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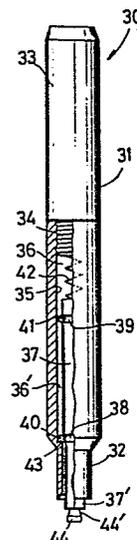
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54 **A grommet-applying tool.**

57 A grommet-applying tool is disclosed, which comprises an elongated cylindrical body (31) and a spring-biased guide pin (37) movably accommodated within the cylindrical body. The guide pin has a washer retainer portion (37') and an eyelet retainer (44) portion, these portions releasably holding a washer (17) and an eyelet (11), respectively, of a grommet (10). A respectively small amount of hand or finger pressure is required to couple the washer and the eyelet together in a snapping action.

FIG. 1



- 1 -

A GROMMET-APPLYING TOOL

This invention relates to a tool for applying grommets to a sheet material.

There are known a variety of grommets made of metal or plastics to be set in sheet material such as of textile articles. The grommet usually comprises an eyelet to be 5 pierced through the sheet material and a washer to be coupled with the eyelet, in which instance the eyelet is curled or otherwise deformed so as to fit securely over the washer. This coupling operation requires considerable pressure such 10 that may be provided for example by a relatively large lever-actuated hand press and hence is so much tedious.

The present invention seeks to provide a novel grommet-applying tool which is suitable for setting plastic grommets in a sheet material, the grommets being of the design 15 in which an eyelet part is snapped resiliently into engagement with a washer part.

The invention also seeks to provide a grommet-applying tool of the type described which is very simple in construction and highly reliable in operation.

20 The invention further seeks to provide a grommet-

- 2 -

applying tool capable of assembling eyelet part and washer part of a grommet securely together with a minimum of hand pressure.

5 According to the invention, there is provided a grommet-applying tool for applying an eyelet and a washer to a sheet material, characterised by said tool comprising an elongated cylindrical body having at one of its ends a reduced diameter portion and at the other end a handle portion, a resilient means, a guide pin movably supported via said resilient means within said cylindrical 10 body and having at its exposed end a washer retainer portion and an eyelet retainer portion, and a spring member disposed within said body and normally biasing said guide pin toward said one end of said cylindrical 15 body, said washer retainer portion resiliently holding the washer to be transferred to and assembled with the eyelet set in an opening of the sheet material.

20 Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of example.

25 Figure 1 is a partly sectional, elevation of a grommet-applying tool embodying the invention;

Figure 2 is a plan view of an eyelet constituting one part of a grommet;

30 Figure 3 is a plan view of a washer constituting the other part of the grommet;

- 3 -

Figure 4 is a partly sectional elevation on enlarged scale of a portion of the tool of Figure 1 shown in operative position; and

5 Figure 5 is a cross-sectional view of the grommet showing the same as assembled and set in a sheet of fabric.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and first Figures 2 and 3, there is shown a kind of grommet 10 which can be applied to sheet material by a tool (Figure 1) embodying the invention.

It comprises an eyelet 11 made of suitable plastic material such as nylon and having a center bore 11'. The eyelet 11 includes a barrel 12 having on one end thereof an annular flange 13 which is to be retained on one side of sheet material in which the grommet is to be set. The barrel 12 has an annular recess 16 opening radially outwardly and defined by a radial surface 16a, a slant or taper 16b spaced axially from the radial surface 16a in confronting relation, and an axial peripheral bottom or inner surface 16c extending between the radial surface 16a and the slant 16b. With the annular recess 16, an annular locking flange 14 is defined on the other end of the barrel 12, the flange 14 projecting radially outwardly and having an annular beveled or tapered surface 15 facing away from the flange 13. Thus, the annular locking flange 14 is located immediately above the annular recess 16 as seen in Figure 4. The annular locking flange 14 has an outside diameter R which is the same as that of the remainder of the barrel 12.

