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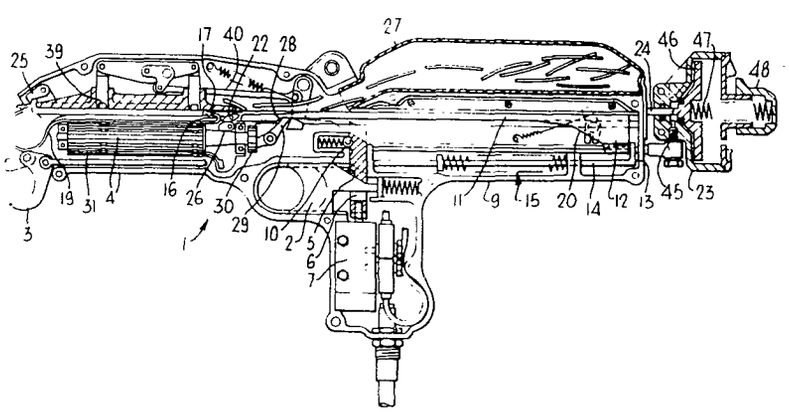
(71) Applicant: **PA Management Consultants Limited, Hyde Park House 60a Knightsbridge, London SW1X 7LE (GB)**

(72) Inventor: **Walker, John Graham, 14 Loates Pasture, Stansted Essex (GB)**

(74) Representative: **Nash, Keith W., KEITH W. NASH & Co. 22 Hills Road, Cambridge CB2 1JP (GB)**

(54) Automatic tie gun.

(57) A tie gun (1) for applying a flexible tie (16) around a roll or bundle, said tie (16) having an apertured head (17) through which the tail of the tie, after looping around the roll or bundle, is threaded, tensioned and locked in position, the gun incorporating an indexing means (28 to 31) including a rotary drum (31) which advances successive ties, tail forward, into the path of a push rod (11) driven by a trigger (2) actuated, pneumatically operated cylinder/piston (8) so that said push rod (11) performs a rearward stroke during the second part of an operating cycle and in so doing indexes the tie feed rum (31) and simultaneously turns the buckle (17) of an advanced tie (16) into a tail receiving position, thus completing loading of the gun in readiness for the next operating cycle during the first part of which the push rod (11) moves forwardly to push the tail around the roll or bundle to be tied back through the preorientated buckle (17) ready for tensioning and locking.



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Specification

Automatic Tie Gun

This invention relates to the automatic application of ties.

It is often necessary to tie an elongate roll or bundle, more especially bundles of elongate objects such as bundles of cables or wires which if left unbound might present a hazard as well as being unsightly. One way in which cables are often bound together is by flexible plastic ties which have an integral fastener, or buckle, at one end through which the tail end of the tie is threaded once it has been passed around the bundle of cables. Manual application of the ties is slow and laborious, and it is therefore desirable to have a tool which automatically performs the binding operation.

A gun for automatically applying ties has been designed in which a pair of jaws can be closed around a bundle of cables, and a flexible tie pushed forwards by a plunger so that the tail is pushed around the loop defined by the jaws and through an apertured buckle at the other end of the tie. The tail is then pulled tight, twisted by 90° with respect to the buckle to lock it in place, and the excess length cut off. Ties are supplied

singly to this gun from a pre-loaded magazine which is mounted on the exterior of the gun. Some of the disadvantages of such a gun stem from the type of tie which is used; the "twist and lock" type of tie has to be overtensioned then relaxed back before it locks, which does not always provide satisfactory tensioning, also the fastened tie has a knobby finish at the buckle, which is apertured so that the tail of the tie is threaded at approximately right angles to the longitudinal direction of the tie adjacent the fastener. Furthermore the gun is made in a sealed unit which is heavy, bulky and cannot be readily serviced.

Another gun has been proposed in which ties are conveyed one at a time from a magazine mounted remote from the gun, but is otherwise similar to that previously described. A third machine uses separate buckles and a continuous spool of tape. Neither of these machines have proved consistently reliable in use.

The present invention is directed towards a tie gun which may provide a reliable tie feed mechanism, which may be readily serviced, and which may incorporate standard replaceable components.

Accordingly the invention provides a tool for automatically applying around an elongate roll or bundle a flexible tie having a tail and an apertured head,

comprising a push rod, driving means for causing said push rod to perform an operating cycle consisting of a forward stroke and a rearward stroke, indexing means driven by the push rod during the rearward stroke of an operating cycle, said indexing means causing a tie to be stepped laterally into a tail forward, ready position in front of the retracting tie rod with the apertured head of said tie turned into an orientation ready to receive the tail, and guide means at the forward end of the tool whereby, during the forward stroke of the next operating cycle of the push rod, said push rod drives the tie forwardly to advance the tail in a loop around the guide means to cause the tail to enter the pre-orientated apertured head.

