J. L. STUART.

DIE FOR SETTING GROMETS AND EYELETS.

APPLICATION FILED MAY 4, 1920.

1,373,461. Patented Apr. 5, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

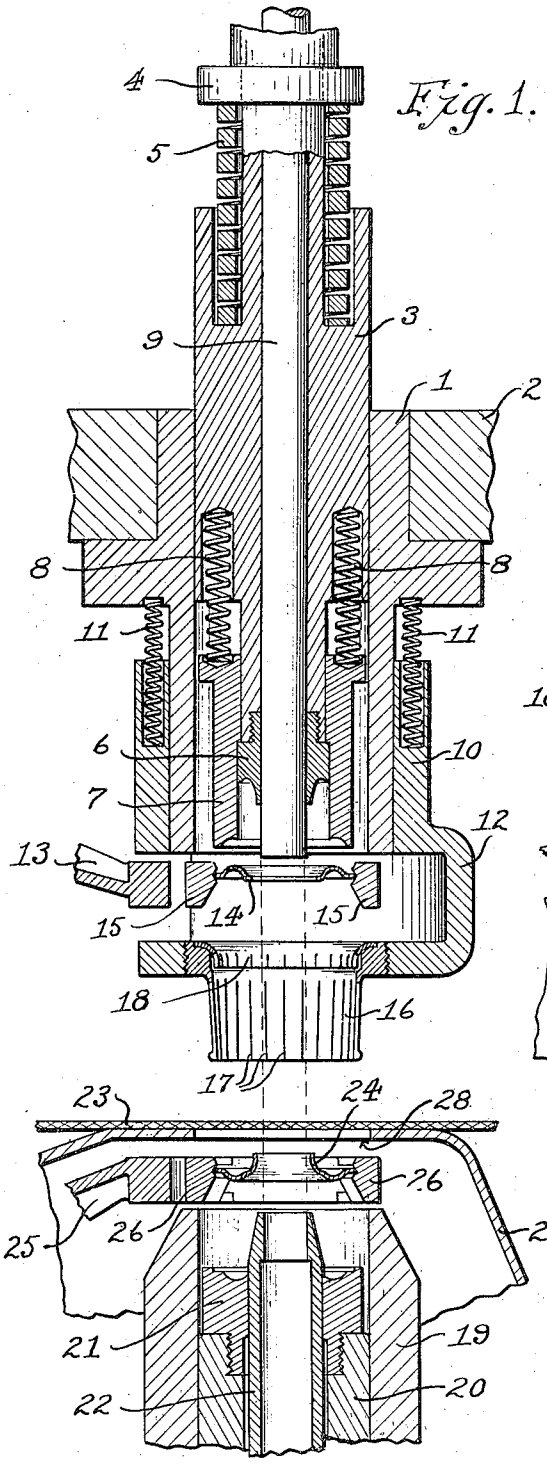
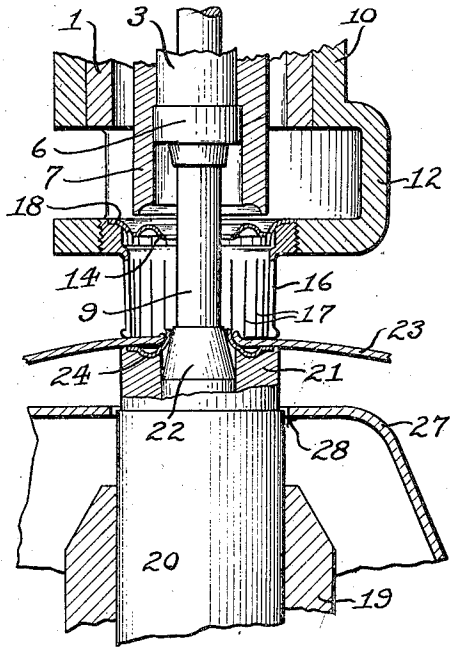


