June 6, 1944. C. SARULLA 2,350,535

METAL TRIMMING

Filed Nov. 14, 1942 3 Sheets-Sheet 1

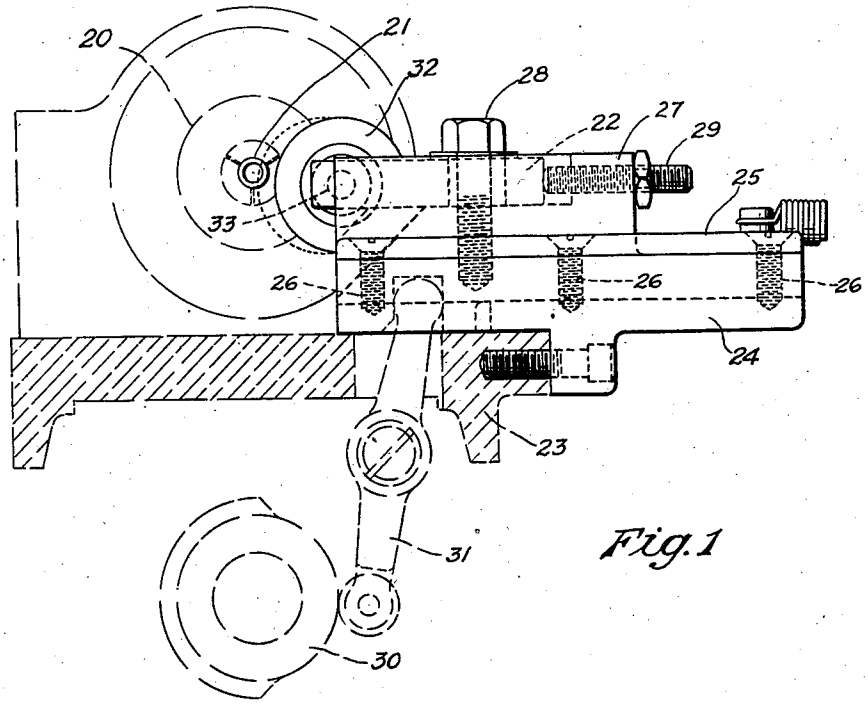



Fig. 1

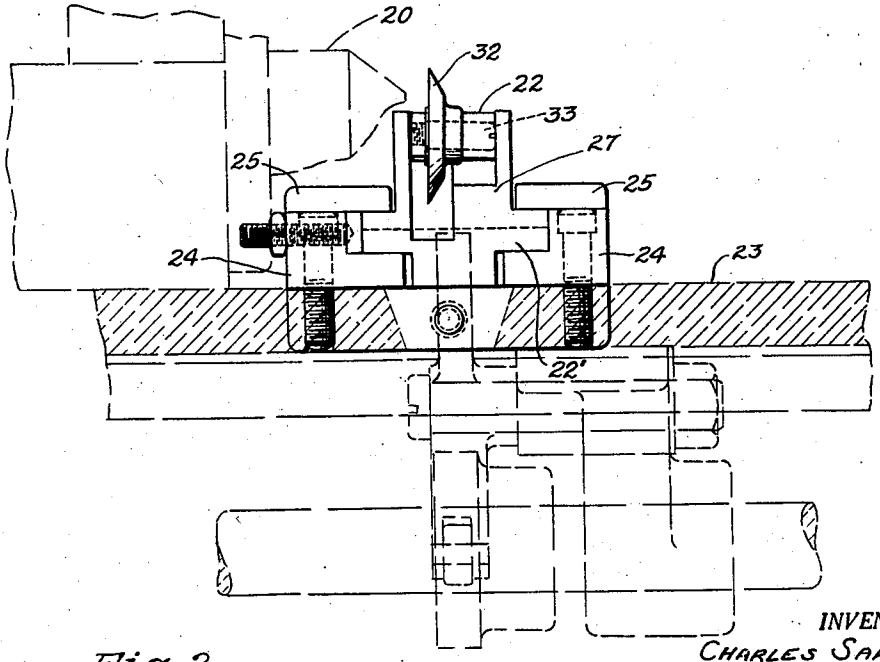



Fig. 2

INVENTOR.
CHARLES SARULLA
BY D. Verner Smythe
ATTORNEYS.