The indexing means conveniently includes a rotary drum the rotation of which is indexed to the stroke of a push rod so that the drum sequentially engages a plurality of laterally connected flexible ties and conveys each tie in turn to a position in front of the push rod which pushes the tie, which has been disconnected from its adjacent ties, so that one end of the tie passes along a guide and into engagement with the apertured head which is joined to the other end of the tie.

Once the one end of the tie is engaged with the head it may be pulled until the loop formed by the tie

grips the roll or bundle at a predetermined tension. The tool preferably includes a unit which senses the tension to which the tie has been pulled, and at a predetermined tension, which may be adjustable, cuts off the excess length of the tie adjacent the head.

The head of the flexible tie may have a longitudinal aperture through which the tail of the tie is threaded, and a resiliently biased pawl which engages with ratchet serrations in the tie and prevents the tie unthreading but permits the tail to be pulled further through the aperture. With this type of tie, once threaded, the threaded portion of the tie overlies the portion of the tie adjacent the head. The ties may be injection moulded as a belt with bridging pieces connecting the tails of the ties.

The tool may be controlled by a fluid operated cylinder and piston unit, with the drum rotation, the rod pushing and tie cutting indexed to the stroke of the piston in the cylinder.

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^{O} 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 buckel 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 de-tent 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 reseated 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^{O} 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 minimize 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 10mm bore, 4mm diameter rod and 130 mm stroke; a suitable type of valve is a Martonair M/1555/1.

Various modifications to the gun may be made, for example the feed mechanism may be modified so that the cylindrical drum or other indexing means can alternatively, or additionally, engage non-connected ties, which may be of use when the gun is not intended for intensive use. Furthermore, the gun can be adapted

for use with other types of flexible ties having apertured heads or buckles.

Claims

1. A tool for automatically applying around an elongate roll or bundle a flexible tie having a tail and an apertured head, characterised by the combination of a push rod (11), driving means (7, 8) for causing said push rod to perform an operating cycle consisting of a forward stroke and a rearward stroke, indexing means (28 to 31) driven by the push rod during the rearward stroke of an operating cycle, said indexing means causing a tie (16) to be stepped laterally into a tail forward, ready position in front of the retracting tie rod with the apertured head (17) of said tie turned into an orientation ready to receive the tail, and guide means (3) at the forward end of the tool whereby, during the forward stroke of the next operating cycle of the push rod, said push rod drives the tie forwardly to advance the tail in a loop around the guide means to cause the tail to enter the pre-orientated apertured head.

2. A tool according to claim 1, characterised in that the indexing means includes a rotary drum (31) rotatable about an axis parallel to the axis of longitudinal movement of the push rod, the rotary drum having longitudinal grooves (37) in its periphery for accommodating ties which are to be successively advanced

by stepped rotation of the drum into the ready position.

3. A tool according to claim 2, characterised in that the indexing means also includes a feed ratchet (30) coupled with the rotary drum and driven by the push rod during the rearward stroke of the latter, and a spring detent engaging the longitudinal grooves in the drum to ensure precise positioning of the latter in its stepped locations.

4. A tool according to claim 2 or claim 3, characterised in that the ties are carried by the rotary drum with their apertured heads overhanging one end of said drum, and the indexing means includes a fixed voluted surface (Figure 10) with which the tie heads engage to bend the ties adjacent the heads in order to turn said heads into the required tail receiving orientation.

5. A tool according to claim 4, handling ties having heads apertured in the longitudinal direction of the tie, characterised in that said volute is adapted to bend the tie adjacent the head through 180 degrees.

6. A tool according to any of claims 1 to 5, characterised in that the guide means comprises an openable nose loop (3) and a coupling means (14) driven in synchronism with the push rod to open the nose loop adjacent the end of the retracting movement of the push

rod and to close the nose loop adjacent the beginning of a forward motion of the push rod, the closed nose loop defining a path of movement for the tie which allows the pre-orientated head to be advanced substantially in line with the push rod and the tail to be turned to enter the aperture in the head in a forward to rearward direction on the line of advance of the head.

7. A tool according to any of claims 1 to 6, characterised in that the driving means is a fluid pressure operated cylinder and piston unit (8) controlled by a trigger actuatable valve (7).

8. A tool according to any of claims 1 to 7, characterised by a clamping device (22) for gripping and pulling rearwardly the tail of the tie threaded through the apertured head, a knife (25) for cutting the tail behind the head, and a tension sensing device (23) for actuating the knife when a preselected tension of the tie has been achieved at the beginning of the rearward stroke of the push rod.

9. A tool according to claim 8 when appendant to claim 7, characterised in that the tension sensing device comprises a spring loaded fluid pressure actuated valve (46), said valve being linked to the cylinder and piston unit (8) to be subject to the pressure in the cylinder whereby, during the rearward stroke of the push rod, the

pressure in said valve increases as the pressure in the cylinder increases due to resistance to movement of the push rod while tensioning the tie until said pressure overcomes the spring loading of the valve to cause actuation of the knife.