The grommet 10 further comprises a circular washer 17 made of similar plastics to that of the eyelet 11, the washer 17 having an annular rib 18 and a plurality (six in the illustrated embodiment) of locking tongues 19 projecting 5 radially inwardly from the annular rib 18 and angularly spaced from each other with a plurality of radial grooves 20 therebetween. The angularly spaced locking tongues 19 with the radial grooves 20 therebetween are rendered more flexible for easy snapping action than would be the case if the 10 locking tongues 19 were integral with each other. The locking tongues 19 have arcuate inner peripheral edges 21 which jointly define a circle having a diameter r that is slightly smaller than the outside diameter R of the locking flange 14, so that the inner peripheral edges 21 can be held 15 against the tapered surface 15 of the locking flange 14 when the eyelet 11 and the washer 17 start being coaxially assembled together. As shown in Figure 4, the locking tongues 19 are thinner than the annular rib 18 so as to be resiliently flexible relatively to the latter. Each of the 20 locking tongues 19 has an arcuate slot 24 extending adjacent to and along the annular rib 18, and serving to give the locking tongue 19 additional resilient flexibility. The annular rib 18 has a plurality of protuberances 25 that are angularly spaced preferably at equal intervals and positioned in radial alignment with the grooves 20 and that 25 project axially of the washer 17.

The grommet 10 is a typical example applicable to the invention but should not be limited to the precise form and

- 5 -

construction above advanced which can be assembled by a grommet-applying tool embodying the invention.

5 The tool shown in Figure 1 and generally designated 30 comprises an elongated cylindrical body or tube 31 having a reduced diameter portion 32 at one or probe end and a handle portion 33 threadedly engaged as at 34 with the other end of the tube 31. The tube 31 has an inner peripheral wall 35 defining an elongated circular chamber 36 for accommodating therein a guide 10 pin 37. The guide pin 37 has adjacent its opposite ends a pair of annular grooves 38, 39 receiving therein O-rings 40, 41, respectively, which O-rings are fitted in peripheral engagement with the inner peripheral wall 35 of the tube 31, providing a clearance 36' 15 between the guide pin 37 and the wall 35 of the tube 31. Each O-ring 40(41) is made of a suitable resilient material such as rubber such that the guide pin 37 may be held resiliently in place within the chamber 36. A 20 spring member 42 is provided in the chamber 36 between the threaded end of the handle portion 33 and the end of the guide pin 37 adjacent to the O-ring 41 to normally bias the pin 37 toward the probe end of the tube 31 or downwardly as viewed in Figure 1. A peripheral ledge 43 is formed integrally with the wall 35 of the 25 tube 31 to project radially inwardly, which ledge 43 is disposed for abutting engagement with the O-ring 40 to limit descending movement of the guide pin 37. In the position shown in Figure 1, the guide pin 37 has a washer retainer 37' exposed beyond the reduced 30 diameter portion 32 of the tube 31, the

- 6 -

washer retainer 37' being diametrically slightly larger than the inside diameter \underline{r} of the washer 17.

5 An eyelet retainer 44 is provided integral with the washer retainer 37' and axially projecting from the guide pin 37, which eyelet retainer 44 is dimensioned to fit into the centre bore 11' of the eyelet 11. The retainer 44 has an inwardly tapered portion 44' for purposes to be hereafter described.

10 The operation of the grommet-applying tool 30 will now be described with reference to Figure 4. The washer 17 is mounted on the guide pin 37 by manually fitting it around the washer retainer 37' of the pin 37, in which instance the washer 17 is retained securely because its diameter \underline{r} is slightly smaller than the diameter of the washer retainer 37'.
15 The tool 30 thus carrying the washer 17 is manipulated to pass the eyelet retainer 44 through the bore 11' of the eyelet 11 which has been previously set in an opening of a sheet of fabric \underline{F} disposed on a working bed 45, as illustrated
20 in Figure 4. The tool 30 is now pressed downwardly with the eyelet retainer 44 borne against the bed 45, so that the guide pin 37 ascends relatively to the body 31 within the chamber 36 against the force of the spring 42. This brings the reduced diameter portion 32
25 of the tube 31 with its bottom end 32' against the washer 17 and urges the latter to move down along the washer retainer 37' of the guide pin 37. Further pressing the tool 30 brings the washer 17 in engagement with the eyelet 11, in which instance the inner peripheral edges 21 of the washer 17 are
30

