschickenden Gürtels aufnehmen, und die Binder im wesentlichen längs ihrer Länge stützen und auf die einwirken.

3. Werkzeug zum Anlegen von Bindern in Kombination mit einem Vorrat von flexiblen Bindern für das Werkzeug, das zum automatischen Anlegen der aufeinanderfolgenden Binder (16) um eine langgestreckte Rolle oder ein langgestrecktes Bündel dient, wobei jeder Binder einen flachen Schwanzteil und einen mit einer Öffnung versehenen Kopf an einem Ende des Schwanzteils aufweist, und wobei das Werkzeug eine Einreihenanordnung (28—31) zum Einreihen jedes der aufeinanderfolgenden Binder in eine mit dem Schwanzteil nach vorne gerichtete benutzungsbereite Stellung innerhalb des Werkzeugs, einen Mechanismus (11, 7, 8) zum Vortreiben des mit dem Schwanzteil nach vorn gerichteten benutzungsbereiten Binders mit dem Schwanzteil voran von dem Werkzeug, eine Führungsanordnung (3) am vorderen Ende des Werkzeugs zum Führen des Schwanzteils des von dem Werkzeug vorgetriebenen Binders um das zu bindende Bündel herum, die so angeordnet ist, daß das Freie Ende des Schwanzteils durch den die Öffnung aufweisenden Kopf bewegt wird, um darin verriegelt zu werden, einen Mechanismus (22), der mit dem freien Ende des Schwanzteils (sobald dieses durch den die Öffnung aufweisenden Kopf bewegt ist) zusammenwirkt und in seiner Längsrichtung vortreibt, um den Binder um das zu bindende Bündel herum zu spannen, ein Messer (25) zum Abschneiden des Schwanzteils hinter dem Kopf und einen Spannungsfühler (23) zum Betätigen des Messers, wenn eine vorher bestimmte Spannung in dem Binder erreicht ist, umfaßt, dadurch gekennzeichnet, daß der Bindervorrat die Form eines Gürtels aufweist, in dem die Binder (16) seitlich nebeneinander mit in einer Ebene flach angeordneten Schwanzteilen und einstückig miteinander bei oder benachbart ihren Köpfen und den freien Enden ihrer Schwanzteile verbunden sind, daß die Einreihenanordnung (28—31) des Werkzeugs auf die aufeinanderfolgenden Binder längs ihrer Länge einwirkt, um den Gürtel vorzuschieben, so daß jeder der aufeinanderfolgenden Binder seitwärts zu sich selbst (in der Ebene seines flachen Schwanzteils) in die mit dem Schwanzteil nach vorne gerichtete, benutzungsbreite Stellung innerhalb des Werkzeugs schrittweise vorgerückt wird, daß das Werkzeug einen Schneidmechanismus (39) zum Trennen der aufeinanderfolgenden Binder von den ihnen benachbarten Bindern an oder benachbart ihren Köpfen und freien Enden der Schwanzteile umfaßt, und Mittel

(41) zum Auswerfen der Abfallüberbrückungsstücke (54), mit denen die benachbarten Binder einstückig zumindest an den freien Enden ihrer Schwanzteile verbunden sind.

4. Werkzeug zum Anlegen von Bindern und ein Vorrat von Bindern nach Anspruch 3, dadurch gekennzeichnet, daß die Einreihenanordnung des Werkzeugs eine rotierende Trommel (31) umfaßt, die um eine Achse parallel zum Binder in diesem mit dem Schwanzteil nach vorne gerichteten, benutzungsbereiten Stellung innerhalb des Werkzeugs drehbar ist, die Längsnuten in ihrer Umfangsfläche aufweist, die aufeinanderfolgende Binder des durch schrittweise Drehung der Trommel vorzuschiebenden Gürtels aufnehmen, und die Binder im wesentlichen längs ihrer Länge stützen und auf die einwirken.

