June 16, 1942. G. W. SOWER 2,286,513

INSIDE FLASH REMOVER

Filed Dec. 5, 1940 3 Sheets-Sheet 1

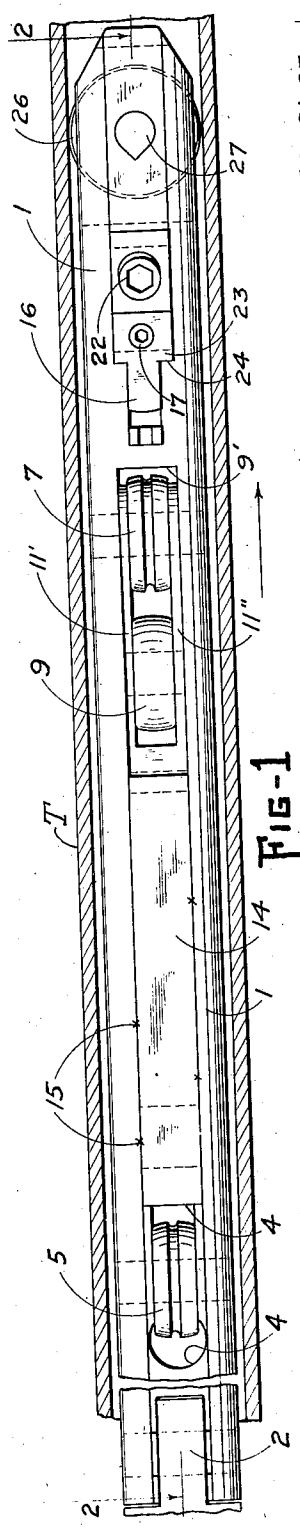


FIG-1

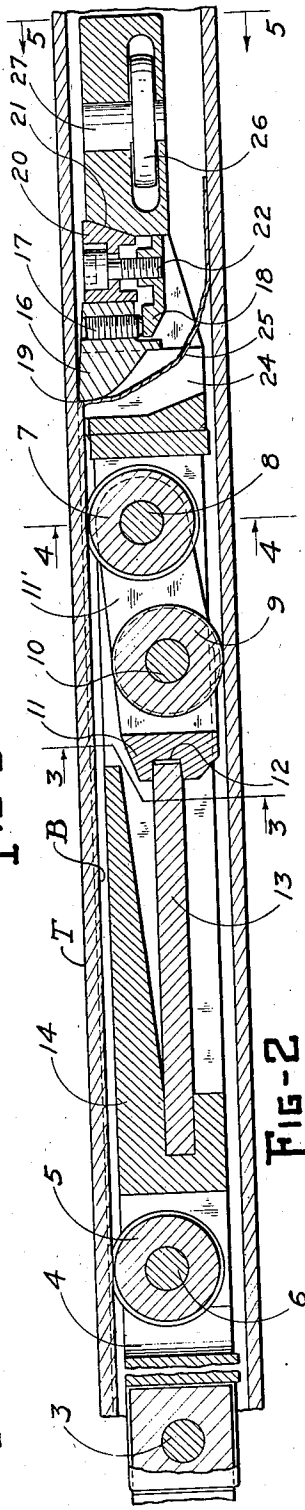


FIG-2

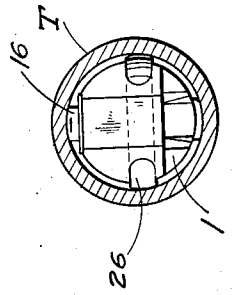


FIG-5

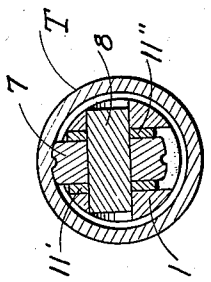


FIG-4

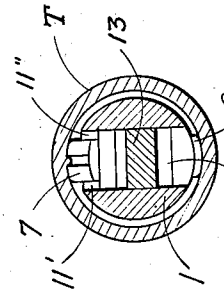


FIG-3

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INSIDE FLASH REMOVER