10. A tool according to claim 7 or claim 8 or claim 9 when appendant to claim 7, characterised in that the push rod carries a member (12) for automatically reversing the trigger actuatable valve (7) at the end of the forward movement of the push rod.

11. A tool according to any of claims 1 to 10, for handling a belt of ties connected by bridging pieces, characterised by cutting means (39) driven by the push rod for severing from the belt a tie which has been stepped laterally into the ready position, said cutting means being actuated during rearward movement of the push rod substantially immediately after completion of operation of the indexing means.

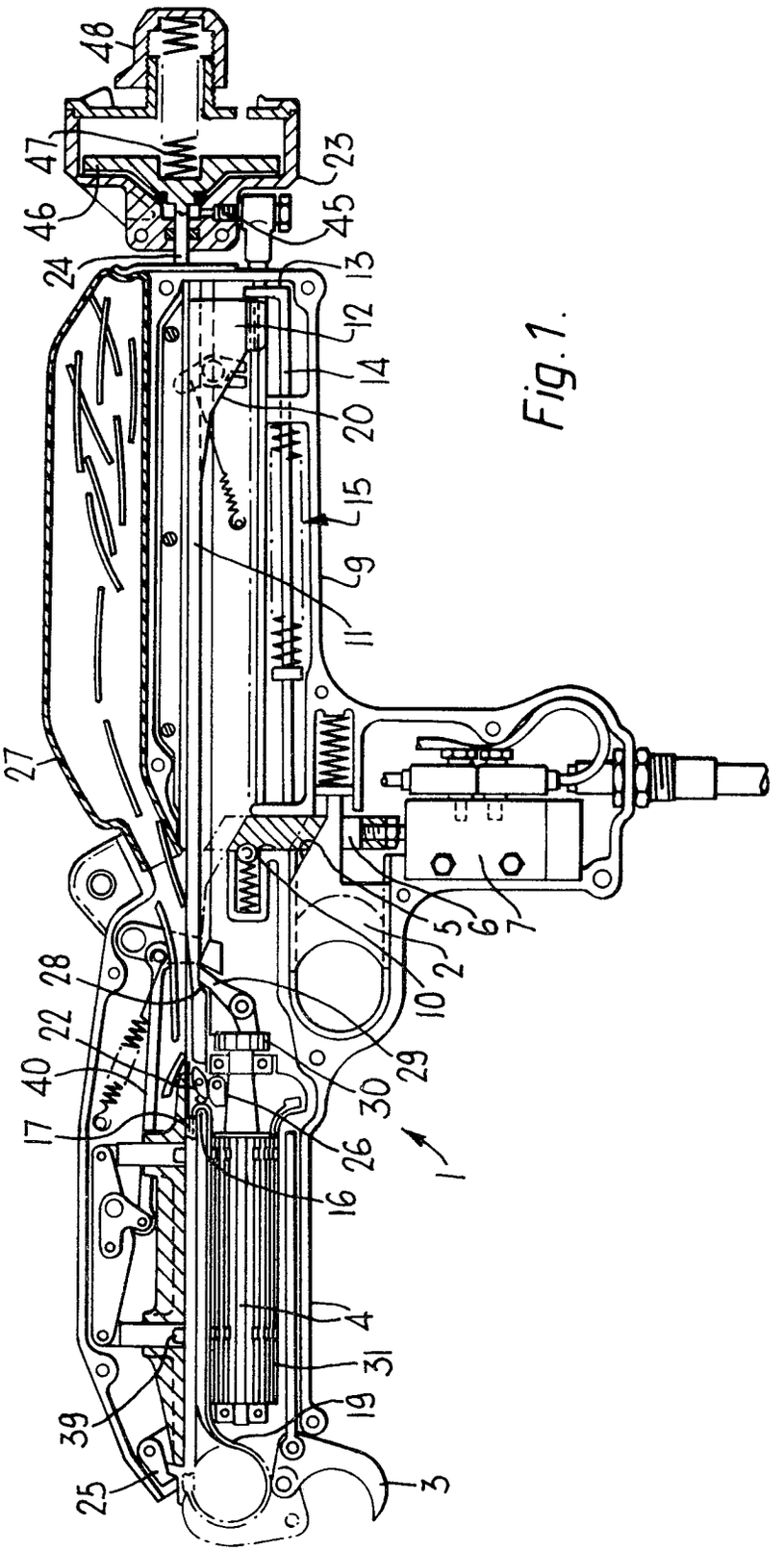
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Fig. 1.