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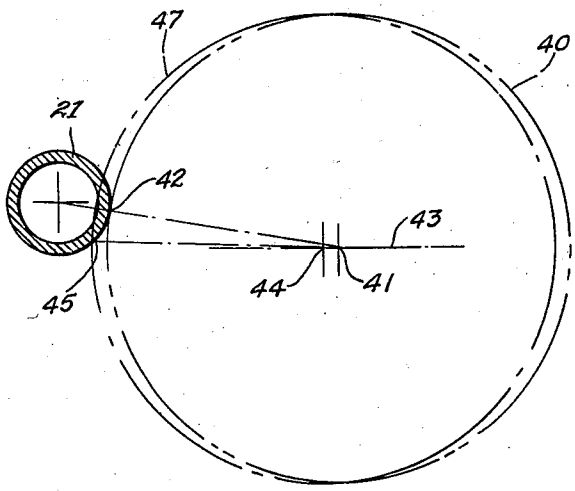



Fig. 3

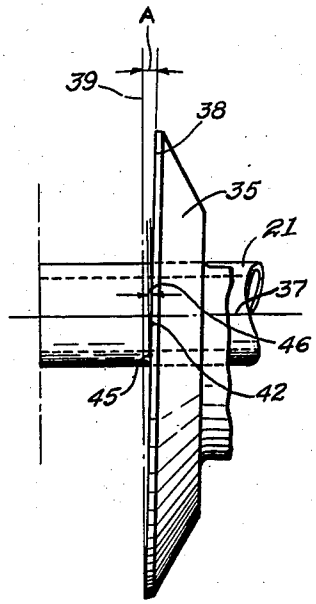



Fig. 4

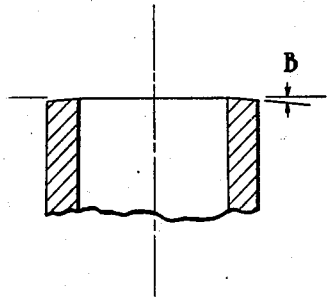



Fig. 5

INVENTOR.
CHARLES SARULLA
BY D. Peter Smythe &
ATTORNEYS.

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METAL TRIMMING

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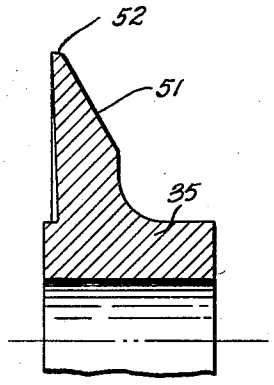