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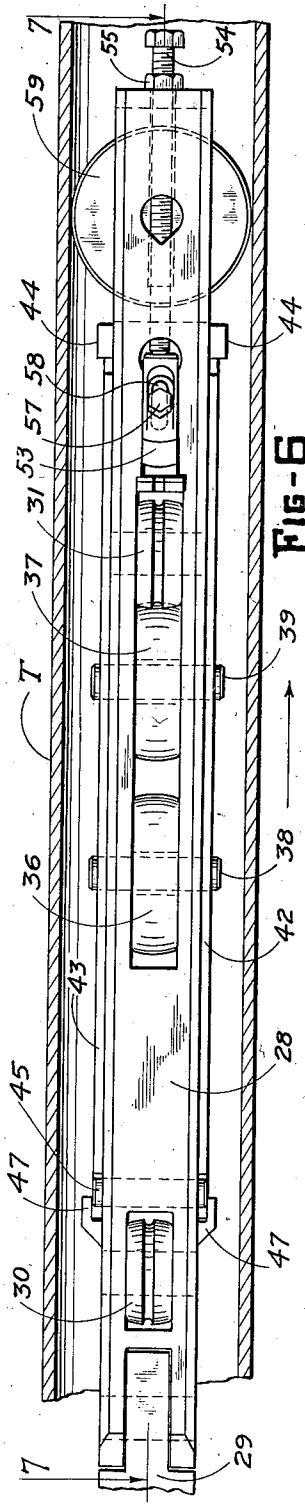


FIG-6

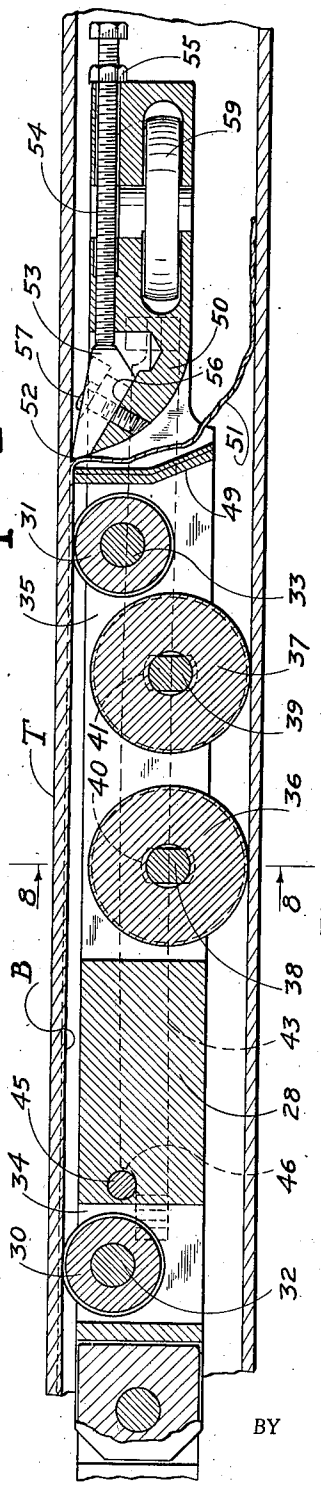


FIG-7

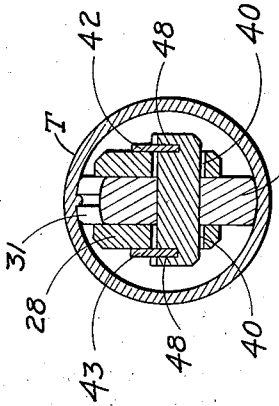


FIG-8

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INSIDE FLASH REMOVER

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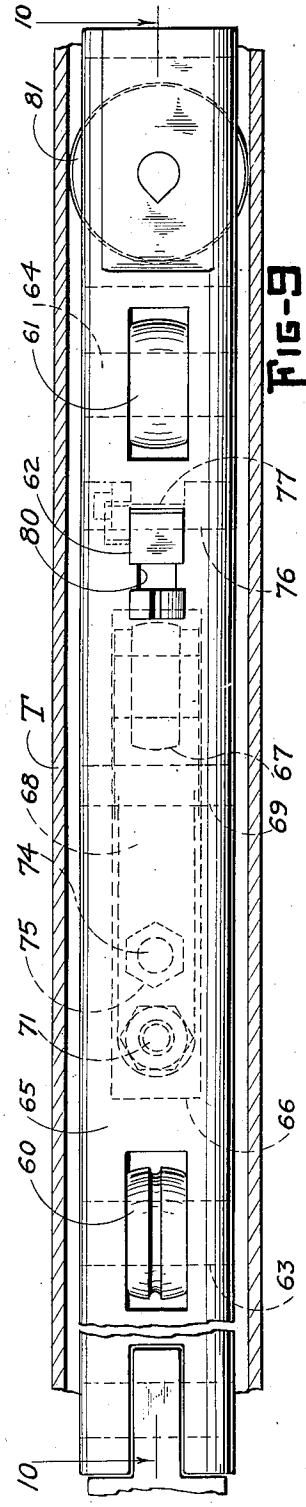