Revendications

1. Outil pour appliquer automatiquement, autour d'un rouleau ou faisceau allongé, une attache flexible (16) ayant une queue plate et une tête à ouverture à une extrémité de la queue, l'outil alimentant, d'une source desdites attaches et l'outil comprenant un agencement d'avance (28—31) pour faire avancer chacune des attaches successives et une position prête, la queue vers l'avant, dans l'outil, un mécanisme (11, 7, 8) pour entraîner, la queue vers l'avant, de l'outil, l'attache qui est en position prête, la queue vers l'avant, un agencement de guidage (3) à l'extrémité avant de l'outil pour guider la queue de l'attache autour du faisceau à attacher tandis que l'attache est entraînée de l'outil et agencé de façon que l'extrémité libre de la queue passe par la tête à ouverture pour en devenir solidaire, un mécanisme (22) pour engager l'extrémité libre de la queue (après son passage à travers ladite tête à ouverture) et l'entraîner longitudinalement à elle-même pour mettre l'attache sous tension autour du faisceau qui est attaché, un couteau (25) pour couper la queue derrière la tête et un dispositif (23) de détection de tension pour actionner ledit couteau lorsqu'une tension prédéterminée dans l'attache est atteinte, caractérisé en ce que pour une utilisation d'attaches sous la forme d'une bande où les attaches (16) sont disposées côte à côte les unes aux autres avec leurs queues disposées à plat dans un plan commun et avec des attaches adjacentes intégralement interconnectées à ou à proximité de leurs têtes et de leurs extrémités libres de queue, l'agencement d'avance (28—31) de l'outil est agencé pour engager les attaches successives sur leur longueur pour faire avancer la bande afin de faire avancer d'une étape chacune des attaches successives latéralement à elle-même (dans le plan de sa queue plate) dans ladite position prête, la queue vers l'avant, dans l'outil, en ce que l'outil comprend un mécanisme de coupe (39) pour séparer les attaches successives de leurs attaches voisines à ou près de leurs têtes et de leurs extrémités libres de queue et en ce que des moyens (41) sont prévus pour expulser les pièces de liaison de rebut (54)

qui servent à intégralement interconnecter les attaches adjacentes au moins à proximité de leurs extrémités libres de queue.

2. Outil selon la revendication 1, caractérisé en ce que l'agencement d'avance comprend un tambour rotatif (31), rotatif autour d'un axe parallèle à l'attache en position prête, la queue vers l'avant, dans l'outil, le tambour rotatif ayant des gorges longitudinales (37) dans son pourtour, lesquelles gorges reçoivent des attaches successives de la bande pour une avance par rotation échelonnée du tambour et lesquelles gorges supportent et engagent les attaches sensiblement sur la longueur de ces attaches.

3. Outil d'application d'attaches en combinaison avec une alimentation en attaches flexibles pour ledit outil, l'outil servant à appliquer automatiquement lesdites attaches (16) en succession autour d'un rouleau ou faisceau allongé, chaque attache ayant une queue plate et une tête à ouverture à une extrémité de la queue et l'outil comprenant un agencement d'avance (28—31) pour faire avancer chacune des attaches successives en une position prête, la queue vers l'avant, dans l'outil, un mécanisme (11, 7, 8) pour entraîner, de l'outil, la queue vers l'avant, l'attache qui est en position prête, la queue vers l'avant, un agencement de guidage (3) à l'extrémité avant de l'outil pour guider la queue de l'attache autour du faisceau à attacher tandis que l'attache est entraînée de l'outil et agencé de façon que l'extrémité libre de la queue traverse la tête à ouverture pour en devenir solidaire, un mécanisme (22) pour engager l'extrémité libre de la queue (après son passage à travers ladite tête à ouverture) et l'entraîner longitudinalement à elle-même pour mettre l'attache sous tension autour du faisceau qui est attaché, un couteau (25) pour couper la queue

derrière la tête et un dispositif (23) de détection de tension pour actionner ledit couteau lorsqu'une tension prédéterminée dans l'attache est atteinte, caractérisé en ce que ladite source d'attaches a la forme d'une bande où les attaches (16) sont disposées côte à côte les unes aux autres avec leurs queues disposées à plat dans un plan commun et avec des attaches successives intégralement interconnectées à ou à proximité de leurs têtes et de leurs extrémités libres de queue, en ce que l'agencement d'avance (28—31) de l'outil engage les attaches successives sur leurs longueurs pour faire avancer la bande afin de faire avancer d'une étape chacune des attaches successives latéralement à elle-même (dans le plan de sa queue plate) dans ladite position prête, la queue vers l'avant, dans l'outil, en ce que l'outil comprend un mécanisme de coupe (39) pour séparer les attaches successives de leurs attaches voisines à ou à proximité de leurs têtes et de leurs extrémités libres de queue, et en ce que des moyens (41) sont prévus pour expulser les pièces de liaison de rebut (54) qui servent à interconnecter intégralement les attaches adjacentes au moins à proximité de leurs extrémités libres de queue.

