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2,414,567

METHOD OF PROGRESSIVELY PERFORATING A SHEET OF METAL

Filed March 9, 1942

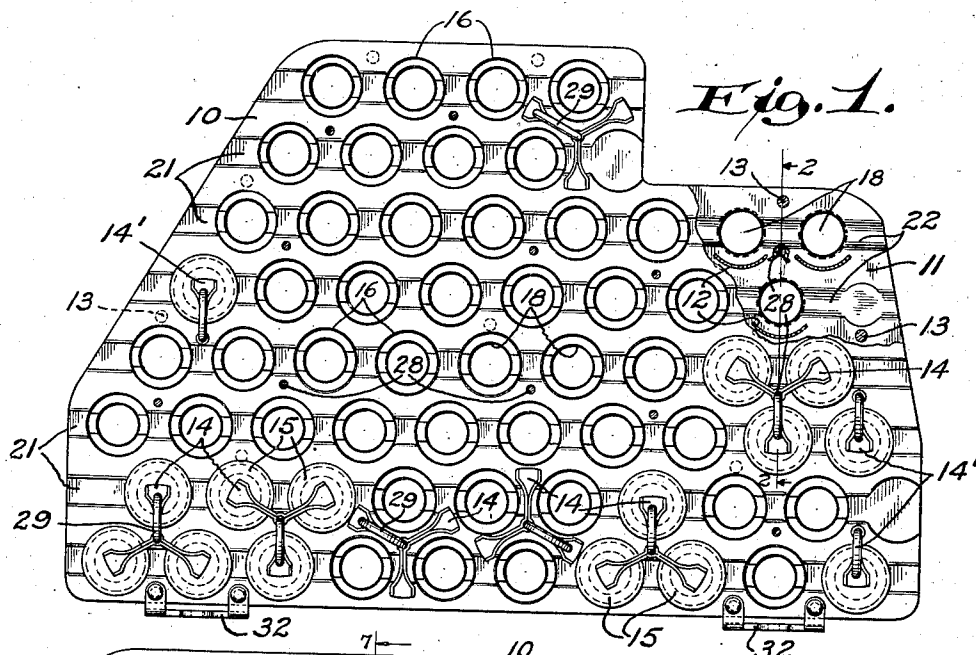


Fig. 1.

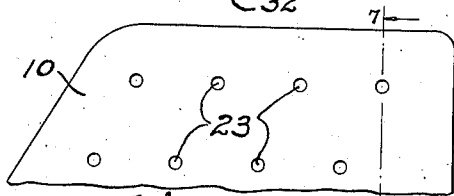


Fig. 3.

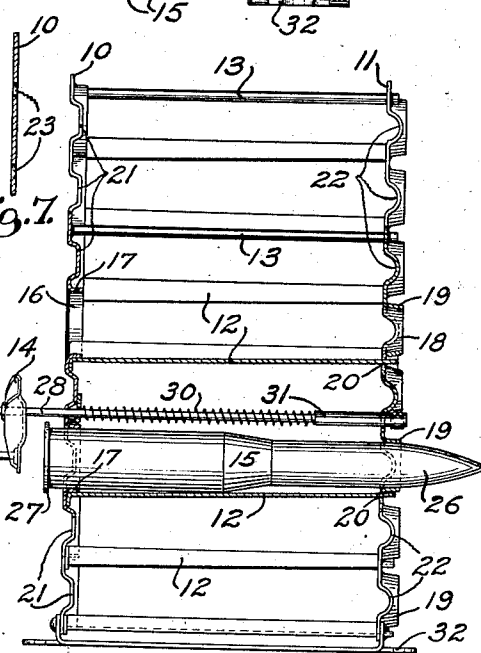


Fig. 2.

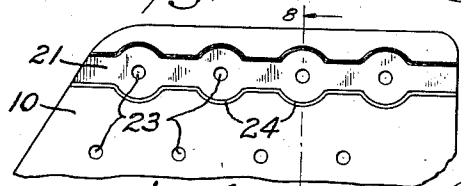


Fig. 4.

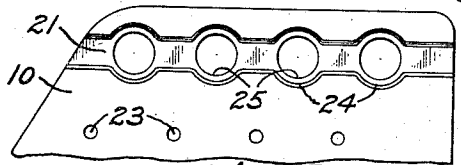


Fig. 5.

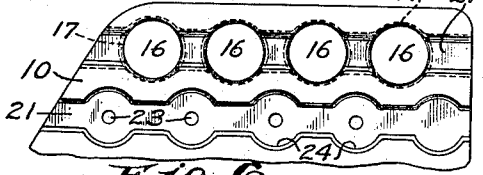


Fig. 6.

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UNITED STATES PATENT OFFICE

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METHOD OF PROGRESSIVELY PERFORATING A SHEET OF METAL

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2 Claims. (Cl. 113—116)

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The present invention relates generally to improvements in the art of producing structures from sheet metal or the like with the aid of punches and dies, and relates more specifically to an improved sheet metal rack assemblage and to an improved method of forming the same.

An object of the invention is to provide an improved method of making a rack structure for firmly but removably supporting a plurality of objects such as ammunition shells, and to also provide an improved method of forming such rack assemblages.