FIG-9

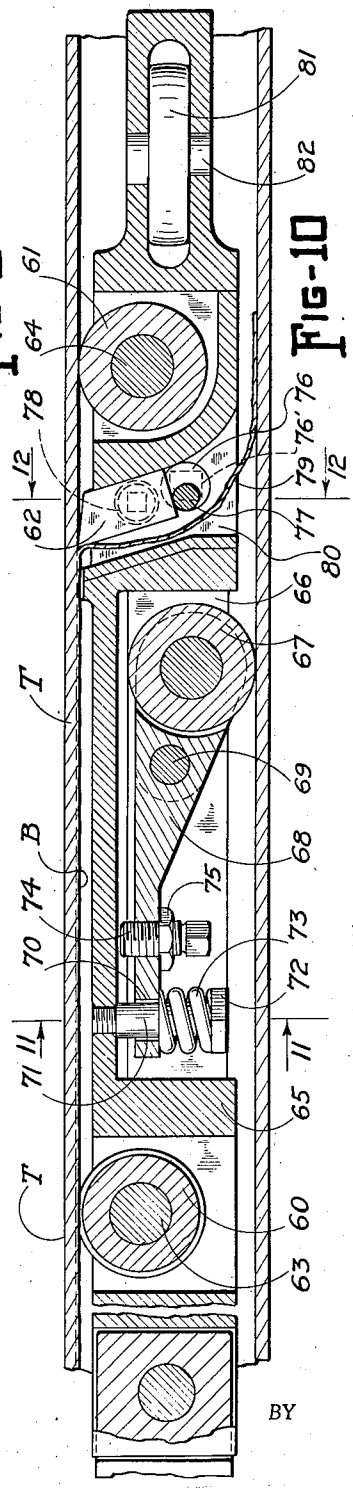


FIG-10

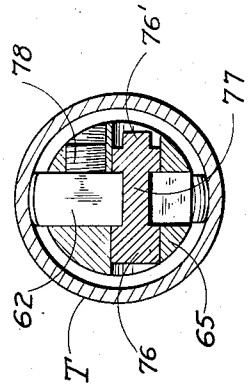


FIG-12

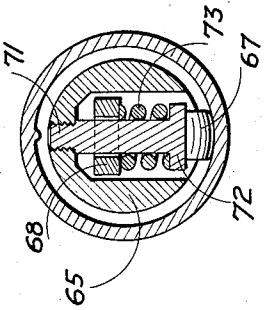


FIG-11

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Patented June 16, 1942 2,286,513

UNITED STATES PATENT OFFICE

2,286,513

INSIDE FLASH REMOVER

George W. Sower, University Heights, Ohio, assignor to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey

Application December 5, 1940, Serial No. 368,657

5 Claims. (Cl. 90—24)

This invention relates to apparatus for removing a flash or burr from welded pipe or tubing and more particularly to an improved inside flash remover or continuously severing the inside burr from pipe or tubing which is formed from flat scelp and continuously welded in long lengths.

In the welding of pipe or tubing by the continuous electrical process and in certain other procedures, a burr is thrown up at the weld both inside and outside of the tube. The removal of the inside burr is necessary for certain uses of the product and numerous devices have been proposed for continuously severing this burr as the tube emerges from the welding apparatus. It is among the objects of my present invention to provide an improved inside flash remover which can be accurately adjusted to take just the desired cut from the inside of the tube and which will maintain a uniform cutting action regardless of minor variations in the inside diameter of the tube or in the burr itself. Other objects of the present invention include:

The provision of an inside flash remover which will maintain its adjustment during long periods of operation; the provision of a flash cutter in which resilient means are effectively employed to maintain the tool in proper cutting relation to the burr and to the inside of the tube; and the provision of an inside flash cutter of simple and rugged form which may be economically manufactured and maintained.

The above and other objects of my invention will appear from the following description of several embodiments thereof, reference being had to the accompanying drawings in which:

Figure 1 is a detached plan view of my improved flash remover in operating position in a tube; the tube being shown in cross section.

