

July 15, 1947.

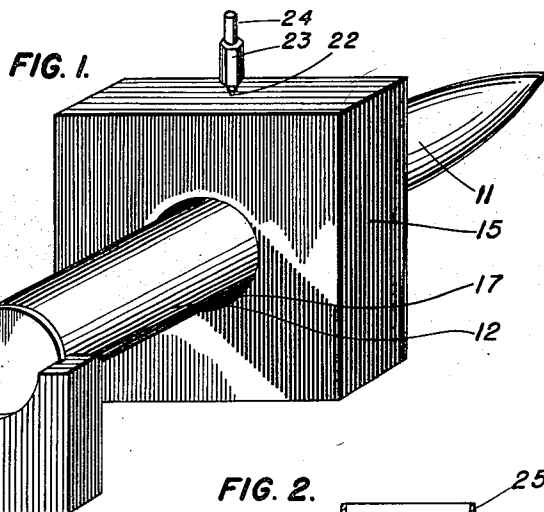
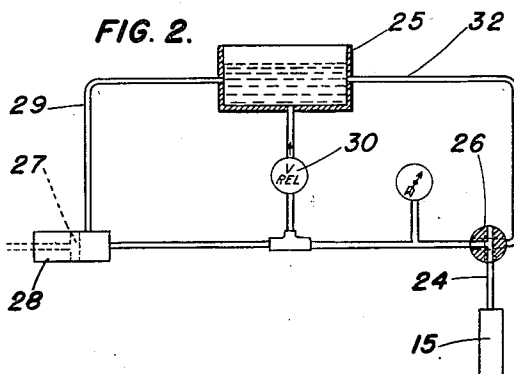
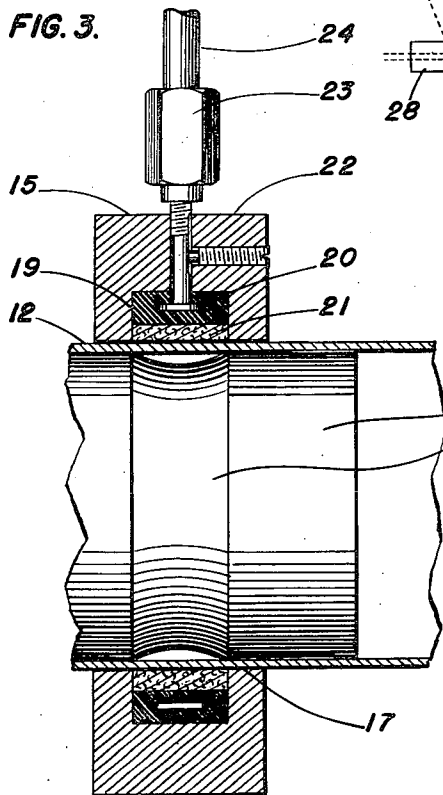
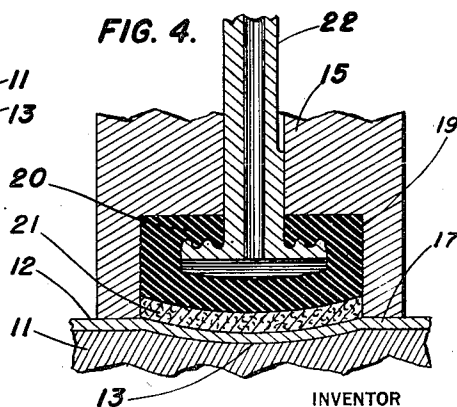
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2,423,862