first brought into contact with the tapered surface 15 of the eyelet 11. This causes the locking tongues 19 of the washer 17 to expand or flare upwardly along the tapered surface 15 and the locking flange 14 of the eyelet to
5 conversely contract or flex inwardly in contact with the locking tongues 19. To allow such expansion of the washer 17, there is provided an annular recess 46 in the bottom of the reduced diameter portion 32 of the tube 31, and to allow such contraction or inward flexing of the eyelet 11, there
10 is provided the tapered portion 44' of the eyelet retainer 44. Continued descending movement of the washer 17 causes the locking tongues 19 to be snapped over the locking flange 14 into the annular recess 16 of the eyelet 11 between the flange 14 and the fabric F. With the locking tongues 19
15 thus trapped in the recess 16, the washer 17 and the eyelet 11 are securely coupled together against accidental separation. The protuberances 25 on the washer 17 bite into the fabric F to fasten the latter securely between the washer 17 and the eyelet 11 as shown in Figure 5.

20 The presence of the resilient O-rings 40,41 on the guide pin 39 permits the pin 37 to move slantingly relative to the tube 31 during assembly of the washer 17 and the eyelet 11, or stated otherwise, the tube 31 tilts in sliding contact with the O-rings 40,41 and so does progres-
25 sively starting with areas of least slide resistance so that the locking tongues 19 can be snapped into engagement with the locking flange 14 progressively in the order in which the series of tongues 19 are more receptive to the

flange 14, and hence much less coupling pressure is required than would be with the case where the guide pin 37 is directly engaged with the tube 31, because in the latter case, all of the locking tongues 19 are subject to uniform
5 pressure to deform simultaneously, requiring more power to manipulate the tool 30.

CLAIMS:

1. A grommet-applying tool for applying an eyelet (11) and a washer (17) to a sheet material (F), characterised by said tool comprising an elongated cylindrical body (31) having at one of its ends a reduced diameter portion (32) and at the other end a handle portion (33), a resilient means (40, 41), a guide pin (37) movably supported via said resilient means (40, 41) within said cylindrical body (31) and having at its exposed end a washer retainer portion (37') and an eyelet retainer (44), and a spring member (42) disposed within said body (31) and normally biasing said guide pin (37) toward said one end (32) of said cylindrical body (31), said washer retainer portion (37') resiliently holding the washer (17) to be transferred to and assembled with the eyelet (11) set in an opening of the sheet material (F).

2. A grommet-applying tool as claimed in claim 1, wherein said resilient means (40, 41) is at least one O-ring of a resilient material secured to said guide pin (37) to permit tilting movement of the pin (37) within and relatively to said cylindrical body (31).

3. A grommet-applying tool as claimed in claim 1 or 2, wherein said reduced diameter portion (32) is provided at its bottom with an annular recess (46) to allow expansive deformation of the washer (17).

4. A grommet-applying tool as claimed in claim 1, 2 or 3, wherein said eyelet retainer (44) is provided with a tapered portion (44') to allow contractive deformation of the eyelet (11).