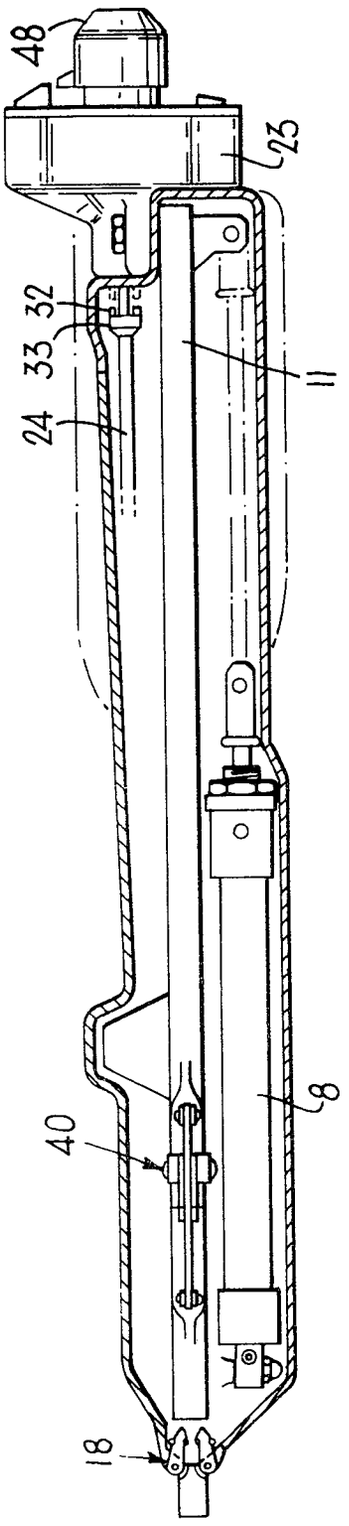


Fig. 2.

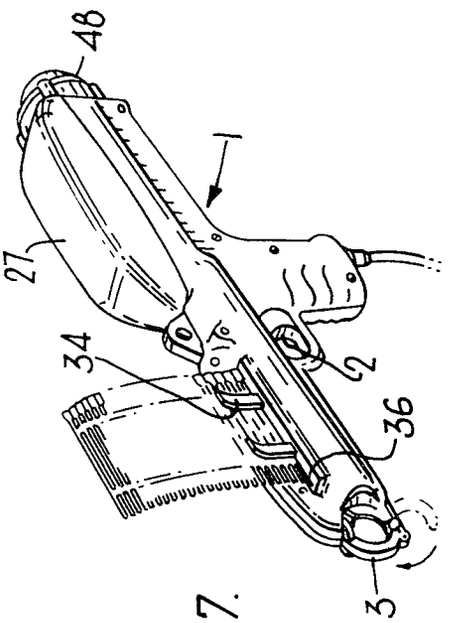


Fig. 7.

Fig.3.

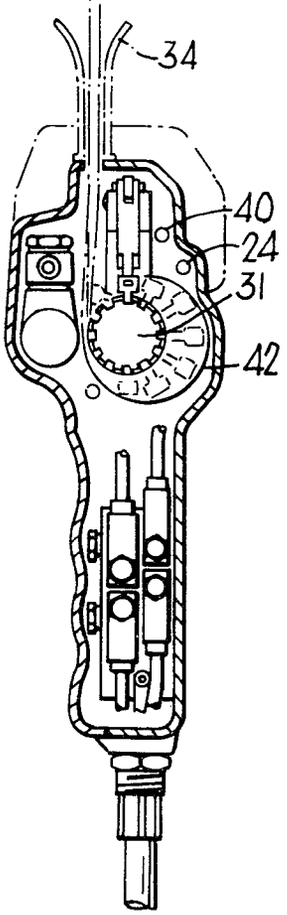


Fig.4.

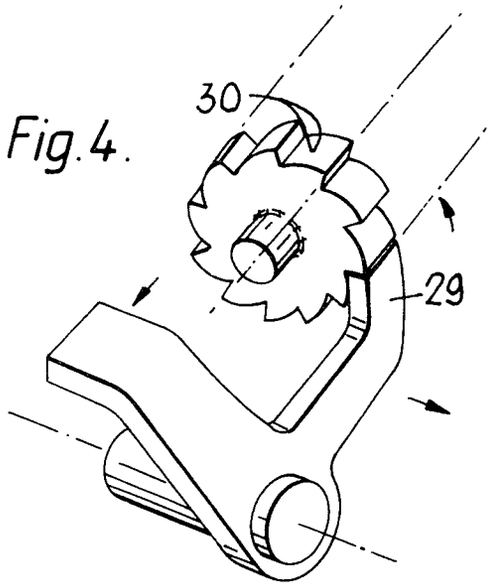


Fig.5.

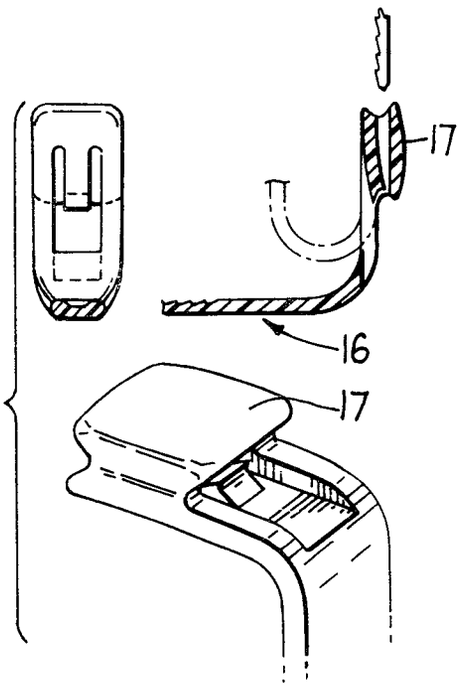


Fig.6a.

