

Jan. 27, 1970

J. A. HILL
RIVETING MACHINE

3,491,930

Filed Dec. 7, 1967

5 Sheets-Sheet 1

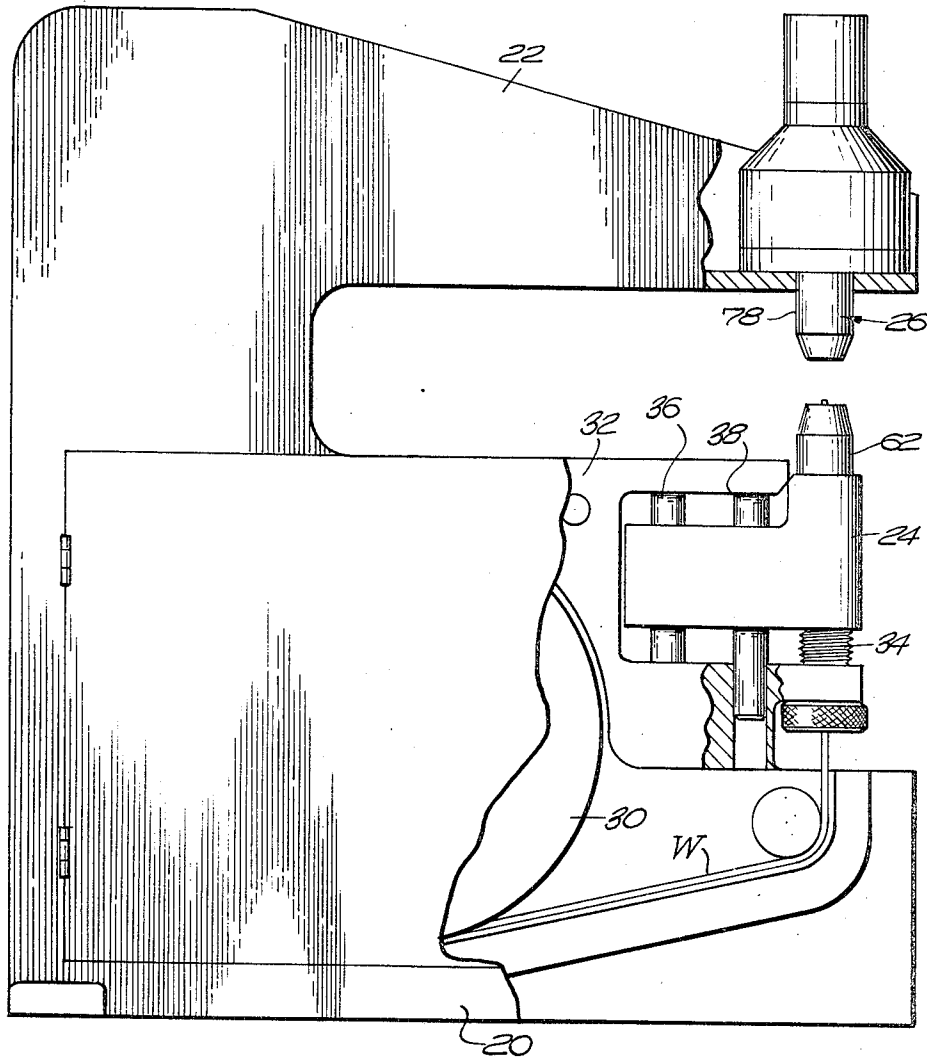


FIG. 1

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5 