Fig. 6

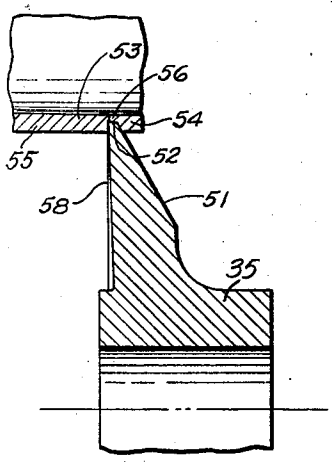



Fig. 7

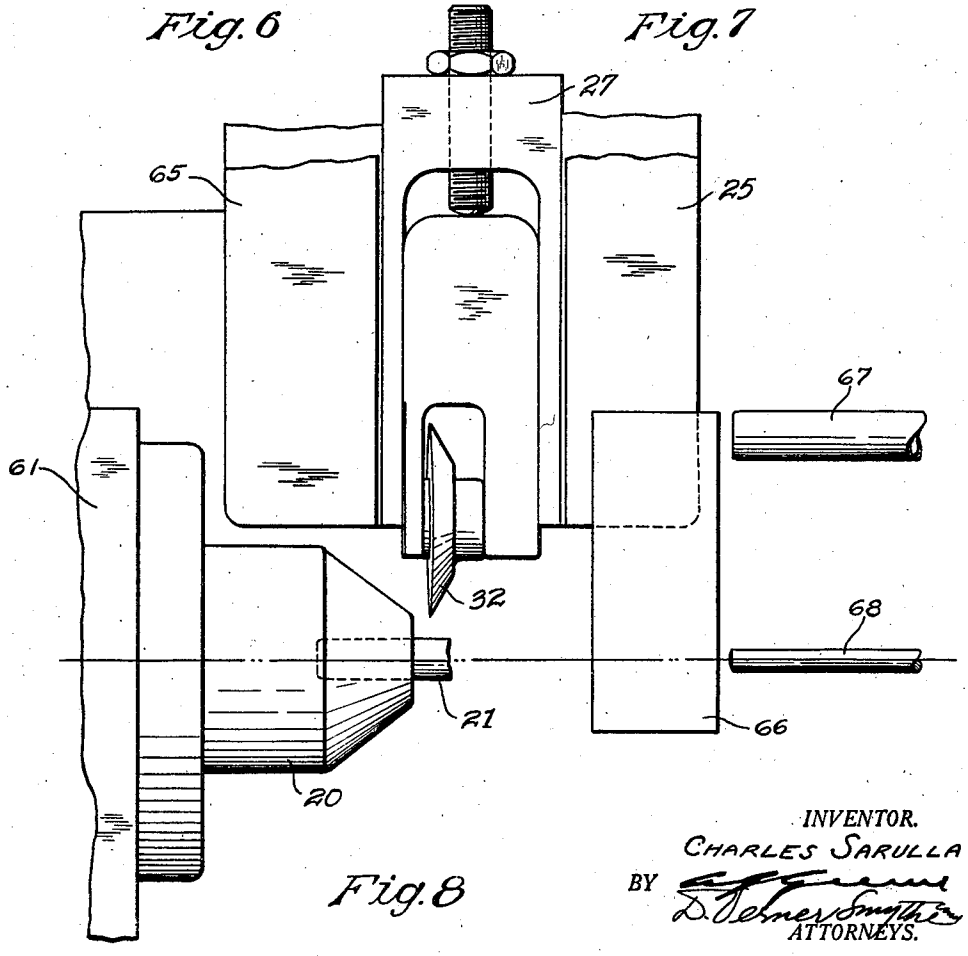



Fig. 8

INVENTOR.
CHARLES SARULLA
BY D. Tesner Smyth & Co
ATTORNEYS.

Patented June 6, 1944

2,350,535

# UNITED STATES PATENT OFFICE

2,350,535

## METAL TRIMMING

Charles Sarulla, Bridgeport, Conn., assignor to Remington Arms Company, Inc., Bridgeport, Conn., a corporation of Delaware

Application November 14, 1942, Serial No. 465,539

11 Claims. (Cl. 164—60)

This invention relates to a means for cutting articles and particularly is adapted for use in the trimming of tubular articles such as ammunition cartridge cases or bullet jackets. In the manufacture of cartridge cases and bullet jackets a cup usually is drawn from a flat strip and the drawing continued in several stages until the final size is reached in a succession of operations. The cup, case, or jacket is usually brought to a definite length by cutting off one end. The conventional small arms projectile comprises a jacket and a core therein. The core may be of lead or of steel and the jacket may be of copper, steel or similar metal. A hollow jacket is formed by usual methods from a cup or strip. The drawn jacket to be trimmed is fed to a machine having a collet or chuck arrangement for rapidly rotating the component. When in place in the chuck, a rotatable tool is advanced against the article which serves to trim off the excess part of the component.