Figure 2 is a vertical longitudinal sectional view taken on line 2—2 of Figure 1.

Figure 3 is a transverse cross sectional view taken on line 3—3 of Figure 2.

Figure 4 is a transverse cross sectional view taken on line 4—4 of Figure 2.

Figure 5 is a transverse cross sectional view taken on line 5—5 of Figure 2.

Figure 6 is a view generally similar to Figure 1 but illustrating a modified form of inside invention.

Figure 7 is a vertical longitudinal sectional view taken on line 7—7 of Figure 6.

Figure 8 is a transverse cross sectional view taken on line 8—8 of Figure 7.

Figure 9 is a view generally similar to Figure 1 but illustrating a third embodiment of my invention.

Figure 10 is a vertical longitudinal sectional view taken on line 10—10 of Figure 9.

Figure 11 is a transverse cross sectional view taken on line 11—11 of Figure 10, and,

Figure 12 is a transverse cross sectional view taken on line 12—12 of Figure 10.

Referring to Figure 1 the main frame or body 1 of my improved flash cutter is attached to the end of a bar or rod 2 by means of a pin 3. This rod 2 extends through the tube T to a point ahead of the weld, and is there anchored in any suitable and well-known manner. Thus the frame 1 of the flash cutter is held in position in the tube which moves, relative to the flash cutter, in the direction of the arrow (Figure 1) during operation.

A vertical slot 4 in the body 1 houses the top roll 5 which is freely rotatable on the transverse shaft 6 which in turn is rigidly supported in the body 1. A second top roll 7 is similarly mounted on a shaft 8 in a vertical slot 9'. It will be noted that the top rolls 5 and 7 are grooved so that they will straddle the burr B and engage the surface of the top portion of the tube on each side of the burr and that their tube engaging surfaces are disposed above the top of the body 1 so that they hold the body of the flash cutter out of contact with the tube wall.

A bottom roll 9 is mounted on a shaft 10 which in turn is carried by a floating yoke member 11 having spaced arms 11' and 11'' having a sliding fit within the slot 9' in the body. The shaft 8 passes through the arms 11' and 11'' and forms a pivotal support for the yoke 11 which is notched at 12 to accommodate the end of the bar spring member 13. The opposite end of the spring 13 is secured in a spring holder 14 which, in order to facilitate assembly of the unit, is preferably a separate piece which is inserted into a slot, in the frame 1, and then welded in place as indicated at 15 in Figure 1.

The flash cutting tool 16 is provided with an adjusting set screw 17 which rests upon the support 18 in the frame 1. By varying the position of the set screw 18 the elevation of the cutting edge 19 of the tool 16 may be adjusted and the tool is held firmly in position by a tapered clamp 20 which engages the rear edge of the tool and the tapered surface 21 on the frame. When the screw 22 is tightened the clamp 20 will force the shoulder 23 on tool 16 against the shoulder 24 on the frame and thus the tool will be locked firmly in position. A slot 24 in the

frame provides an exit for the severed burr which is seen at 25 in Figure 2, and it will be noted that the cutting edge 19 of the tool is disposed closely adjacent the point of contact of the top roll 7 with the tube surface.

A guiding roll 26 is mounted on a vertical shaft 27 behind the tool holding portion of the device and serves to prevent undesirable side sway and to maintain the frame and tool properly centered in the tube.

In the operation of the above described device the heavy stiff spring 13 is so formed and located that, when the unit is not in cutting position in a tube, the top rolls 5 and 7 and the bottom roll 9 will be spaced apart a greater distance than the inside diameter of the tube in which the device is to be used. When the apparatus is inserted into a tube the spring 13 is flexed upwardly, and the yoke 11 swings around the supporting shaft 8 in clockwise direction. Thus the bottom roll is caused to exert a continuous and substantial force downwardly against the bottom of the tube. This force has a corresponding upward reaction supporting the frame 1 with the top rolls 5 and 7 firmly engaging the top of the tube adjacent the burr. As the cutting edge 19 of the tool is close to the point of contact of the roll 7 with the tube its depth of cut will be limited and maintained uniform by this roll.

By employing a relatively stiff heavy bar spring the desired resiliency is obtained while, at the same time, the cutting edge 19 is always held at exactly the right location to produce a uniform cut regardless of minor variations in the form of the tube.