Sheets-Sheet 2

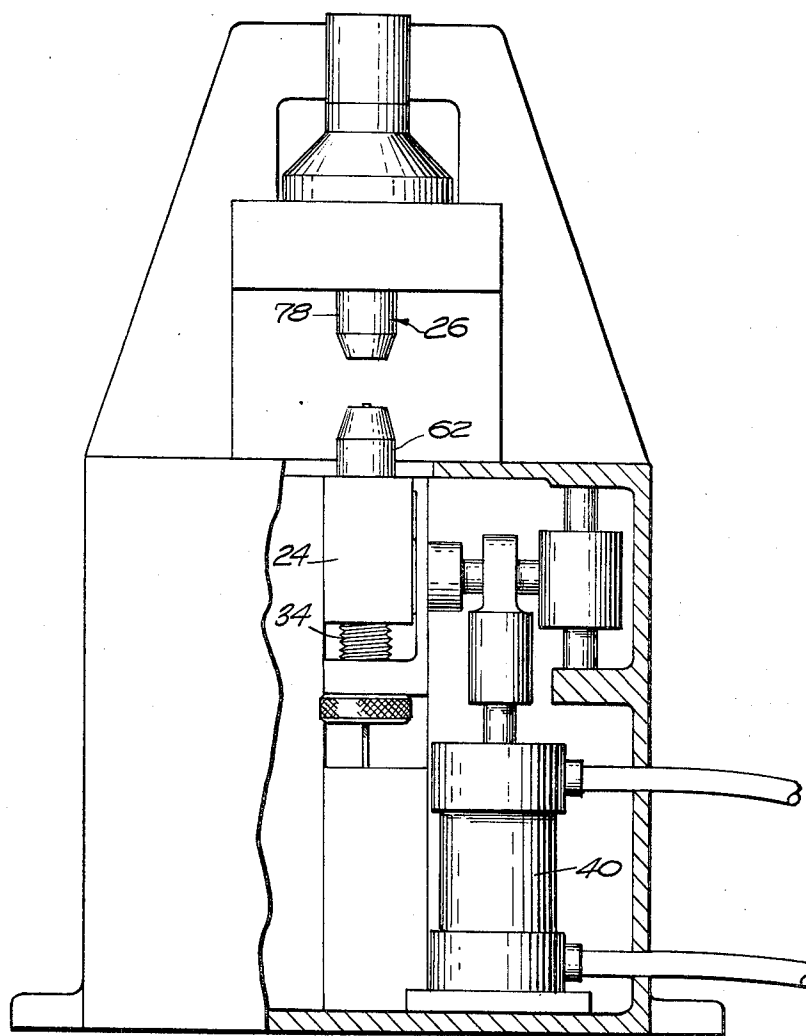


FIG. 2

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5 Sheets-Sheet 3