It has heretofore been customary in the manufacture of mechanized military equipment, to provide ammunition racks each adapted to removably confine a selected number or group of loaded shells or cartridges in parallel approximately horizontal position. Each of these prior shell racks ordinarily consisted of a pair of laterally spaced upright end heads and a series of horizontal tubes or guides interconnecting the two heads, and in order to reduce the weight of the rack assemblage to a minimum, it was ordinary prior practice to form each of the end heads of an aluminum casting. Because of the difficulty encountered in securing this cast metal, it has been attempted to utilize sheet metal in the formation of the end heads for these shell racks, but considerable difficulty has again been encountered in these attempts, because these racks must be of sturdy construction in addition to being light in weight, and it required sheet metal of such heavy gauge with the ordinary prior methods of manufacture and in order to provide the necessary strength, so that the weight of the assemblages was prohibitive.

It is therefore a more specific object of the present invention to provide an improved mode of constructing sheet metal shell racks of the general type above referred to, wherein the desired lightness and rigidity may be secured by utilizing relatively thin gauge sheet metal.

Another specific object of this invention is to provide a new and useful shell rack assemblage of compact construction adapted to snugly and safely confine a maximum number of loaded shells or the like, while permitting rapid withdrawal of the individual shells.

A further specific object of my invention is to provide an improved durable and effective shell confining rack, which can be quickly manufactured from relatively thin sheet metal and at moderate cost, with the aid of simple punches and dies.

Still another specific object of the invention

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is to provide a new method of forming reinforced and extremely rigid end heads for shell racks or similar structures, of sheet metal or similar distortable material and with punches and dies of inexpensive construction.

These and other specific objects and advantages of the invention will be apparent from the following more detailed description.

A clear conception of the specific construction of one type of sheet metal assemblage embodying the present improvement, and of the mode of producing the improved assemblage, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a front part sectional view of a typical ammunition shell rack embodying the improvement;

Fig. 2 is a transverse vertical section through the shell rack of Fig. 1, taken along the line 2—2 and showing one loaded shell in place;

Fig. 3 is a plan view of a fragment of the sheet of metal used in forming the front end head of the rack, depicting the initial step in the formation of this head;

Fig. 4 is a similar view of the same fragment of sheet metal, showing the second step in the formation of the uppermost row of shell receiving holes;

Fig. 5 is another similar view of the head fragment, illustrating the third step involved in the formation of the upper row of holes;

Fig. 6 is still another similar view of the same front head fragment, showing the final step involved in forming the uppermost set of holes;

Fig. 7 is a transverse vertical section through the front head fragment of Fig. 3, taken along the line 7—7; and

Fig. 8 is a transverse vertical section through the head fragment of Fig. 4, taken along the line 8—8.

While the invention has been shown and described herein as being applied to a particular type of ammunition shell rack formed of sheet metal, it is not my desire or intent to thereby unnecessarily limit the scope or restrict the utility of the improved features.

The improved shell rack specifically shown in the drawing by way of illustration, comprises in general a sheet metal front end head 10; a sheet metal rear end head 11 spaced from the front head 10; a series of transversely curved elongated guide shelves 12 interconnecting the heads 10, 11; spacer bolts 13 rigidly uniting the

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heads 10, 11 so as to retain the shelves 12 in proper position; and a plurality of retractable clamps 14 for normally holding loaded ammunition shells 15 or the like confined within the rack, while permitting ready removal thereof.

The end heads 10, 11 are both formed of relatively thin gauge sheet metal, and the front head 10 has a plurality of transverse rows of openings 16 therein each of which is surrounded by an integral tubular flange 17, while the rear head 11 has a similar group or number of transverse openings 18 therein of smaller diameter than the opening 16 and each of which is likewise surrounded by an integral tubular flange 19. The corresponding sets of openings 16, 18 are disposed in horizontal axial alinement with each other; and the curved shelves 12 which serve as guides for directing the elongated loaded shells 15 into these alined openings and flanges 17, 19, are welded or otherwise rigidly attached to the front head 10 directly beneath and near the flanges 17 and penetrate arcuate slots 20 formed in the rear head 11 beneath the flanges 19 thereof.

Because of the light weight and other characteristics of the sheet metal used in the formation of the end heads 10, 11, it would be impossible to draw the relatively long tubular flanges 17, 19 out of the flat sheets from which these heads are formed, without danger of rupturing or cracking the metal, and the heads 10, 11 would also be insufficiently stiff or rigid if no other re-enforcing means were provided. Each end head is therefore preferably also provided with a series of transverse parallel or horizontal corrugations 21, 22 which extend through or across the openings 16, 18 in the several rows and merge into the tubular flanges 17, 19 respectively. These corrugations 21, 22 obviously reduce the extent to which the metal must be drawn or distorted at the opposite sides of the openings 16, 18 in order to form the long flanges 17, 19, and the corrugations 21 in the front head 10 are somewhat wider than the corrugations 22 in the rear head 11, but both sets of corrugations 21, 22 obviously stiffen and materially re-enforce the adjacent end heads 10, 11.