BINDING AND COVERING APPARATUS

Filed Dec. 30, 1944

3 Sheets-Sheet 1



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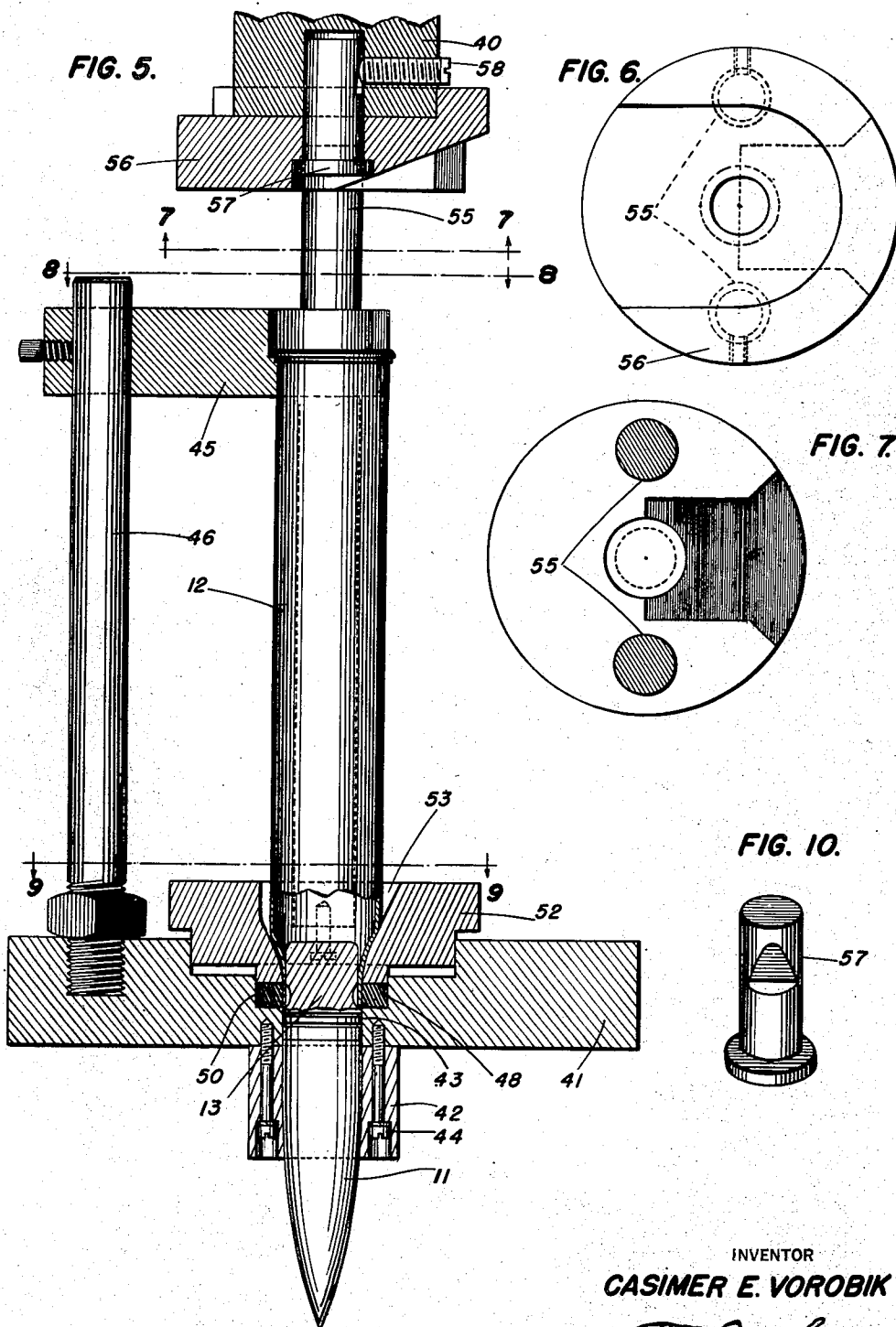
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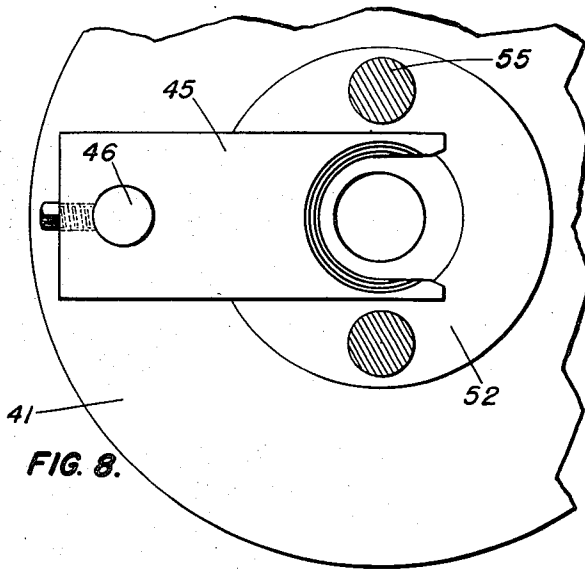
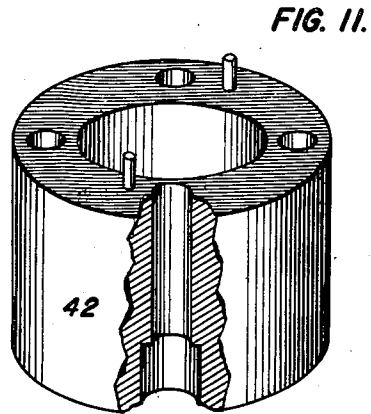
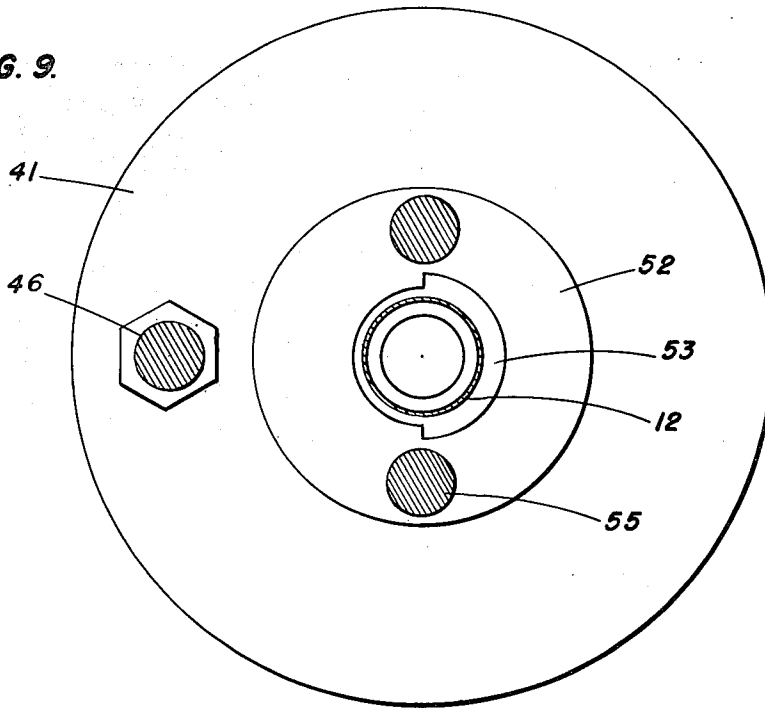