Previous practice has employed means for moving this tool directly into the component at right angles thereto. In so doing, a burr is raised on the exterior surface of the jacket and a burr is also raised on the interior surface of the jacket due to the action of the tool. As the jacket is operated upon by other machines, the burrs will seriously affect the dies and punches causing undue wear and other undesirable features. When the jacket material is made of steel in place of conventional soft metal, such as copper bearing metals, the burr which is raised is particularly objectionable. By the present invention a means is provided for eliminating the burrs. Wear of tools is also an important factor in quantity production and particularly when steel is used. The present invention provides a means for greatly increasing the life of trimming tools. The other objects of the invention will appear from the following description and illustrations which are merely exemplary.

Fig. 1 is a fragmentary transverse sectional view of a machine which can be used.

Fig. 2 is a fragmentary sectional longitudinal view of the machine shown in Fig. 1.

Fig. 3 is a diagrammatic sketch illustrating one of the principles of the invention.

Fig. 4 is a side view of Fig. 3.

Fig. 5 is a sectional view of a cup showing the end shape in a greatly exaggerated form.

Fig. 6 is a cross sectional view of a portion of a tool which may be used in the present invention.

Fig. 7 is a diagrammatic illustration of the use of the tool shown in Fig. 6.

Fig. 8 is a fragmentary diagrammatic plan view of a bullet jacket trimming machine.

In Fig. 1, a chuck or collet is shown at 20 which may be of any conventional type having means to open the chuck as a jacket 21 is fed thereto and closing upon the jacket 21 when it is in place within the chuck. It is to be understood that a bullet jacket is shown merely for purposes of illustration and that other tubular articles, or ammunition components such as cartridge cases, may be operated upon. The chuck 20 is normally rapidly revolving and the tool holder 27 is slidably mounted on the bed plate 23 of the machine and is guided in its reciprocation by means of guides 24. The reciprocating slide 27 can be held in place by means of cover guide plates 25 which are fastened by screws 26 to the guides 24. The tool holder 22 is adjustably held and positioned on the reciprocating slide 27 by means of bolt 28 and adjustable screw 29. The reciprocating slide 27 is reciprocated by means of the cam 30 and oscillating arm 31. The motion of the slide is properly timed by means of the cam to reciprocate the slide inwardly after a jacket has been fed into the collet and is ready to be trimmed. One form of rotatable tool 32 is mounted on the shaft 33 so that it may turn as it contacts the jacket. It is evident that if desired, the tool may be positively rotated by an external source of power although such is not necessary and is not the preferred form.

The present invention provides for the mounting of the axis of the rotating tool 32 at an angle to the horizontal axis of rotation of the jacket. The tool is moved into the jacket substantially perpendicular to the axis of rotation of the jacket but due to the inclination of the cutting plane of the tool, a skiving cut is taken longitudinally of the component as the tool moves inwardly and in this manner the burr on the exterior face is removed and the end of the jacket is left smooth and clean. When the tool is moved inwardly and the plane of the cutting edge is perpendicular to the horizontal axis and parallel to a vertical plane perpendicular to the axis a burr will result at the end of the jacket at the outside face. As will be explained in detail at a later point, a burr will also occur at the inner face which also is eliminated by this invention.

Referring now specifically to Figs. 3 and 4, the preferred form of tool is shown at 35 of Fig. 4 (described in greater detail in Figs. 6 and 7)

and the jacket is at 21 which rotates about a horizontal axis 37. The cutting plane of the tool is located at 38 and is at an angle A with the vertical plane 39 which is perpendicular to the axis of rotation 37. In Fig. 3, the circle 40 with its center at 41 shows the position of the tool cutting edge when it first contacts the exterior surface of the jacket 36, the contact point being at 42. As the tool moves inwardly along the line 43, it will trim the end of the jacket until it reaches its inner limit of travel when the center of the tool is located at point 44. At this time the exterior cutting edge of the tool is operating at the exterior face of the jacket at point 45. Referring now to Fig. 4, the first point of contact 42 is indicated and the point of contact 45 is also indicated showing that the cutting point of the edge of the tool with the exterior face moves downwardly. Because of the inclination of the plane 38 of the cutting face of the tool the point 45 is seen to have moved forwardly by an amount equal to the dimension indicated at 46. It is evident that the amount the point 45 moves forwardly or longitudinally of the horizontal axis 37 will depend upon the angle A and also the amount the tool moves inwardly. The end of the jacket 21 will have a very slight bevel B thereon as shown in a greatly exaggerated form in Fig. 5. This bevel is so slight that it is difficult to detect the same in the ordinary bullet jacket. It is thus seen that in addition to the cut which is being taken perpendicular to the axis of rotation 37 as the tool moves inwardly, there is also a skiving cut being taken longitudinally of the jacket which will serve to remove any burr which might have been made on the exterior surface. This will also serve to leave a clean cut face on the end of the jacket.