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

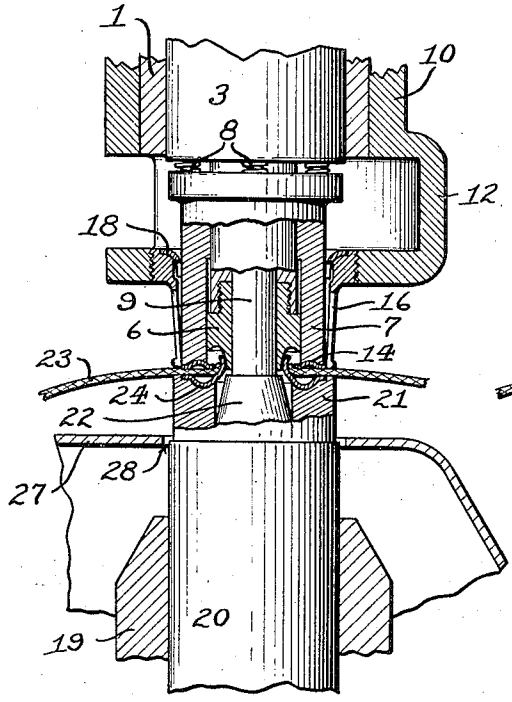
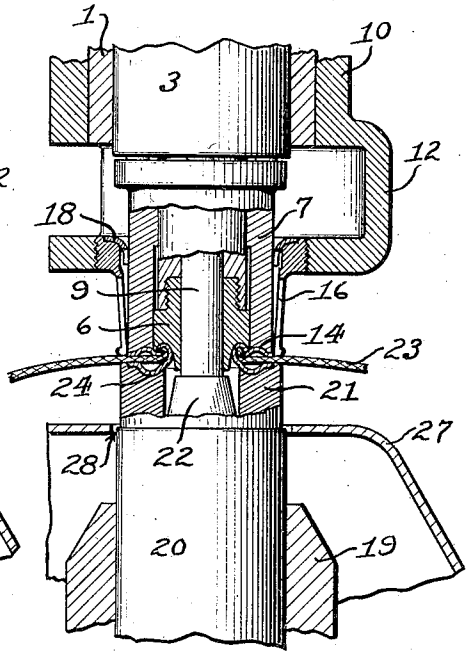


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN LENARD STUART, OF OAKLAND, CALIFORNIA, ASSIGNOR TO STUART MACHINE CO., OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

DIE FOR SETTING GROMETS AND EYELETS.

1,373,461. Specification of Letters Patent. Patented Apr. 5, 1921.

Application filed May 4, 1920. Serial No. 378,901.

To all whom it may concern:

Be it known that I, JOHN LENARD STUART, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Dies for Setting Gromets and Eyelets, of which the following is a specification.

The present invention relates to dies for setting gromets, eyelets, or similar articles in fabric or other material.

Dies substantially similar to those embodying the present invention are disclosed, in my contemporaneously executed and copending application Serial No. 378902 filed May 4, 1920, for United States Letters Patent for gromet making and setting machines, but in said application they enter into and are claimed only as generically expressed elements in combinations involving other mechanisms, and producing general results, whereas in the present case, it is my purpose to claim these dies specifically, as forming a distinct and separate subject-matter of invention.

The object of my invention herein is to provide dies capable of so associating the gromet or eyelet and the fabric to which they are applied that in the setting of said parts they shall include and bind at their inner edges the edge of the fabric in a novel grip of a character which will insure a clean, safe and permanent connection with said fabric. To this end my invention consists in the novel dies which I shall hereinafter fully describe, by reference to the accompanying drawings, in which—

Figure 1 is a central vertical section of my dies, showing the relative positions of the parts at the beginning of the setting operation.

Fig. 2 is a fragmental partial section showing the positions of the parts after the punching operation.

Fig. 3 is a similar view showing the setting operation partially completed.

Fig. 4 is a similar view showing the setting operation fully completed.

In the drawings, the reference numeral 1 designates a guide, tubular in cross section, secured to a suitably constructed frame member 2, Fig. 1. Within said guide is a vertically slidable plunger 3 which is reduced in diameter at both ends. A sleeve 4 is slidably mounted upon the upper end of said plunger, and a cushioning spring 5 is interposed between said sleeve and the shoulder of the plunger 3. This sleeve 4 is intended to be connected, in any suitable manner, with means not shown in the drawings for operating it in a vertical reciprocal movement, and this movement of said sleeve is imparted to the plunger 3 through the cushioning spring 5.