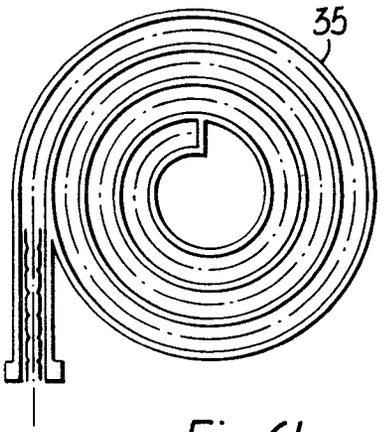


Fig.6b.

Fig.8a.

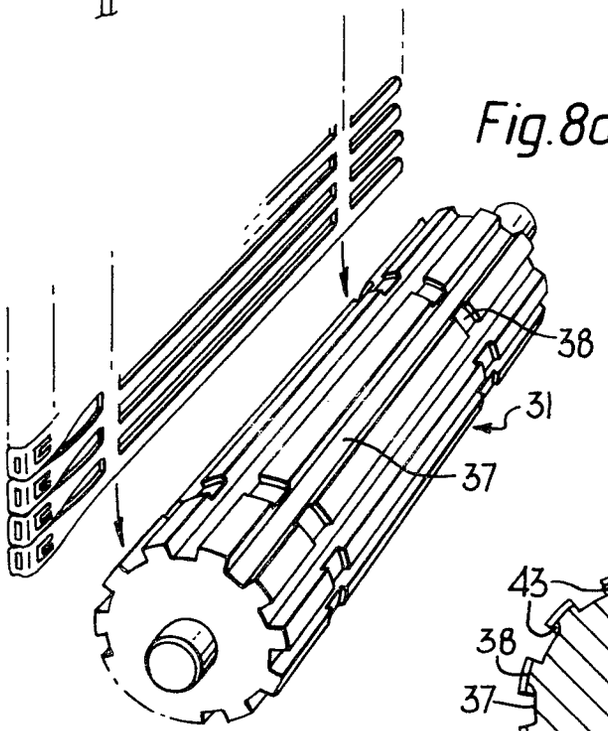


Fig.8b.

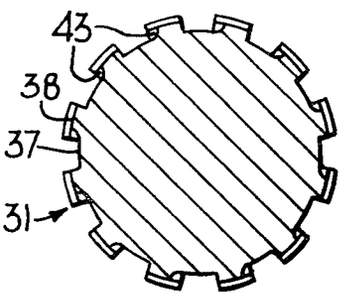


Fig. 9.

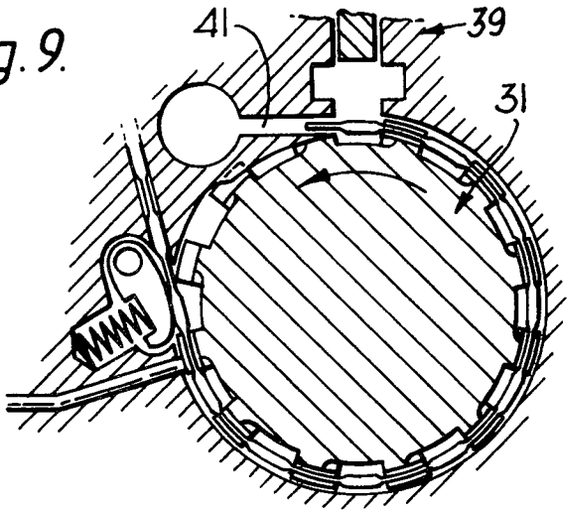


Fig.10.

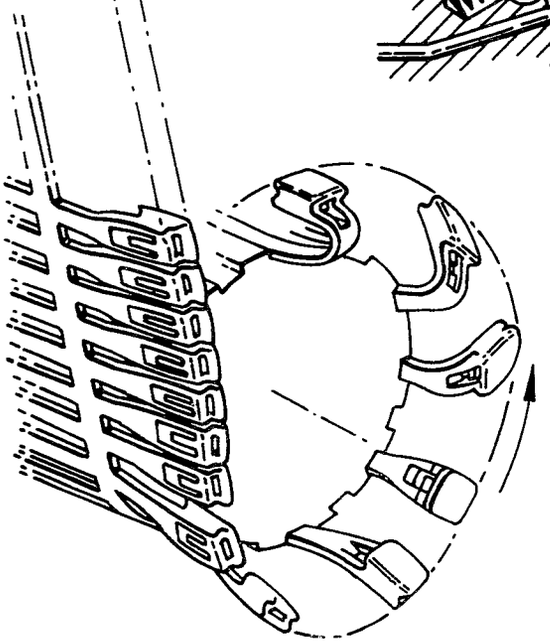


Fig.11a.