In Figures 6, 7 and 8 a modified form of my flash cutter in which the body or frame 28 is held in position in the tube by a bar 29. The top rolls 30 and 31 are spaced longitudinally on the frame 28 and are mounted on shafts 32 and 33 which in turn are rigidly supported in the body 28. Suitable slots 34 and 35 are formed in the body to accommodate the rolls 30 and 31 respectively. A pair of floating bottom rolls 36 and 37 are mounted on shafts 38 and 39 which have flattened end portions slideably carried in suitable slotted holes 40 and 41 in the opposite sides of the frame 28. Thus the two bottom rolls 36 and 37 may rotate freely on their supporting shafts and may have limited vertical movement relative to the frame 1 and to the top rolls 30 and 31. Spring means, in the form of pair of elongated flat spring bars 42 and 43, are provided to exert a force on the shafts 38 and 39 tending to move the shafts and bottom rolls downwardly away from the frame 28. Each of the spring bars 42 and 43 is latched under an angle lug member 44 at one end and under a removable pin 45 at the other end, the ends of the spring bars being suitably cut away, as seen at 46 in Figure 7, to engage properly the lug and pin. Additional retaining flanges 47 are provided on the sides of the body 28 to retain the spring bars 42 and 43 in position, and the ends of the shafts 38 and 39 are notched as seen at 48 (Figure 8) to accommodate the spring bars.

These bars are so formed and so supported that, when the flash cutter is removed from a tube, the spring bars tend to move the rolls 36 and 37 away from the frame 28. When the device is in operating position in a tube the spring bars are flexed upwardly, thus causing a force to be exerted between the body 28 and the bottom rolls 36 and 37 which firmly holds the top rolls 30 and 31 in engagement with the top of the tube. The top rolls 30 and 31 are grooved to straddle the seam in the manner described previously in referring to Figure 1.

Just beyond the top roll 31 in the direction of tube movement a transverse baffle wall 49 extends across the slot in the body 28 and, together with the tool holding portion 50, defines a guide chute for the severed flash 51. The cutting edge 52 of the tool 53 is disposed closely adjacent to the point of contact of the roll 31 with the top inner surface of the tube and thus an accurate gauge is provided for determining the cut taken by the tool. An adjusting screw 54, provided with a lock nut 55, is adapted to locate the tool 53 on the inclined surface 56 of the tool support and a clamp screw 57 retains the tool in any desired adjusted position. As seen in Figure 6, the screw 57 passes through an elongated slot 58 in the tool 53, and thus the desired degree of adjustment of the tool is permitted. The lateral guide roll 59 is mounted on a suitable vertical shaft and prevents undesirable lateral movement of the flash cutter in the same manner as the roll 26 in Figure 1.

The longitudinal spring bars 42 and 43 exert the necessary spring force to hold the cutting tool properly in cutting position and permit of an exceedingly simple, compact and rugged construction which effectively achieves the desired results within the limited space available.

In Figures 9, 10, 11 and 12 a third modification of my invention is illustrated in which a grooved top roll 60 and an ungrooved top roll 61 engage the upper inner surface of the tube respectively ahead of and behind the tool 62. These rolls are mounted on shafts 63 and 64 which are nonyieldingly carried in the frame 65. A recess 66 extends upwardly from the bottom of the frame 65 and houses the bottom roll 67 which is rotatively mounted in a pivoted roll supporting bracket 68. The transverse shaft 69 carries the bracket 68 and the forward end of the bracket 68 is apertured at 70 to fit loosely over a stud 71 having an enlarged head 72 and which is threaded into the body 65. A compression spring 73 is disposed around the stud 71 and exerts a force tending to lift the forward end of the bracket 68 and to move the roll 67 downwardly. A screw stop 74, provided with a lock nut 75, regulates the degree of downward movement which may be imparted to the roll 67 by the action of the spring 73, and it will be observed that, when the apparatus is in use in a tube of proper diameter, the roll 67 will be urged downwardly against the bottom of the tube by the spring 73, and the frame 65 and top rolls 60 and 61 will be held up with the top rolls firmly engaging the upper inner surface of the tube. The tool 62 is closely adjacent the top roll 61 and therefore the cut taken by the tool 62 is regulated by the relative positions of the cutting edge of the tool and the point of engagement of the roll 61 with the tube wall in the manner previously described.