The lower end of the plunger 3 carries a setting die 6, which is surrounded by a tubular stripping and clamping member 7, the latter being vertically slidable upon the reduced end portion of the plunger 3, and normally held at the outer or lower limit of its play by springs 8.

The plunger 3 and the setting die 6 are provided with a central longitudinal bore, in which operates an independently movable punch 9. This punch is caused to reciprocate vertically by any suitable mechanism, not shown in the drawings, and forming no part of the present invention.

Surrounding the lower end portion of the guide 1 is a sleeve 10, which is permitted to have a relatively small amount of vertical movement upon said guide, and is normally held in the position shown by springs 11. Said sleeve has an enlarged pocket 12 positioned below the ends of the guide 1 and the die members therewithin, and said pocket is provided with an aperture in one side to permit the entrance of a holder or carrier 13 adapted to support a washer 14. Said holder, which may be of any construction suitable for temporarily holding the washer in the position shown, is preferably provided with relatively movable jaws 15, between which the washer 14 is gripped, as shown in Fig. 1, and is so positioned that the central hole in said washer is in vertical alinement with the punch 9.

The sleeve 10, below the pocket 12, carries means for supporting and guiding the washer 14, subsequent to its release from the carrier 13, to insure its correct positioning with relation to the gromet and the setting dies. These supporting and guiding means consist of a tubular member 16, formed preferably of spring steel, and having its end portion divided into a plurality of fingers by saw cuts or slits 17, and an inner ring 18, having similar but shorter spring fingers,

positioned within the upper end of said tubular member 16. The washer 14, upon being released from the carrier 13, first drops upon the upper ring 18, as shown in Fig. 2, and is held in this position until the descending stripper 7 forces it down, through said ring 18 and through the tubular guide 17, into the correct position for setting, as shown in Fig. 3.

Below and in vertical alinement with the plunger guide 1 is a lower plunger guide 19, Fig. 1, in which operates a reciprocating tubular plunger 20 carrying a setting die 21 upon its upper end. Within said plunger, and extending through said setting die, is an independently operated reciprocating tubular punch 22 adapted to coöperate with the upper punch 9 to form the gromet receiving hole in the work or fabric 23. This upper end portion of said punch 22 is exteriorly tapered, as shown, and is of such diameter that, although its upper extremity will pass completely through the central tubular portion of the gromet 24, to enable it to properly coöperate with the upper punch 9 to form the gromet-receiving hole in the work 23, yet the central tubular portion of said gromet will be engaged by the portion of enlarged diameter of said punch 22, to enable said punch to temporarily support said gromet for a purpose to be later set forth. The mechanism by which the plunger 20 and the punch 22 are operated forms no part of the present invention, and is therefore not illustrated in the drawings.

The gromet 24 is supported, above the guide 19 and in vertical alinement with the punch 22, by a holder or carrier 25, similar to the washer carrier 13, and having relatively movable jaws 26 adapted to grip and hold said gromet. A plate 27 is positioned above the gromet carrier 25, and serves both as a protective housing for the lower die and carrier parts, and as a rest upon which the work 23 is placed. Said plate is formed with an aperture 28 through which the lower setting die may rise.

In the operation of the device, the various parts starting from the positions shown in Fig. 1, move as follows:—the punches 9 and 22 first approach each other, the upper punch 9 moving down through the central hole in the washer 14, and the lower punch 22 moving up and its upper extremity passing through the central hole in the gromet 24. As soon as the washer and gromet have been thus entered by the respective punches 9 and 22, the carriers 13 and 25 are withdrawn laterally, by mechanism not shown in the drawings. The washer 14, freed by the carrier jaws 15, drops down, upon the central punch 9, and rests upon the inner supporting ring 18 in a horizontal position; and the gromet 24, freed by its carrier jaws 26, is left resting temporarily upon the tapering portion of the ascending lower punch 22, but slightly below the extremity thereof.

The punches 9 and 22 continue to approach each other, and, in meeting, punch the gromet receiving hole in the work or fabric 23. At the same time, the lower setting die 21 has been ascending, closely following the lower punch 22, and has come into contact with the lower surface of the gromet 24. This upward movement of the lower punch and setting die continues, causing the gromet 24 to raise the fabric 23 into contact with the bottom of the washer guide 16, and during this movement the central tubular portion of the gromet has been forced through the punched hole in the fabric. Said hole is smaller in diameter than the central tubular portion of the gromet, so that the fabric at the edge of said hole is curled upwardly, as shown in Fig. 2, by the entry of the gromet thereinto.