4. Outil d'application d'attaches et source d'attaches selon la revendication 3, caractérisés en ce que l'agencement d'avance de l'outil comprend un tambour rotatif (31) rotatif autour d'un axe parallèle à l'attache en position prête, la queue vers l'avant, dans l'outil, le tambour rotatif ayant des gorges longitudinales (37) dans son pourtour, lesquelles gorges reçoivent des attaches successives de la bande pour une avance par rotation pas à pas du tambour et lesquelles gorges supportent et engagent les attaches sensiblement sur les longueurs de ces attaches.

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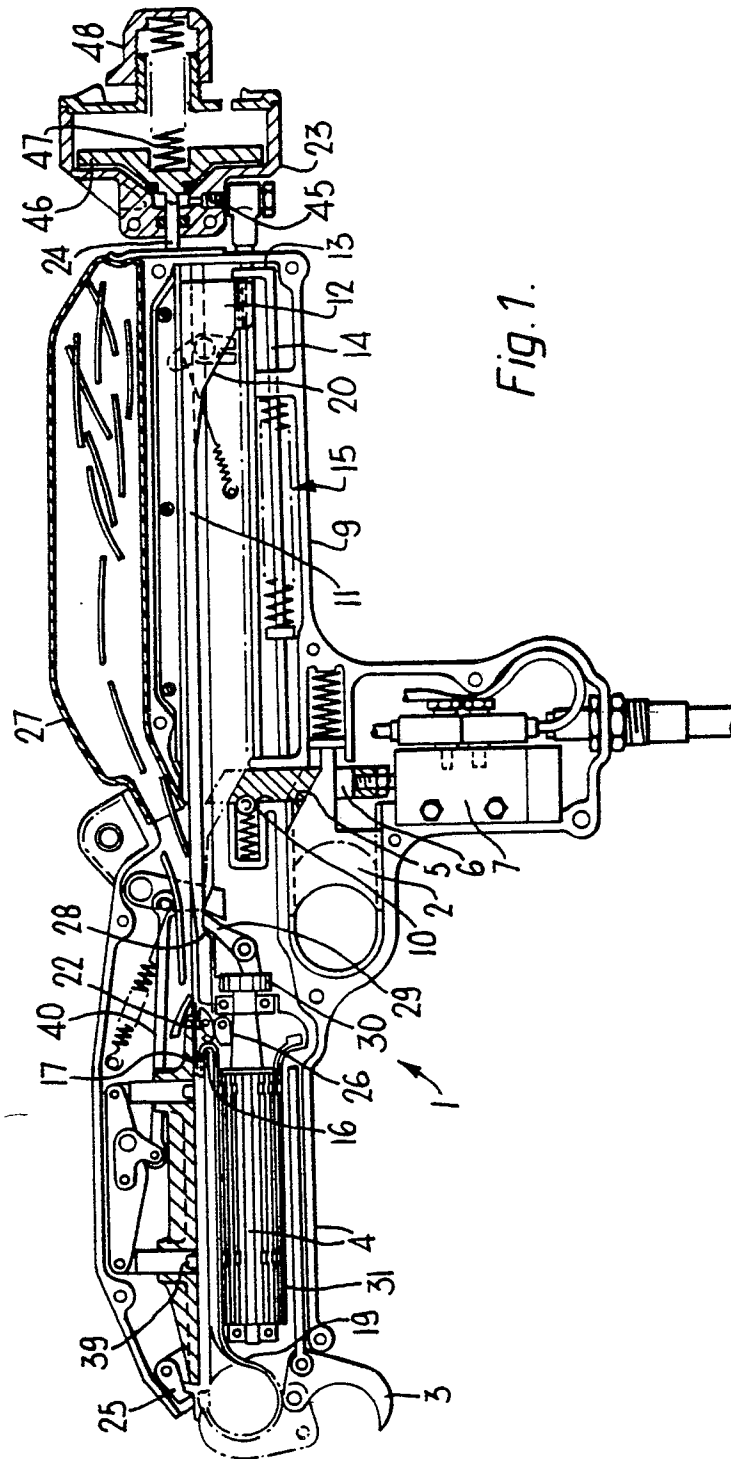