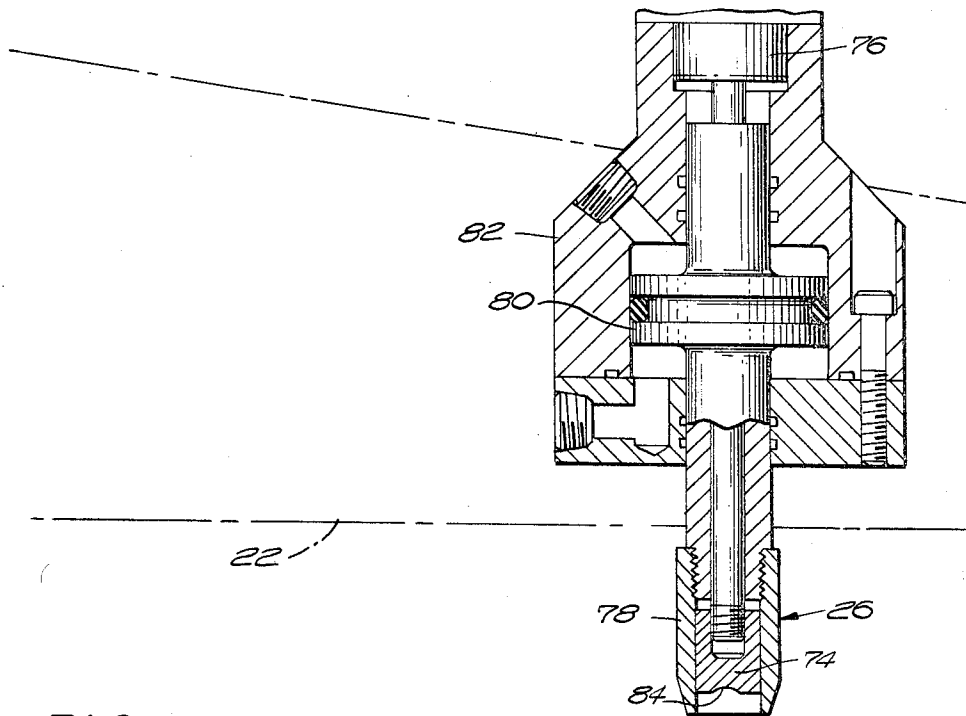
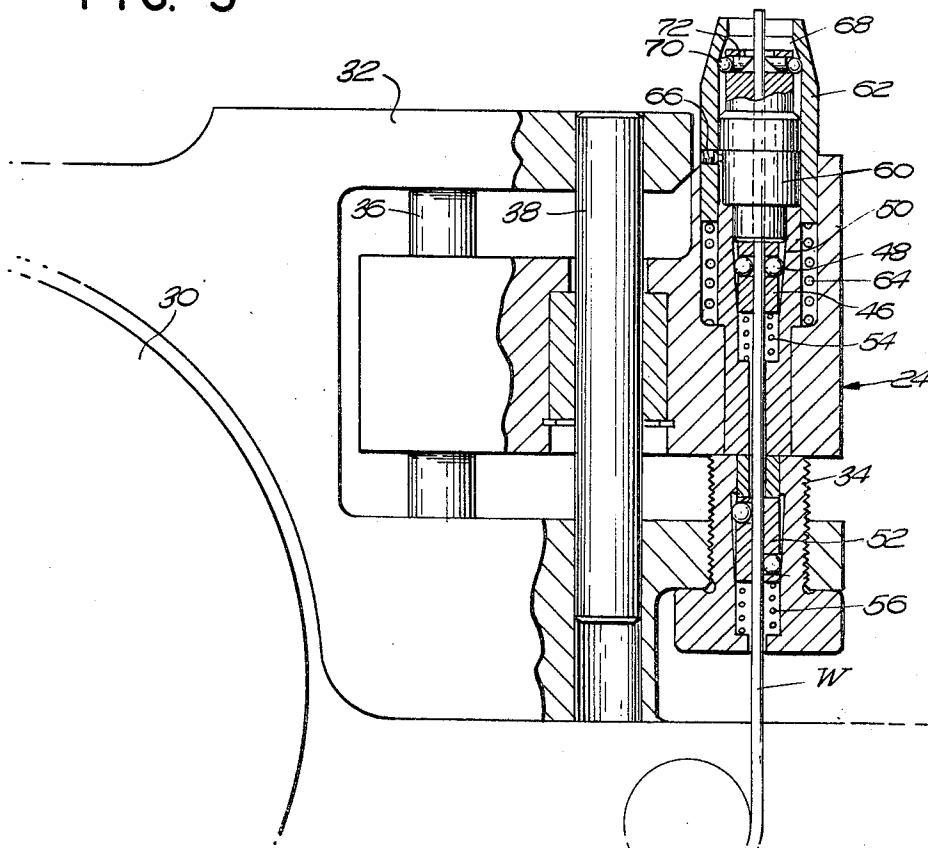


FIG. 3



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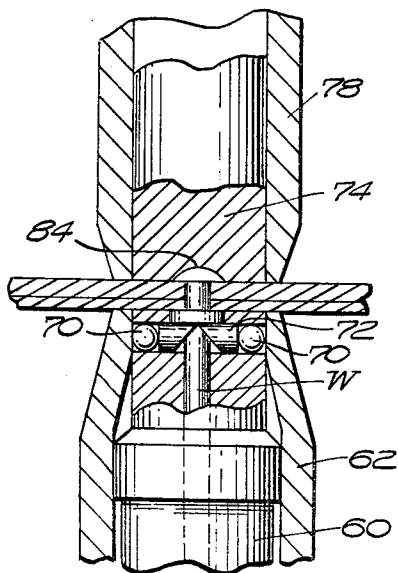