The parts are now in the positions shown in Fig. 2. The gromet 24 and the fabric 23 are clamped between the lower setting die 21 and the washer guide 16, which latter, on account of the action of the sliding sleeve 10 and the springs 11, is capable of giving sufficiently to allow for fabrics of any desired thickness. The upper plunger 3, meanwhile, has been moving downward, so that the stripper 7 next forces the washer 14 through the spring supporting ring 18, upon which it has been resting, and through the spring guide 16 onto the fabric 23, said spring guide 16 acting to retard the downward movement of the washer and prevent it from becoming misplaced upon said fabric. The hole in the work or fabric 23 is less in diameter than the hole in the washer, so that, as shown in Fig. 3, the washer encircles both the turned up cut edge of the fabric and the tubular portion of the gromet.

As the upper plunger 3 continues its downward movement, the washer, fabric, and gromet are securely clamped, in the proper relative positions for setting, by the upper stripper 7 and the lower setting die 21, as shown in Fig. 3. Then, as said plunger 3 continues to descend, the stripper 7 remains stationary, while the upper setting die 6 enters the central tubular portion of the gromet, and expands and curls the same over the washer, as shown in Figs. 3 and 4, the lower punch 22 receding slightly to clear said upper setting die. On account of the cushioning spring 5 of the upper plunger 3, a practically uniform pressure is exerted upon the gromet by the setting dies, irrespective of the thickness of the fabric.

It is to be noted that in the fully set position, as shown in Fig. 4, the central portion of the gromet is not only clenched over

the inner edge of the washer, but is actually curled back upon itself, so that its edge is directed downwardly, thus forming a very stiff and rigid ring at the edge immediately around the hole; and further that the cut edge of the fabric is caught and clamped between said curled edge of the gromet and the rim of the hole in the washer, so that there is no possibility of the set gromet pulling out of the fabric, or of the fabric tearing or becoming frayed at its cut edge.

After the gromet has been thus set, the plungers 3 and 20 separate, and the stripper 7, actuated by its springs 8, forces the set gromet away from the setting die 6. The parts then return to the positions shown in Fig. 1, and the carriers 13 and 25 bring a new washer, and gromet into position for the next setting operation.

I claim:—

1. Die mechanism for setting a gromet and a coöperating washer comprising means for punching a hole in the work of less diameter than the central tubular portion of the gromet and of less diameter than the hole in the washer; means for forcing the tubular portion of the gromet into said hole in the work to carry the cut edge of said work into the hole of the washer; and means for curling said tubular portion of the gromet back upon itself to confine and grip said cut edge of the work about the rim of the washer hole.

2. Die mechanism for setting a gromet and a coöperating washer comprising alined reciprocating members adapted to coact to punch a hole in the work of less diameter than the central tubular portion of the gromet and of less diameter than the hole in the washer; and independently operated annular dies surrounding the punch members and adapted to coact to force the tubular portion of the gromet into said hole in the work to carry the cut edge of the work into the hole in the washer, and to curl said tubular portion of the gromet back upon itself to confine and grip said cut edge of the work about the rim of the washer hole.

3. Die mechanism for setting gromets comprising alined reciprocating members adapted to coact to punch the gromet receiving hole in the work; and independently operated annular dies surrounding said punch members and adapted to coact to set the gromet within said hole.

4. Die mechanism for setting gromets comprising alined reciprocating punch members adapted to operate through the gromet in punching the gromet receiving hole in the work; and independently operated annular dies surrounding said punch members and adapted to coact to set the gromet within said hole.

5. Die mechanism for setting gromets comprising a pair of alined reciprocating members adapted to coact to punch the gromet receiving hole in the work; an independently operated annular die surrounding one of said punch members; and an independently operated spring-cushioned annular die surrounding the other punch member and adapted to coact with the first mentioned annular die to set the gromet within said hole.