Fig. 1.

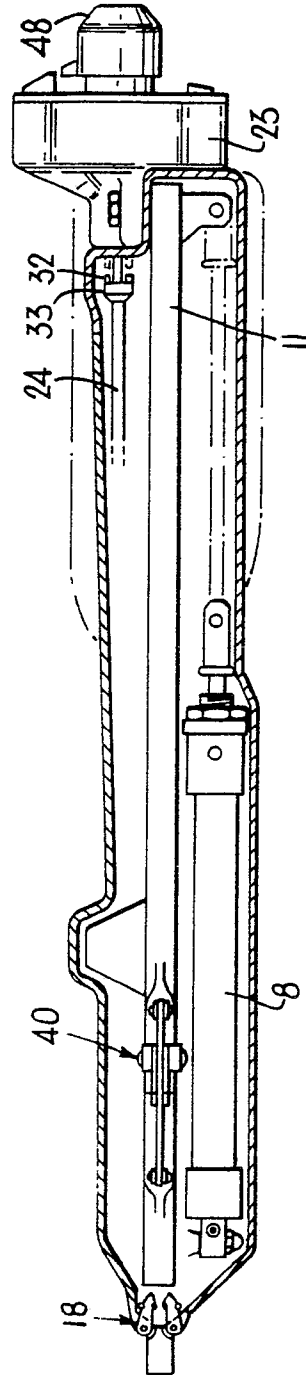


Fig. 2.

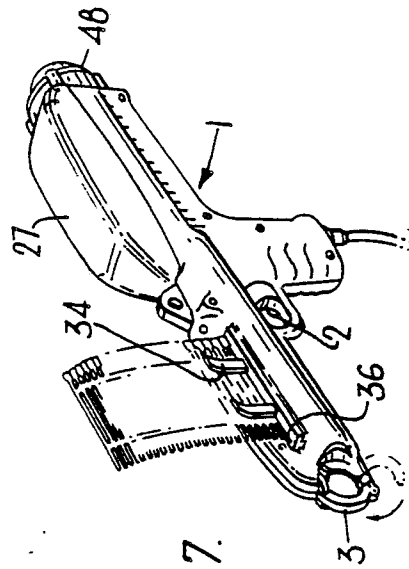
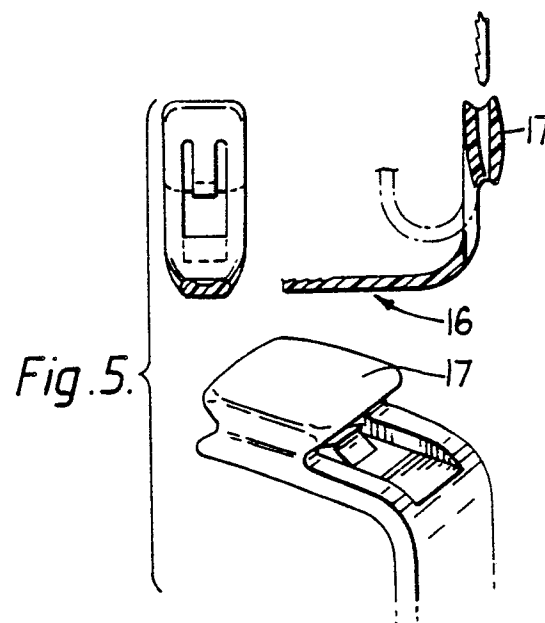
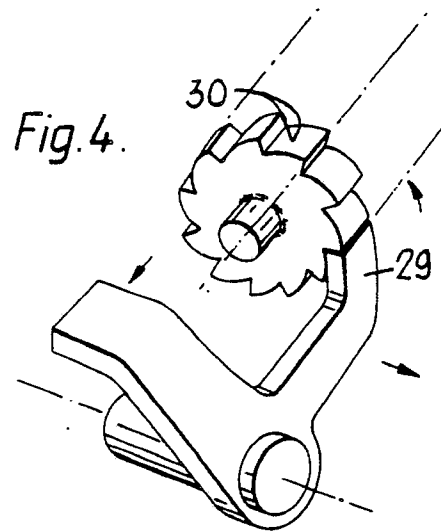
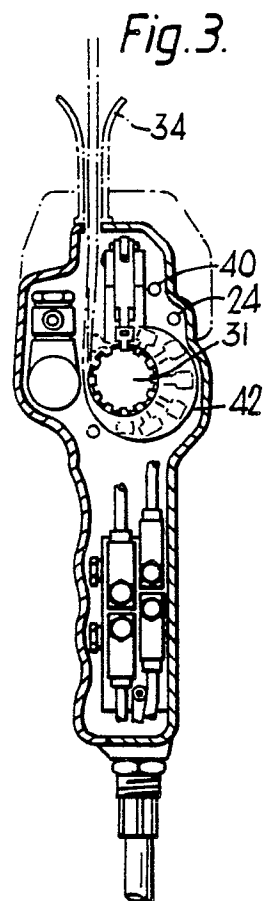