Adjustment for the tool 62 is provided by a rotatable member 76 having an eccentric portion 77 against which the bottom of the tool 62 rests. A set screw 78 is adapted to clamp the tool in any adjusted position and, by loosening this screw 78 and turning the adjusting member 76 by means of its square head portion 76', the tool can be raised or lowered and then reclamped in position.

The severed flash 79 passes down through the slot 80 in a manner generally the same as in the other forms of my flash cutter device and a later-

al guide roll 81 is mounted on a vertical shaft 82 behind the top roll 61.

In all of the illustrated embodiments of my invention a rigidly fixed cutting tool having a single cutting edge is disposed closely adjacent to a roll rotatable on an axis which is fixed relative to the tool and which engages the inner top surface of the tube. The entire body of each device, together with the tool and the fixed axis top rolls, is spring supported and resiliently held up toward the top of the tube by a roll or rolls which engage the bottom of the tube. With my arrangements of floating bottom rolls and spring mounts very compact and rugged structures are obtained which may be employed in relatively small diameter tubes and which have proved in actual use to be entirely satisfactory and to produce a uniformity of inside flash removal which has not been obtainable with devices previously employed.

Although I have described the illustrated embodiments of my invention in considerable detail, it will be understood by those skilled in the art that variations and modifications may be made in the specific form and arrangement of parts herein shown and described without departing from the spirit of my invention. I do not, therefore, wish to be limited to the particular devices illustrated herein but desire to claim all forms of my invention coming within the scope of the appended claims.

I claim:

1. In an inside flash remover of the type described, a frame, a pair of longitudinally spaced top rolls supported on axes rigidly carried by said frame, a cutting tool rigidly positioned in said frame and having a cutting edge disposed adjacent one of said top rolls, means for adjusting the position of the cutting edge of said tool relative to the point of contact of said one of said top rolls with the surface of the tube, a bottom roll between said top rolls, floating support means for said bottom roll whereby limited movement of said bottom roll relative to said frame may be had, and spring means tending to move said bottom roll in one direction transversely of the tube and to move said frame and top rolls in the opposite direction.

2. In an inside flash remover for tubular articles, a frame, a pair of longitudinally spaced top rolls rotatably supported by said frame with their axes fixed against other than rotative movement relative to said frame, a cutting tool rigidly mounted on said frame and having a flash cutting edge disposed adjacent one of said top rolls, means for adjusting the position of said cutting edge relative to said one of said top rolls, a bottom roll between said top rolls, support means for said bottom roll whereby limited movement of said bottom roll relative to said frame may be had, a flat bar spring having one end engaging said frame and engaging said bottom roll support means at a point removed from said one end, said spring being adapted to urge said top rolls against the inner wall of a tubular article adjacent the flash and said bottom roll in the opposite direction against the opposite portion of the tube wall when the frame is positioned in the tubular article.

3. An inside flash remover for severing flash from a tubular article including, a frame, a pair of longitudinally spaced top rolls supported by said frame with their axes fixed against other than rotative movement relative to said frame, a cutting tool rigidly mounted on said frame and having a fixed flash cutting edge disposed adjacent one of said top rolls, a pair of bottom rolls disposed in a slot in said frame between said top rolls, shafts for said bottom rolls, the ends of each of said shafts extending beyond said frame on each side thereof and said shafts being supported in elongated slots in said frame whereby limited vertical movement of said shafts relative to said frame may be had, a pair of elongated flat spring bars disposed one on each side of said frame, and spring bar retaining means carried by said frame and engaging said spring bars adjacent their ends, said bars engaging the extended ends of said shafts whereby said bottom rolls are urged away from said top rolls when said body is in operating position in a tubular article from which the flash is to be removed.

4. In apparatus of the type described, a frame, longitudinally spaced top rolls carried by said frame, a fixed cutting tool carried by said frame and having a flash cutting edge adjacent one of said top rolls, a bottom roll between said top rolls, a shaft for said bottom roll, said frame having vertically extending slots in which the ends of said shaft are disposed, and a longitudinally extending spring bar member engaging said shaft at a point between its ends and being supported at its ends by said frame.

5. In an inside flash remover for tubular articles, a frame, a pair of longitudinally spaced rolls carried by said frame, a fixed cutting tool carried by said frame adjacent one of said top rolls, a roll supporting bracket pivotally supported on said frame, a floating roll carried by said bracket on the opposite side of said frame from said pair of rolls and between said top rolls, and spring means between said bracket and said frame and tending to urge said floating roll away from said frame when said frame is in operating position in a tubular article.

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