FIG. 9.



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BINDING AND COVERING APPARATUS

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to United States of America, as represented by
the Secretary of the Navy

Application December 30, 1944, Serial No. 570,722

2 Claims. (Cl. 153—1)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

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This invention relates to improved apparatus for deforming relatively ductile sheet material.

An important object of the invention is to provide improved means for crimping or channeling sheet metal and similar materials, with particular reference to the art of crimping cartridge cases, although it will readily be apparent that the invention is equally applicable to other uses.

It is common practice to secure projectiles in their cartridge cases by providing a peripheral groove in the base of the projectile, inserting the projectile in the neck of the casing, and then crimping or channeling the casing in a peripheral area overlying the groove to force the crimped area into the groove and so firmly unite the parts, although the groove and crimped portions are shallow and rounded in section to permit discharge of the projectile without tearing the casing upon firing. The material of the shell casing, since it must be of the greatest practicable strength, is not as ductile as would be possible if strength were sacrificed. Actual or incipient fatigue stresses and/or season cracking therefore sometimes result from channeling the neck by mechanical methods, such as the use of rolls, with resultant channeling failures when the projectiles are fired. It will be appreciated that relatively high local stressing is unavoidable when such crimping is done by ordinary mechanical means.

An important object of the present invention is to provide improved means for crimping the necks of cartridge casings for the indicated purpose, which means prevents the creation of localized high stresses, greatly reducing the likelihood of failures of the character above noted.

Another object of the invention is to provide such crimping means utilizing the hydrostatic effect resulting from the transmission of pressure through a confined mass of elastic material such as rubber or the like to distribute the deforming stresses throughout the entire area of the metal which is to be worked, and which eliminates the possibility of pinching the elastic material between the work and the apparatus, or between any of the operating parts of the apparatus.

Other objects and advantages will become apparent upon consideration of this disclosure in its entirety.