Fig. 7.



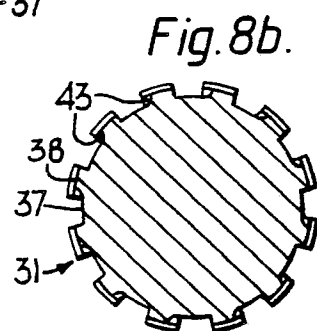
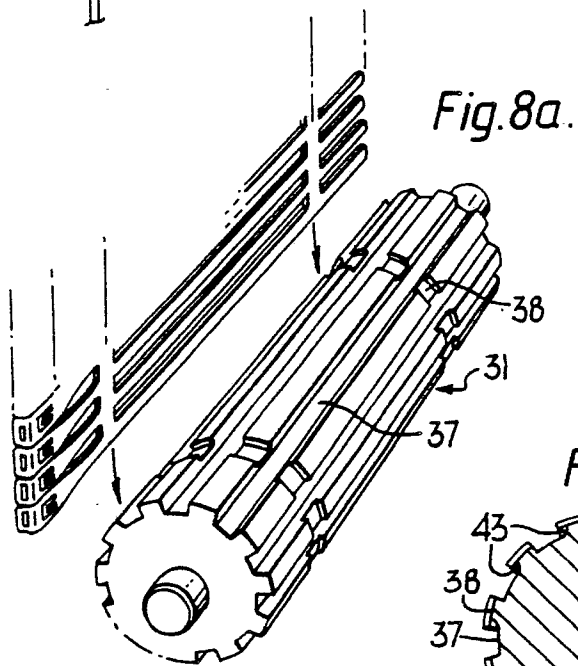
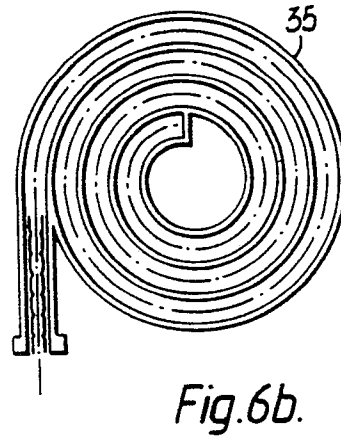
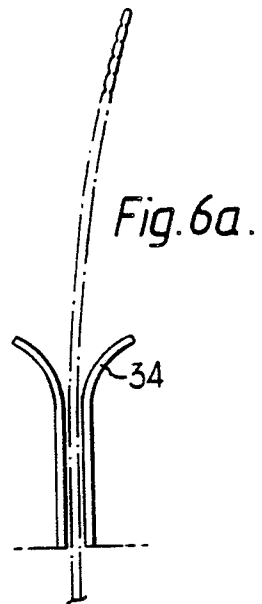


Fig. 9.