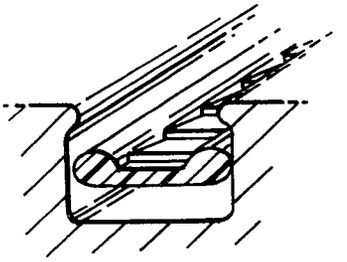


Fig.11b.

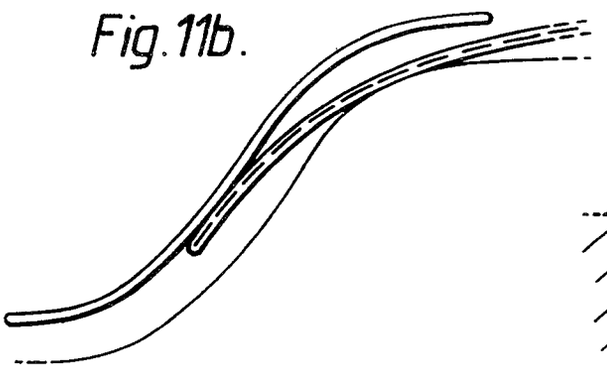


Fig.11c.

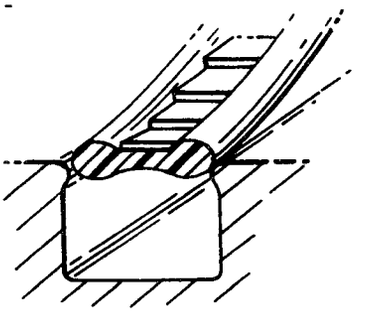


Fig.12.

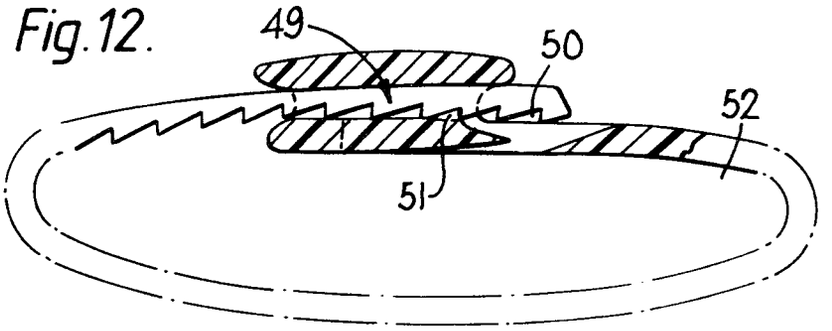


Fig.13.

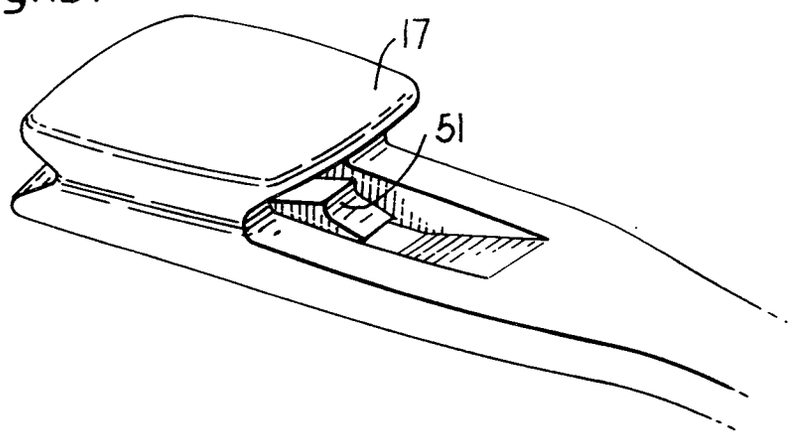


Fig.14.

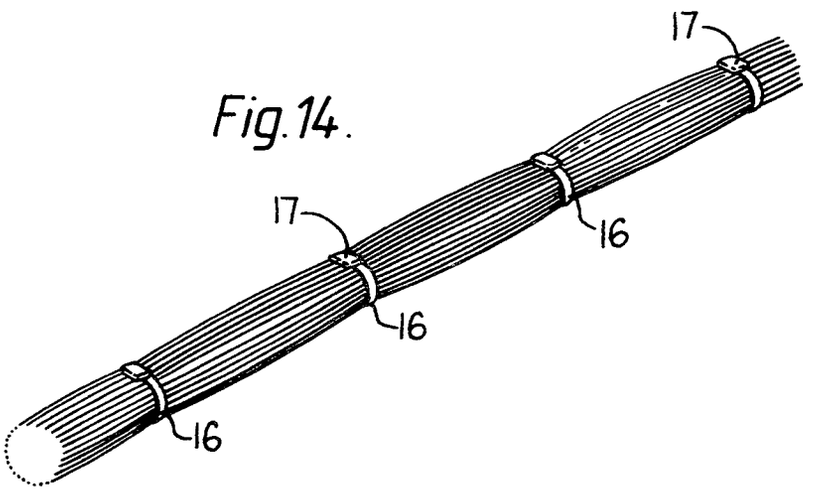


Fig.15a.