6. Die mechanism for setting gromets comprising a pair of alined reciprocating members adapted to coact to punch the gromet receiving hole in the work; a pair of independently operated annular dies surrounding said punch members and adapted to coact to set the gromet within said hole; and a tubular spring-pressed clamping and stripping member surrounding one of said annular dies in axially movable relation thereto, and adapted to coact with the other annular die to clamp the peripheral portion of the gromet during the setting thereof.

7. Die mechanism for setting a gromet and a coöperating washer comprising a pair of alined reciprocating members adapted to pass through said gromet and washer respectively and to coact to punch the gromet receiving hole in the work; and a pair of independently operated annular dies surrounding said punch members and adapted to coact to set the gromet and its coöperating washer.

8. Die mechanism for setting a gromet and a coöperating washer comprising means for holding said gromet and washer in axial alinement; a pair of alined reciprocating members adapted to pass through said gromet and washer respectively and to coact to punch the gromet receiving hole in the work; a guide member for positioning said washer in setting relation with the gromet and the work; and a pair of annular dies surrounding said punch members and adapted to set the gromet and washer in the work.

9. Die mechanism for setting a gromet and a coöperating washer comprising means for holding the gromet and washer in axial alinement; alined reciprocating members adapted to coact to punch the gromet receiving hole in the work; an expansible tubular guide member, having a normal diameter less than that of the washer, for guiding said washer into setting position with relation to the gromet and the work; and a pair of annular dies surrounding said punch members and adapted to set the gromet and washer in the work.

10. Die mechanism for setting a gromet and a coöperating washer comprising means for holding a gromet and washer; means for punching the gromet receiving hole in the work; an expansible tubular guide member, having a normal diameter less than that of the washer, for guiding said washer from the holding means into setting position with

relation to the gromet and the work; and means for setting the gromet and washer in the work.

11. Die mechanism for setting a gromet and a coöperating washer comprising means for holding a gromet and washer; means for punching the gromet receiving hole in the work; an expansible tubular guide member, having a normal diameter less than that of the washer, for guiding said washer from the holding means into setting position with relation to the gromet and the work; and a pair of alined reciprocating dies adapted to coact to set the gromet and washer in the work, one of said dies being further adapted to force the washer through said tubular guide member.

12. Die mechanism for setting a gromet and a coöperating washer comprising means for holding the gromet and washer in axial alinement; a pair of reciprocating members adapted to pass through the gromet and washer respectively and to coact to punch the gromet receiving hole in the work; an expansible tubular guide member, having a normal diameter less than that of the washer, for guiding said washer from said holding means into setting position with relation to the gromet and the work; and a pair of reciprocating annular dies surrounding said punch members and adapted to coact to set the gromet and washer in the work, one of said die members being further adapted to force the washer through said tubular guide member.

13. Die mechanism for setting a gromet and a coöperating washer comprising means for holding the gromet and washer in axial alinement, the gromet being below the work and the washer above; a pair of vertically alined reciprocating members adapted to pass through said gromet and washer respectively and to coact to punch the gromet receiving hole in the work; an expansible tubular guide having a normal diameter less than that of the washer, positioned between the held washer and the work; an annular reciprocating die surrounding the lower punch member and adapted to force the central tubular portion of the gromet through the hole in the work and to raise said work into contact with said tubular guide, and a reciprocating die surrounding the upper punch member and adapted to force the washer downward through said tubular guide and to coact with the lower annular die to set the gromet and washer in the work.

14. Die mechanism for setting a gromet and a coöperating washer comprising means for holding the gromet and washer in axial alinement, the gromet being below the work and the washer above; a pair of vertically alined reciprocating members adapted to pass through said gromet and washer respectively and to coact to punch the gromet receiving hole in the work; an expansible tubular guide having a normal diameter less than that of the washer, positioned between the held washer and the work; an annular reciprocating die surrounding the lower punch member and adapted to force the central tubular portion of the gromet through the hole in the work and to raise said work into contact with said tubular guide; a reciprocating tubular clamping member surrounding the upper punch member and adapted to force the washer downward through said tubular guide and to coact with the lower die to clamp the washer and gromet together, in their peripheral regions, with the work therebetween; and a die, movable within said upper clamping member, adapted to coact with the said lower die to set the gromet and washer in the work.

In testimony whereof I have signed my name to this specification.

JOHN LENARD STUART.