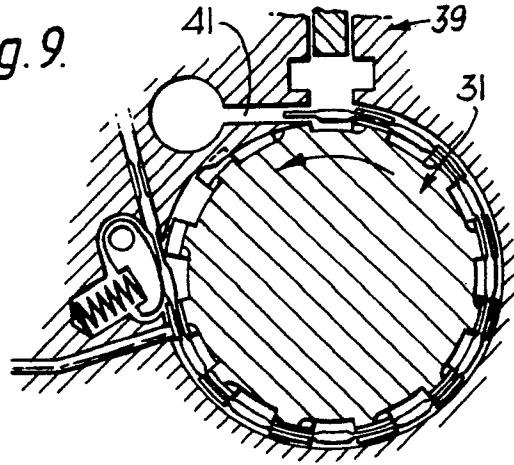


Fig. 10.

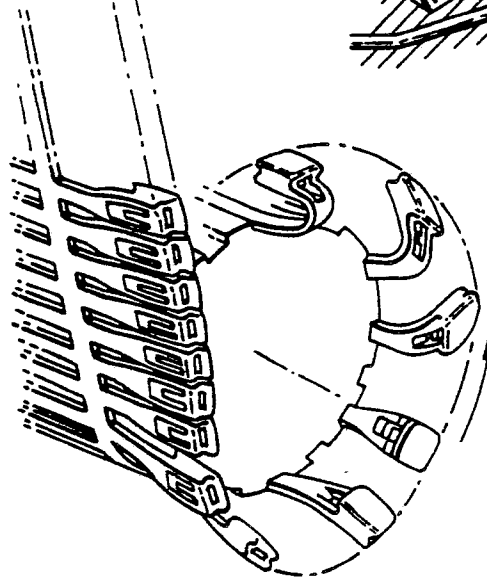


Fig. 11a.

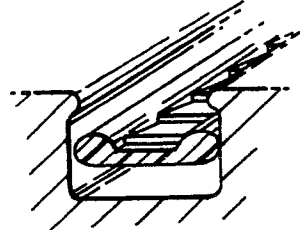


Fig. 11b.

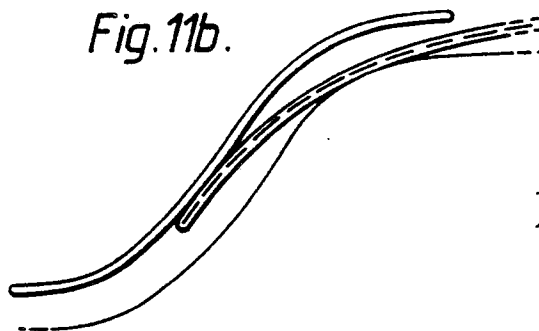
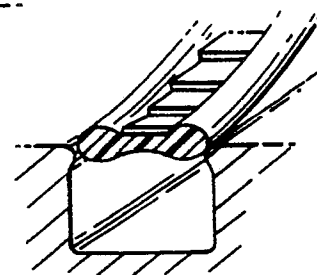


Fig. 11c.