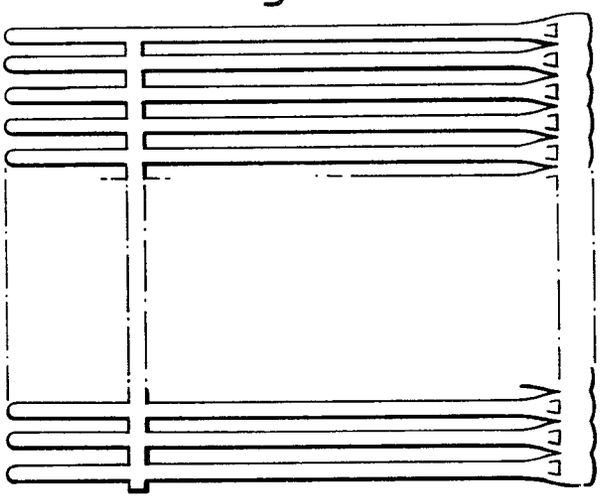


Fig.15b.

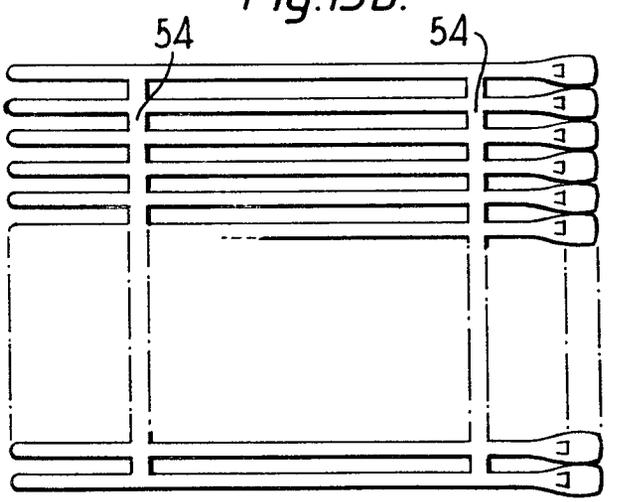


Fig.16a.

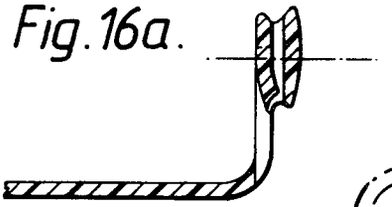
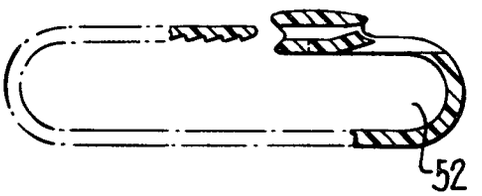


Fig.16b.