In the drawings, the movement of the center of the tool is shown on a line below the center of the jacket and is the preferred form but it is to be understood it may be above the center line or on the center line. The size of the cutting tool relative to the component will also depend on the amount the point 45 is to move downward which of course also is related to the inward movement.

The angular setting of the tool also provides a force directed to the right in Figs. 4 and 7. When the portion 56 becomes sufficiently thin, it will break or fracture so that a clean edge without a burr will result on the interior face. This is partly due to the fact that the left portion of the jacket is held in the chuck and the trimmed portion forced to the right.

In order to facilitate the fracturing action, the form of tool shown in Figs. 4, 6 and 7 may be used wherein a conical surface 51 is provided which is at a comparatively small angle with the surface of the jacket. Merely as an example, this angle may be about 10° with the axis of the tool for a Cal. .30 steel bullet jacket and the length of the surface may be made about .020" with a tool diameter of about 1½". The joining conical surface may have a greater angular relation to the axis, and, for example, can be about 60° with the axis of the tool. It is to be distinctly understood that these dimensions and angles are merely exemplary and not limiting because they will depend on many variables such as the material, tool angle, etc.

Referring now to Fig. 7, the wall of the jacket is indicated at 53 together with surfaces 51 and 52. As the tool moves inwardly, the surfaces 52 and 51 may assist in breaking and removing the portion 54 longitudinally from the main part of the jacket 55. As the cut progresses and the metal at 56 becomes sufficiently thin, a fracture at this point will occur and the trimmed portion 54 will be forcibly moved longitudinally away from the finished part 55 of the jacket. In this manner, any interior burr will be eliminated.

Because of the skiving action as the tool moves inwardly, the tool is in effect self-sharpening due to the wearing action on the cutting surface 58. It has been determined that when a tool is moved directly inward that there is a blunting or dulling action on the cutting surface which makes the tool wear very rapidly. By means of the present device the life of the tool has been enormously lengthened, as well as eliminating burrs and giving a clean cut off. It has been found that the angle A can be between about ½° and 1½° for the particular collets involved and a Cal. .30 jacket. If the angle were increased much beyond this it was found that there was a tendency to actually pull the jacket to the right or out of the collet. This action, of course, would depend upon the type of chuck or collet used, lubrication of surfaces and many other variables.

In Fig. 8 is shown diagrammatically a plan view of a bullet jacket trimming machine showing the feeding means in schematic form. 20 is the rotating collet supported by the driving head 61 with a jacket 21 shown in place. The tool is at 32 supported in the reciprocating slide 27 held by the guide plates 25 similar to Figs. 1 and 2. The tool 32 may be of the type indicated or of the form shown in Figs. 4, 6 and 7. At 66 is a reciprocating block which carries jackets from a feed tube 67 to a position in line with the reciprocating feed punch 68 in any well known manner. A jacket is fed from tube 67 into a suitable recess in the block 66 and then the block 66 reciprocates to bring the shell into alignment with the punch 68. The punch 68 moves to the left and carries the jacket into the collet 20. The collet previous to this has been opened so as to allow the jacket to be placed therein. The collet then closes and the tool slide 27 is reciprocated inwardly to trim the jacket. A reciprocating punch (not shown) located within the collet then ejects the trimmed jacket from the collet as the collet is opened. The various reciprocating parts may be operated in a well known manner by a set of cams which are arranged to properly time the various feeding and cutting operations. A detailed description of these parts is not necessary as they are well known in the art.