In the drawing:

Fig. 1 is a perspective view of the pressure head and work supporting means of a crimping system constructed in accordance with the present invention, a projectile being illustrated therein in the position it occupies while being worked upon;

Fig. 2 is a schematic diagram of the complete

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hydraulic crimping system which incorporates the parts of Fig. 1;

Fig. 3 is a view corresponding to a vertical cross-section through the pressure head shown in Fig. 1, the work being fragmentarily shown in position therein;

Fig. 4 is a fragmentary sectional detail view on a larger scale, showing the hydraulically operated deforming parts under pressure and the work completed;

Fig. 5 is a vertical cross-sectional view of a somewhat modified form of the invention;

Fig. 6 is a plan view of the ram plate employed in the embodiment of Fig. 5, removed from the remainder of the apparatus;

Figs. 7, 8 and 9 are cross-sectional views taken substantially on the lines 7—7, 8—8 and 9—9, respectively, of Fig. 5, and looking in the direction of the arrows;

Fig. 10 is a perspective view of a structural element; and

Fig. 11 is a sectional perspective view of a supporting element, partly broken away.

Referring now to the drawings, and particularly to Figs. 1 to 4 inclusive, a round of fixed ammunition in process of treatment is illustrated in Fig. 1 as consisting of a projectile 11 which is inserted in position in the mouth of a loaded cartridge case 12 ready for the crimping process which secures the projectile and case together. The construction and arrangement of the projectile and casing may be conventional, and, forming no part of the present invention, will not be considered in detail. As best shown in Fig. 3, a peripheral groove 13 is formed around the projectile near its base. The groove is of shallow, rounded cross section and the parts are secured together by forcing the metal of the casing into the groove, as illustrated in Fig. 4. Structurally this arrangement will also be recognized as old, the present invention addressing itself to the means employed for effecting such deformation of the casing.

A relatively heavy block-like pressure vessel 15 is provided with a central opening 17 proportioned to receive the round, as shown in Fig. 1, and to fit relatively snugly about the neck of the cartridge casing, as best shown in Fig. 3, when the round is fully inserted.

An internal channel 19 is bored or otherwise formed in the housing 15 in such position that when the cartridge casing is inserted the channel overlies the area of the casing which is to be inwardly deformed. The width of the channel conforms to that of the groove 13 in the projectile.

Within the channel are a distendable annular bladder 20 and a pressure communicating member 21 of cylindrical form, the latter interposed between the bladder and the inwardly opening face of the channel which bears against the cartridge casing. The tubular bladder may be formed of rubber or the like, while the pressure communicating element, although it is also flexible, is preferably of relatively stiffer rubber, reinforced with cording. Successful results have also been achieved with pressure communicating members made of leather. The pressure communicating member is radially compressible in the channel when the bladder is distended, the side walls of the channel and the pressure strip 21 being straight to permit the strip to slide inwardly and outwardly in the channel. Member 21 is thicker, at least along its edges, than the required deformation of the subjacent portion of the metal of the casing. In deforming the metal, therefore, the edges of the pressure communicating member are never entirely ejected from the channel 19. The pressure communicating member accordingly cannot be forced into the space between the round and the housing, where it might become pinched or damaged by excessively high local stresses.

A tubular stem 22 provides communication with the interior of the bladder 20 and a pipe or tube as 24 is adapted to be coupled to the stem by the hydraulic fitting 23. As shown in Fig. 2, the hydraulic fluid from a reservoir 25 is delivered to the tube 24 and so to the pressure vessel 15 through a two-way valve 26, the deforming pressure being generated by the reciprocating plunger 27 working in a cylinder 28. The hydraulic fluid is delivered to the cylinder through a pipe 29 entering its side, so that the piston in its forward movement traps a quantity of the fluid and forces it under pressure into the bladder 20 (when the valve 26 is in the position shown in Fig. 2). The plunger may be moved by any suitable power means (not shown). The condition of the bladder when distended is shown in Fig. 4. The metal of the casing is forced into the groove 13 in the base of the projectile, as shown, when the bladder is thus distended. A pressure relief valve 30 is provided to limit the maximum pressure, as well as a return line 32 through which the hydraulic fluid and the pressure are exhausted to the reservoir, after completion of the deforming operation, by turning the valve 26 to the position shown in dotted lines in Fig. 2. When the pressure is relieved in the manner indicated, the bladder and pressure communicating member relax to the shapes indicated in Fig. 3, freeing the completed round for removal.