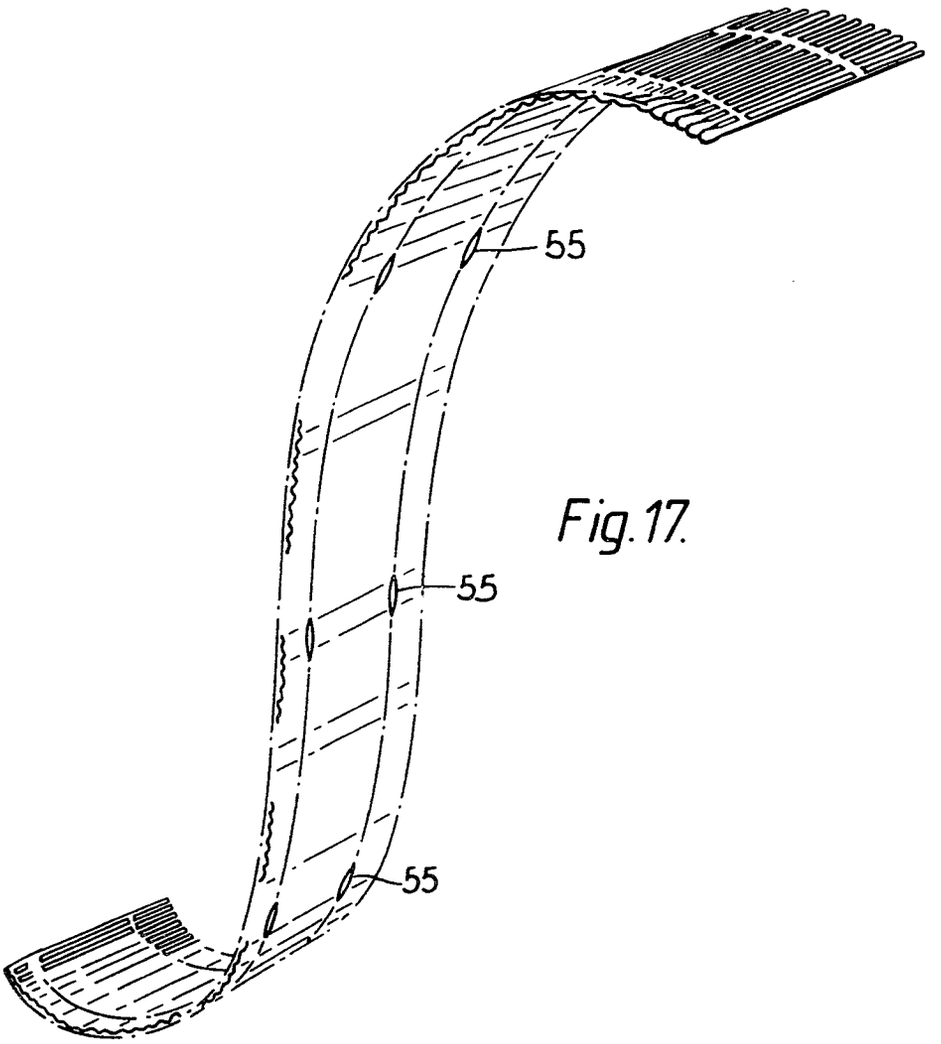


Fig.17.

Fig.18a.

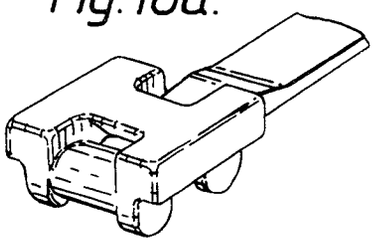


Fig.18b.

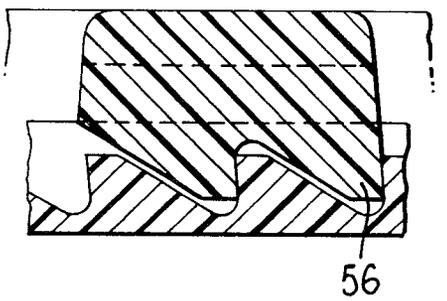


Fig.18c.

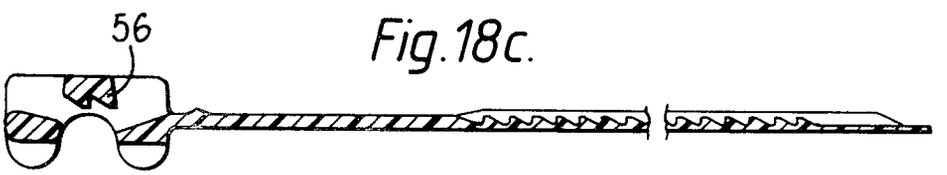


Fig.18d.

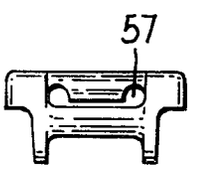
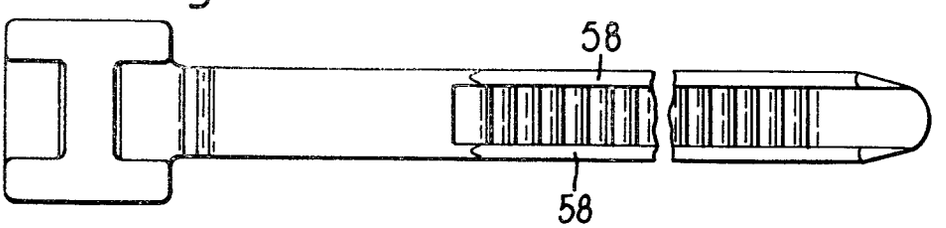


Fig.18e.



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EUROPEAN SEARCH REPORT

0035367
Application number
EP 81300791.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	DE - A1 - 2 902 560 (SOCIETE D'USINAGE DES TUBES) + Page 5 + & US-A-4 202 384 --	
A	DE - A1 - 2 444 404 (PANDUIT CORP.) + Totality + & US-A-3 865 156 --	7,8
A	GB - A - 1 320 296 (THOMAS & BETTS CORP.) + Totality + --	
A	GB - A - 2 006 152 (AMP INC.) + Totality + --	1,6,8
A	GB - A - 1 446 746 (HELLERMANN) + Totality + --	
A	DE - A1 - 2 723 651 (AMP INC.) + Totality + & GB-A-1 543 998 & US-A-4 119 124 ----	1,6,7, 8

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 B 13/02
B 25 B 25/00

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 25 B 25/00
B 65 B 13/00
B 65 B 27/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
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E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	13-05-1981	MELZER

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