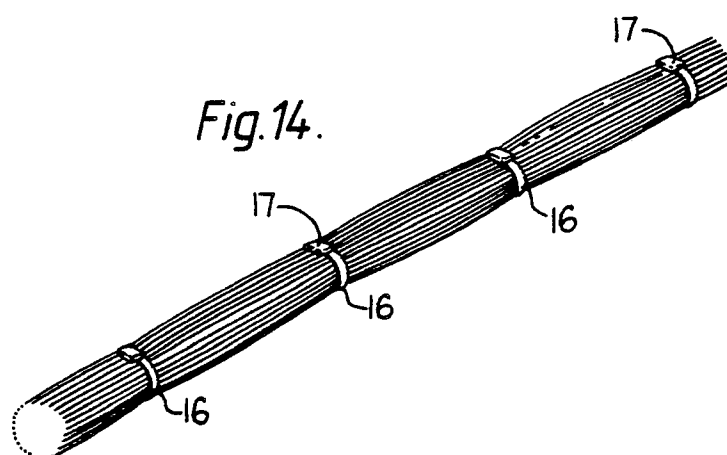
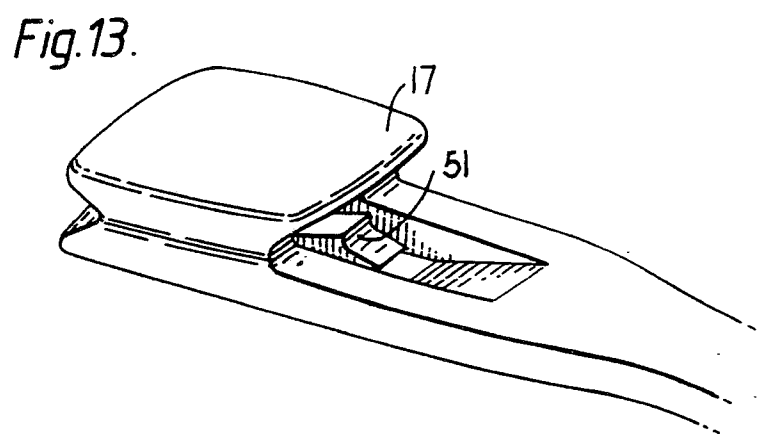
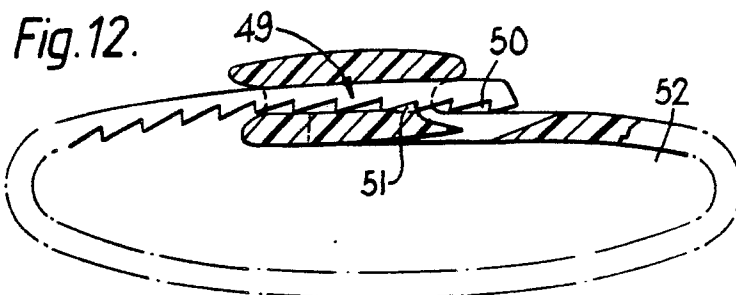


Fig.15a.

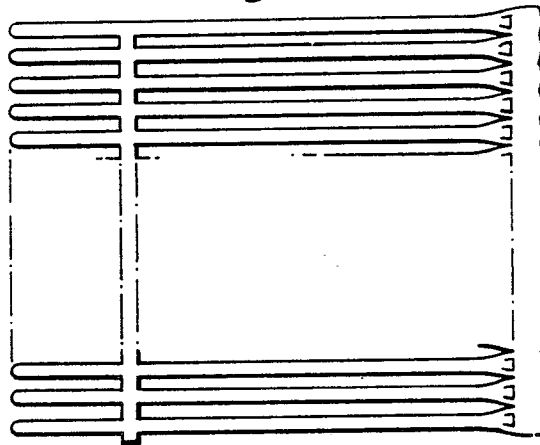
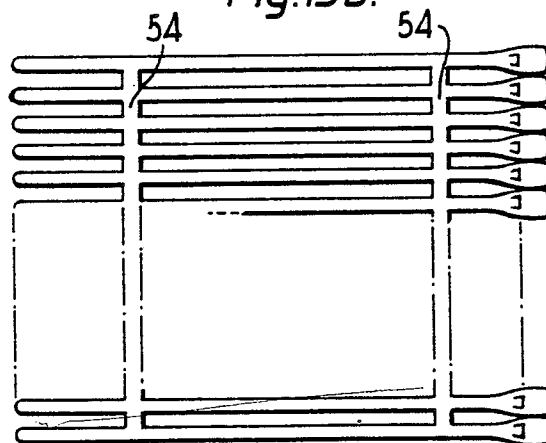


Fig.15b.