By reason of the pressure equalizing action of the hydraulic fluid and the flexible character of the bladder and pressure communicating member, the deforming stresses are uniformly distributed throughout the entire area of the work acted upon, and the development of stresses higher than necessary in any localized area is impossible.

Similar benefits are achieved by the modified construction shown in Figs. 5-10 inclusive, in which the deforming power is derived from a conventional press, of which only the ram portion 40 and bed 41 are shown. Fixture means for supporting the round is carried by the bed and comprises the cylindrical support 42 shaped to receive the ogive portion of the projectile 11 and to assist in supporting the round in vertical position. As shown in Fig. 5, the round when inserted pro-

jects through a vertical opening 43 in the bed, the support 42 forming a downward extension of such opening and being secured to the underside of the bed by lag screws 44. An upper support 45 carried by a post 46 is shaped to receive the flanged base of the cartridge case which is thus held in accurate axial alignment with the projectile during the forming operation.

Seated in a counterbored portion 48 of the opening 43 in the bed and surrounding the area corresponding to the grooved portion 13 of the projectile is an elastic ring 50 of rubber or the like, the confinement of which is completed by a pressure member 52 which slides accurately in the counterbored portion 48 and is also accurately fitted with respect to the cylindrical mouth of a cartridge casing 12 of the type to be worked upon.

The opening 53 in the pressure member 52 is flared, as indicated in Figs. 5 and 9, to facilitate insertion of the rounds. The presser member is carried by and rigidly connected to the ram 40 by the bars 55 attached to the presser member at their lower ends and at their upper ends secured to a plate 56 secured to the ram by a stem 57 and set screw 58. When a round is positioned in the press in the manner shown in Fig. 5, downward movement of the presser member by the ram forces the rubber 50 and the subjacent metal of the cartridge casing inwardly into the groove 13 thereby securing the parts together in a manner analogous to the method describing connection with the hydraulic embodiment. The fluid characteristics of the rubber similarly equalize pressure throughout the entire deformed area of the metal, preventing the development of unequal stresses. When the pressure is relieved upon lifting of the ram, the rubber contracts, freeing the round and permitting easy removal thereof and insertion of new work.

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. Binder and covering apparatus for inwardly deforming a limited area of a hollow element to bind it about a grooved inner member comprising a relatively rigid, pressure-resistant receptacle having an opening therein adapted to receive and proportioned to fit relatively snugly about the element to be deformed, an inwardly opening generally annular pocket in the first mentioned opening and facing and surrounding the element to be deformed when the latter is inserted in the opening in the receptacle, and means for exerting deforming pressure against the portion of said element which abuts and is surrounded by said pocket, comprising a flexible bladder in said pocket deformable inwardly against the wall of said element, and a pressure communicating member formed of material which is also flexible but relatively stiffer and less flowable than the material of the bladder and fitted in the pocket over the bladder and slidable inwardly and outwardly of the pocket, at least the marginal portions of said pressure communicating member being thicker than the desired inward deformation of the subjacent portions of the work, whereby upon distention of the bladder and inward flexing of the pressure communicating member, said member prevents the ejection from the pocket of any marginal portion of the bladder which might become pinched between the receptacle and the work, and means for distending

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the bladder to exert deforming pressure upon the work.

2. Binder and covering apparatus for inwardly deforming a limited area of a hollow element to bind it about a grooved inner member comprising a relatively rigid, pressure-resistant receptacle having an opening therein adapted to receive and proportioned to fit relatively snugly about the element to be deformed, an inwardly opening generally annular pocket in the first mentioned opening and facing and surrounding the element to be deformed when the latter is inserted in the opening in the receptacle, and means for exerting deforming pressure against the portion of said element which abuts and is surrounded by said pocket, comprising a flexible bladder in said pocket deformable inwardly against the wall of said element, and a pressure communicating member formed of material including a flowability limiting means therewithin, said member being also flexible but relatively stiffer and less flowable than the material of the bladder and fitted in the pocket over the bladder and slidable inwardly and outwardly of the pocket, at least the marginal portions of said pressure communicating member being

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thicker than the desired inward deformation of the subjacent portions of the work, whereby upon distention of the bladder and inward flexing of the pressure communicating member, said member prevents the ejection from the pocket of any marginal portion of the bladder which might become pinched between the receptacle and the work, and means for distending the bladder to exert deforming pressure upon the work.

CASIMER E. VOROBK.

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