FIG. 1

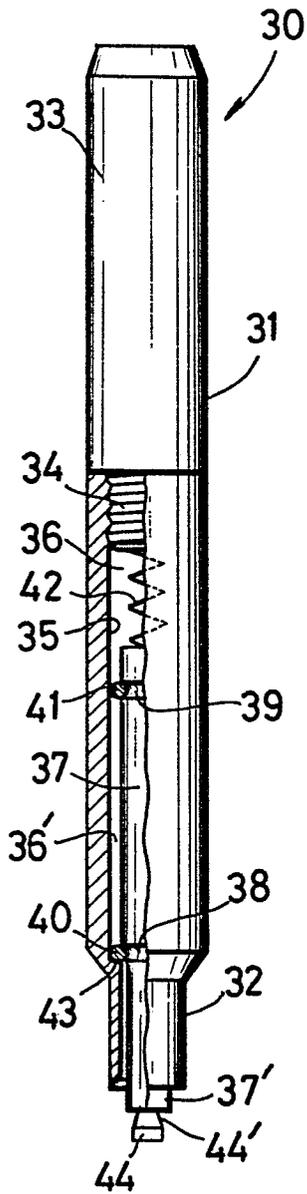


FIG. 2

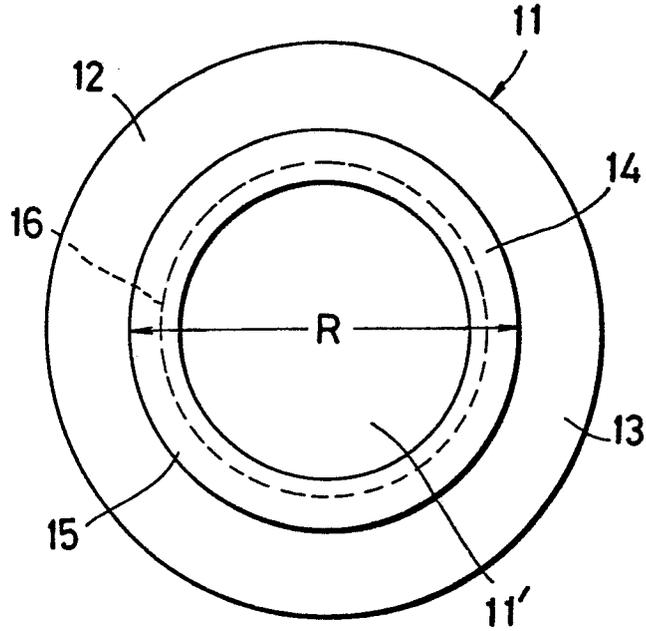


FIG. 3

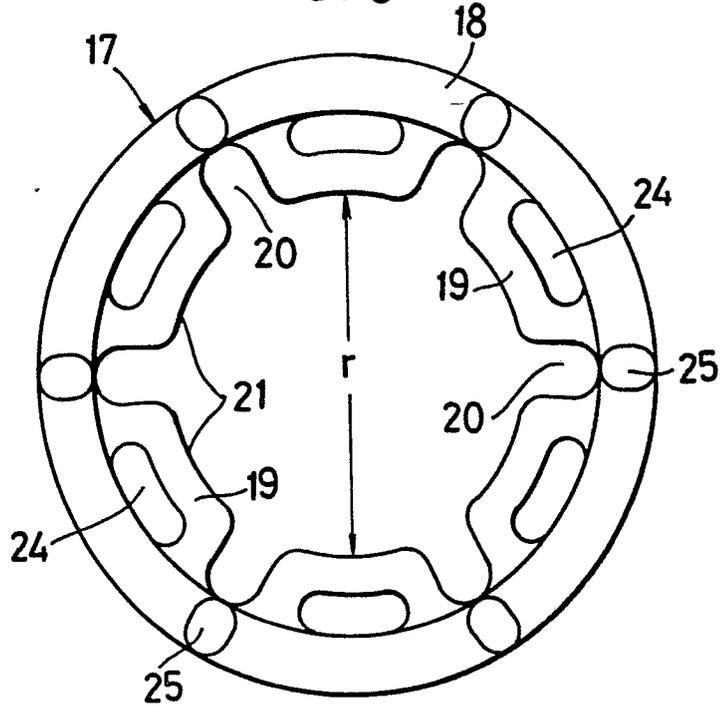


FIG. 4

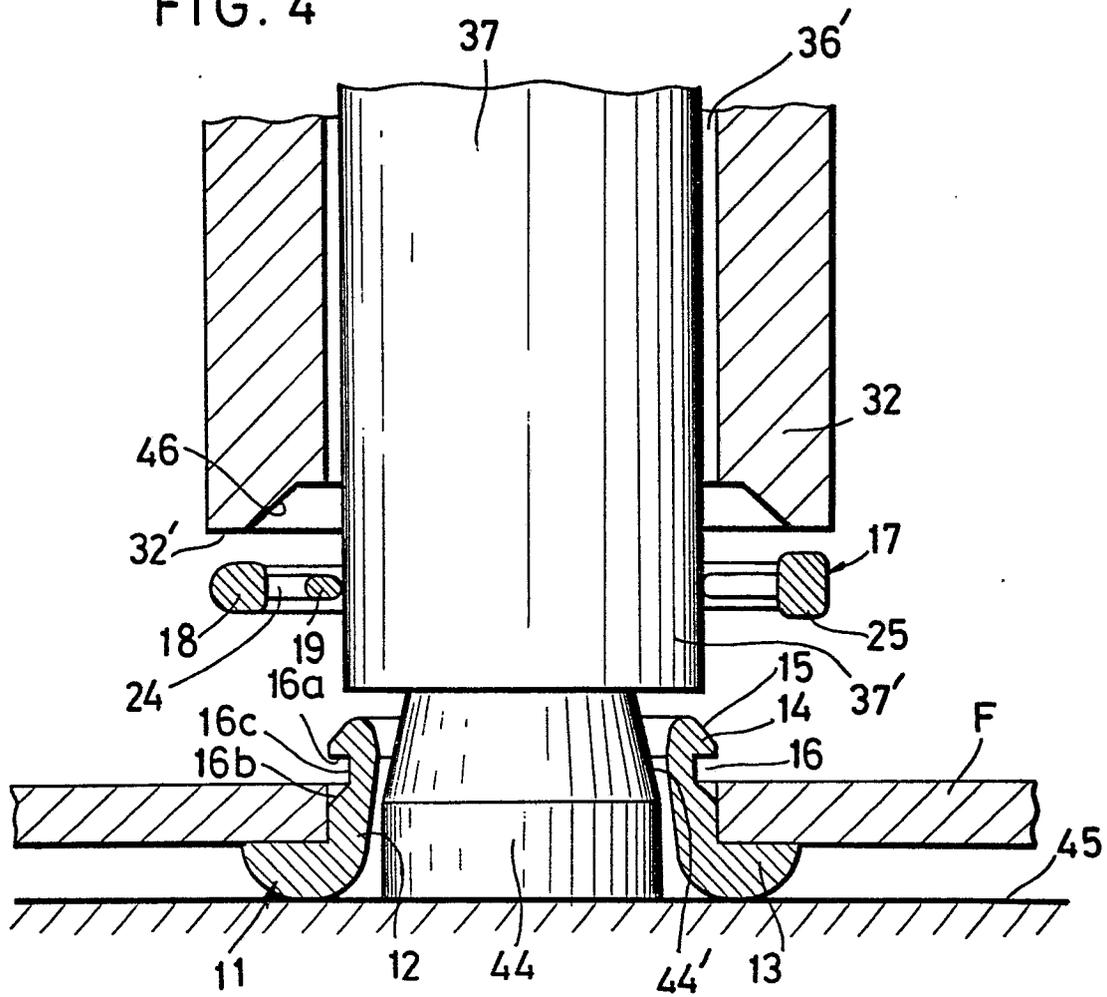
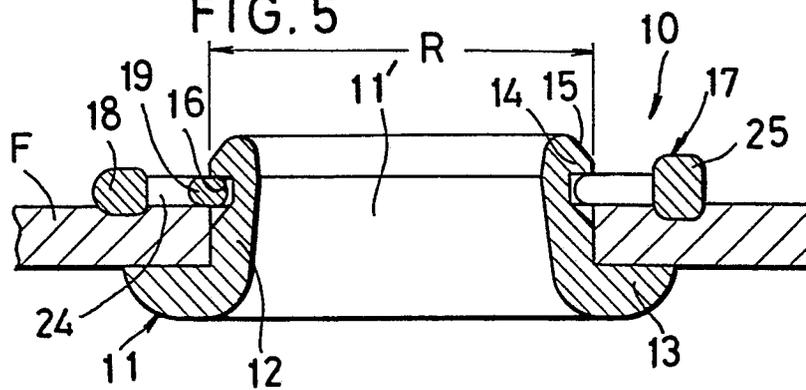


FIG. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>US - A - 3 918 140 (A.N. KONSTANT)</u> * column 2, lines 21-68; column 3, lines 1-15; claims; figures 3-5 * --	1	A 41 H 37/02
	<u>US - A - 1 438 692 (G.W.J. MURPHY CO.)</u> * page 1, lines 73-110; page 2, entirely; figures 3-5 * --	1	TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
	<u>US - A - 2 177 232 (A.H. TINNER-MAN)</u> * page 2, column 1, lines 28-75; column 2, lines 1-25; page 3, column 1, lines 7-74; column 2, lines 1-12; claims; figures * --	1	A 41 H
	<u>US - A - 3 964 660 (D.W. HENSLEY)</u> -----		CATEGORY OF CITED DOCUMENTS
The present search report has been drawn up for all claims			X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner	
The Hague	08-01-1982	GARNIER	