Since the metal employed in the construction of the end heads 10, 11 will not permit simultaneous formation of all of the corrugations 21, 22, and also because the power required to do this would be excessive, I have evolved an improved and simple mode of forming these corrugated and punctured heads. The successive steps of this improved method are clearly depicted in Figs. 3 to 8 inclusive, and in view of the fact that the method employed in forming both heads 10, 11 is substantially the same, a description of the mode of producing one of these heads 10 will suffice. When forming one of the front heads 10, for example, a flat sheet of metal is first provided with successive rows of laterally spaced relatively small perforations 23 as shown in Figs. 3 and 7, of which the perforations 23 in the upper row are staggered relative to those of the next lower row, and the vertical distance between the row of perforations 23 is considerably greater than the distance between successive final corrugations 21 of the completed end head 10. A die having positioning pins adapted to contact with the equally spaced small perforations 23, is next applied to the perforations of the upper row, and is manipulated to form a single corrugation 21 having local cup-shaped areas or enlargements 24 therein concentric with the perforations 23, extending along this row as illus-

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trated in Figs. 4 and 8. After the corrugation 21 has been thus formed, the center of each cup-shaped area 24 is punched out to provide a larger slightly oval hole 25 therein of lesser diameter than the final opening 16, as shown in Fig. 5. An expanding punch of well known construction is thereafter forced through the row of holes 25 so as to complete the tubular flanges 17 and the openings 16 of the upper row, whereupon the same cycle of operations may be performed to complete the successive rows of corrugations 21, flanges 17 and openings 16. While the successive rows of perforations 23 which ultimately locate the openings 16 are initially spaced farther apart than the horizontal center lines of the rows of corrugations 21, these rows of perforations 23 are drawn toward each other as each new corrugation 21 is produced, and the final openings 16 will be closely nested as illustrated in Figs. 1 and 2.

The spacer rods or bolts 13 which rigidly unite the front and rear heads 10, 11 co-operate with the guide shelves 12 to stiffen the rack assembly, and are preferably disposed near the outer edges of the heads so as not to interfere with other mechanism. Most of the retractable clamps 14 for normally confining the loaded shells 15 within the alined openings 16, 17 are formed to simultaneously co-operate with three shells 15, and the tubular flanges 19 of the rear head 11 are preferably tapered to fit the taper of the bullets or projectiles 26 and to prevent the shell ridges 27 from engaging the front head 10, thereby permitting the shells 15 to be readily withdrawn. The spider clamps 14 are also preferably formed of sheet metal, and each of these clamps is secured to a wire or rod 28 which is slidably and rotatably supported in both of the end heads 10, 11, and the outer end of which is reversely bent to form a handle 29. Each clamp rod 28 is embraced by a compression spring 30 one end of which coacts with a sheet metal bracket 31 secured to the corresponding rod 28 near the rear head 11, and the opposite end of which reacts against the inner surface of the front head 10, and these springs 30 constantly urge the clamps 14 toward the outer front surface of the end head 10. By gripping the handle 29 and thereafter pulling and simultaneously twisting the same, the corresponding clamp 14 can be retracted to release the shells 15 for free withdrawal from the openings 16, 18; and in cases where a single set of extra openings 16, 18 is available, a modified single clamp 14' may be utilized as shown in Fig. 1.

The mode of constructing and of utilizing the improved shell racks should be clearly apparent from the foregoing detailed description of the method of forming and of assembling the same, and these racks may be of diverse sizes and shapes and may be provided with supporting feet 32 as illustrated in Figs. 1 and 2. The improved racks are adapted to be fixedly or movably mounted in relatively cramped quarters within mobile mechanized combat units, and by virtue of their improved formation the shell racks are extremely strong and durable and may be constructed at moderate cost. The new racks may obviously be produced from relatively light weight, inexpensive and readily available sheet metal, without sacrificing strength or rigidity, and can also be rapidly manufactured with the aid of relatively simple equipment. The various parts of each rack can be readily assembled and rigidly united by welding or otherwise, and the

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invention has proven highly successful and advantageous.

It should be understood that it is not desired to limit the invention to the exact details of construction, or to the precise mode of formation of the various parts, since various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. The method of progressively perforating a sheet of metal with rows of perforations each surrounded by an integral tubular flange, which comprises, forming a corrugation throughout the width of a flat sheet having a series of relatively small holes through the bottom thereof, expanding each small hole to provide larger holes each having an integral tubular flange projecting from the bottom of the corrugation, and repeating said operations to provide successive corrugations and flanged holes while gradually di-

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minishing the plane length of the sheet transversely of the corrugations.

2. The method of progressively perforating a sheet of metal with rows of perforations each surrounded by an integral tubular flange, which comprises, providing a flat sheet with a rectilinear row of relatively small laterally spaced perforations, forming a continuous corrugation throughout the width of the sheet and having the row of perforations extending along the bottom thereof, expanding each small hole to provide larger holes each having an integral tubular flange projecting from the bottom of the corrugation, and repeating said operations to provide successive parallel corrugations and flanged holes while gradually diminishing the plane length of the sheet transversely of the corrugations.

JOEL R. THORP.