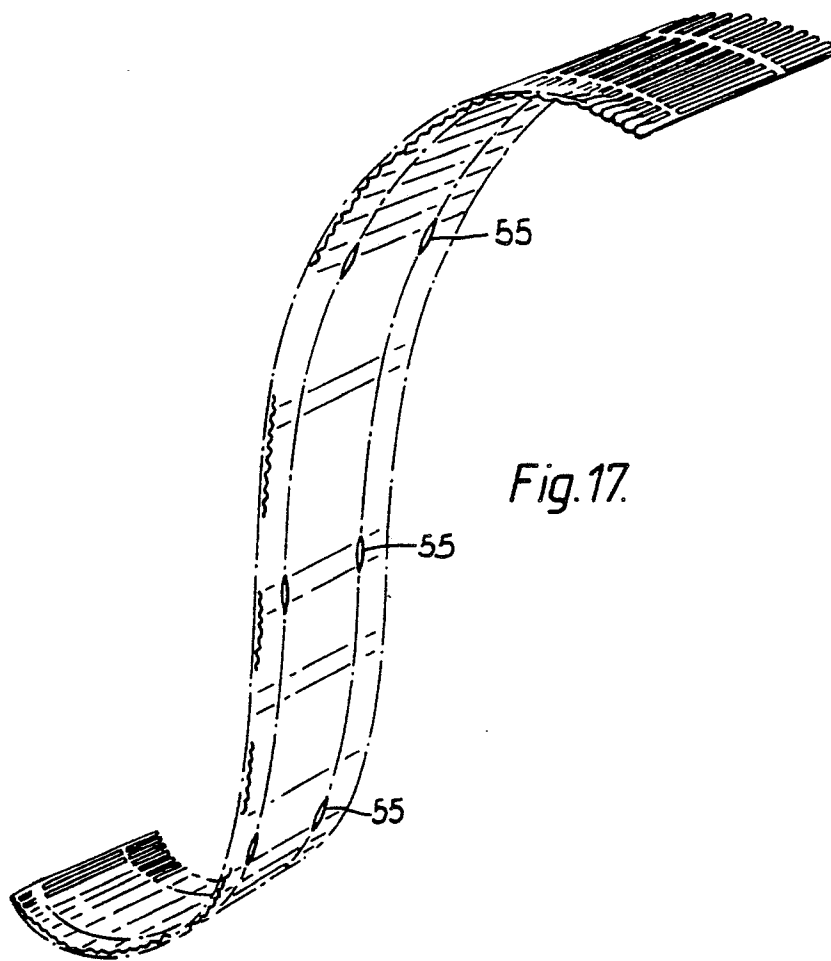
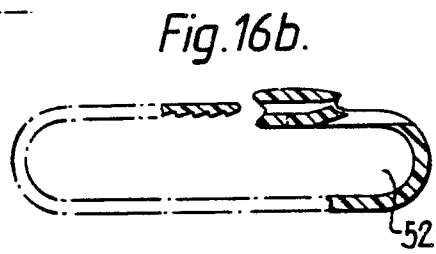
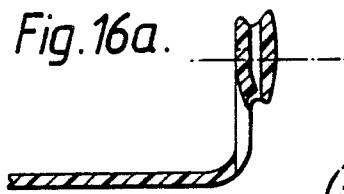


Fig.18a.

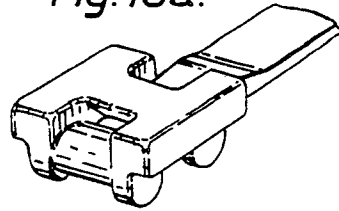


Fig.18b.

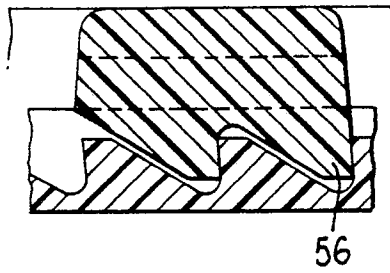


Fig.18c.

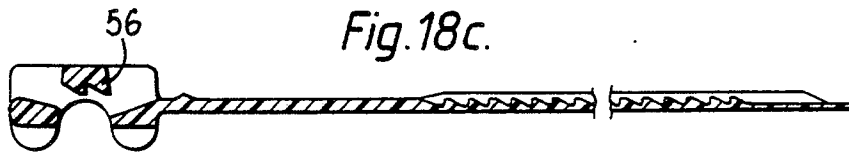


Fig.18d.

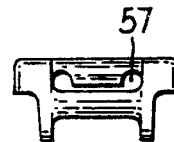


Fig.18e.