By the invention described herein, a tool has been provided by which the ends of jackets and other tubular articles may be cut off cleanly without burrs and with an enormous increase in the life of the tool.

What is claimed is:

1. The method of transversely cutting substantially cylindrical articles comprising the steps of rotating an article relative to a rotary tool; advancing said tool relative to the article in a plane transverse to the axis of rotation of said article; cutting said article along said plane; and taking a skiving cut longitudinally of the axis as the tool advances relative to said article.

2. The method of trimming ammunition components comprising the steps of rotating a component relative to a rotary tool; advancing said tool into the component in a plane transverse to the axis of rotation of said component; cutting said component in said plane; and also taking a skiving cut longitudinally of the axis

as the tool advances into said component whereby burrs are removed from the exterior surface.

3. The method of trimming tubular ammunition components, comprising the steps of rotating a case relative to a tool; advancing said tool into said component in a plane transverse to the axis of rotation of said component; cutting said component in said plane and also taking a skiving cut longitudinally of the axis as the tool advances into said component; and finally separating the parts by a force exerted by said tool longitudinally of the axis.

4. The method of transversely cutting tubular articles comprising the steps of rotating an article relative to a rotary tool; and advancing said tool into the article in a plane substantially perpendicular to the axis of rotation of the article in the direction of tool advancement and at an angle to the axis of rotation of the article in another direction to take a transverse and a skiving cut on the article.

5. Apparatus for cutting substantially cylindrical articles including means to provide relative rotary movement between an article and a tool having a cutting edge; means to advance the tool relative to the article in a plane transverse to the axis of the article; and means to support the cutting edge of said tool at an angle relative to said transverse plane so that a composite transverse and skiving cut is made by the tool.

6. Apparatus for cutting articles including means to rotate an article relative to a rotary tool; means to support said rotary tool for movement transversely to the axis of rotation of said article; and means on said support to hold the plane of the cutting face of said rotary tool at an angle to said transverse plane so that a composite transverse and skiving cut is made by the tool as it is fed into the article.

7. Apparatus for trimming tubular ammunition components including means to rotate a component; and means to support a rotary tool having a cutting edge for movement transversely of the axis of rotation of said component, the plane of said cutting edge being located at an angle relative to the transverse plane of movement of said tool, whereby as the tool moves inwardly, the cutting point of the tool located at the exterior surface of the component moves longitudinally of said axis to give a skiving cut.

8. Apparatus for trimming bullet jackets, including a rotating chuck; means to feed jackets to said chuck; tool holding means reciprocable to move a tool in a plane transverse to the axis of rotation of said chuck; a rotary tool; means to support said rotary tool at an angle to said transverse plane; and means to operate said feed means, chuck, and tool holder in timed relation for trimming said jackets.

9. Apparatus for trimming tubular ammunition components including means to rotate a component; and means to support a rotary tool having a cutting edge for movement in a direction substantially perpendicular to the axis of rotation of said component, said support holding the plane of the cutting edge of said tool at a small angle relative to said transverse plane of movement whereby a composite transverse and longitudinal cut is made by said tool.

10. Apparatus for trimming tubular ammunition components including means to rotate a component; means to support a rotary tool having a cutting edge; means to move said support in a direction transverse to the axis of rotation of said component; means on said support to hold the cutting edge in a plane located at a small angle relative to said transverse plane; and a rotary tool having a cutting edge and a trailing edge, said trailing edge comprising a frusto-conical surface adjacent the cutting edge, said surface being at a small angle relative to the axis of the component, and a frusto-conical surface at a large angle relative to the axis of rotation of the component.

11. A rotary tool for a trimming machine comprising a dished face; a cutting edge; and a trailing edge composed of at least two frusto-conical sections, one being adjacent the cutting edge and defining a small angle relative to the axis of the tool and the other defining a greater angle than the first mentioned conical surface relative to the axis of the tool.

CHARLES SARULLA.