FIG. 4

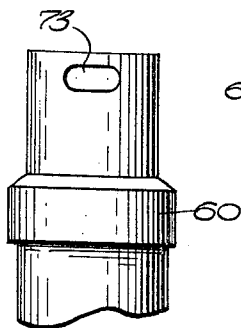


FIG. 5

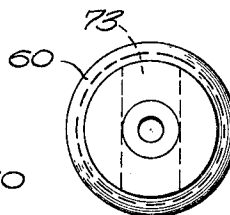


FIG. 6

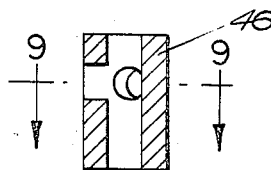


FIG. 8

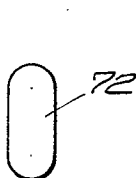


FIG. 7a



FIG. 7b



FIG. 7c

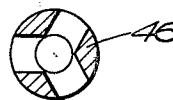


FIG. 9

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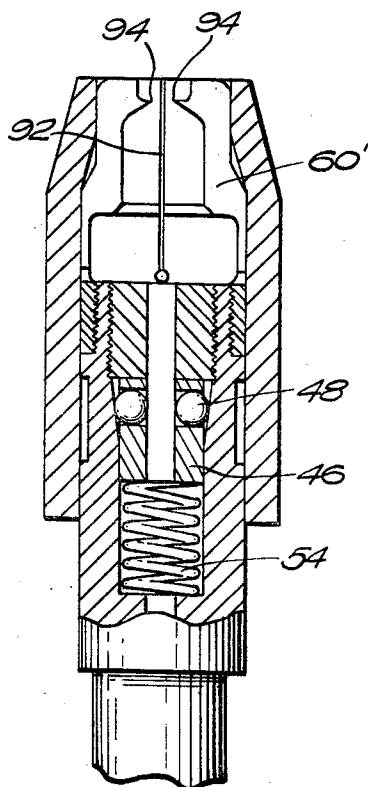


FIG. 10

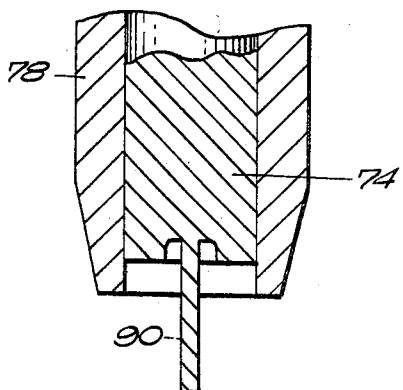


FIG. 11

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3,491,930

RIVETING MACHINE

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U.S. Cl. 227—92

6 Claims

ABSTRACT OF THE DISCLOSURE

A riveting machine has a lower and an upper die, both of which are vertically reciprocable by hydraulic pistons. A wire of malleable metal (e.g. aluminum) is fed upward through an axial bore in the lower die by reciprocation of the lower die. Cutters are provided in the lower die to cut off a predetermined length of the wire to form a rivet when the dies come together. The cutters then act as a header to upset the lower end of the rivet while the upper die upsets the upper end of the rivet. The lower die assembly, a stop member and a reel of wire (solid or tubular) are supplied in the form of a unitary cartridge which can readily be detached from the machine and replaced by another cartridge having stock of the same or different diameter.

This invention relates to a riveting machine which is operated by suitable power means such as hydraulic pistons, two such pistons being employed to operate the outer sleeve and the inner head, respectively, of an upper die assembly. A third piston reciprocates a lower die assembly which has a central bore through which wire stock is fed upward. This lower die contains cutters to sever the stock when the inner member of the lower die assembly moves upward relatively to the sleeve which surrounds it. Then simultaneous downward movement of the inner head of the upper die assembly and further upward movement of the inner head of the lower die assembly cause both ends of the rivet to be upset, after which the dies are retracted from each other. A one-way clutch in the lower die assembly grips and advances the wire stock when the lower die moves upward and a one-way clutch in the stop member grips the wire stock to prevent retrograde movement of the stock when the lower die assembly moves downward.

For a more complete understanding of the invention reference may be had to the following description thereof and to the drawings, of which:

FIGURE 1 is a side elevation of a riveting machine containing an embodiment of the invention;

FIGURE 2 is a front elevation of the same; part of the front wall being broken away;

FIGURE 3 is a side elevation, on a larger scale, of the machine shown in FIGURE 1, the upper and lower die assemblies being shown in section;

FIGURE 4 is a fragmentary sectional view, on an enlarged scale, of the two dies after they have come together to cut off and upset the ends of a rivet;

FIGURE 5 is a fragmentary elevational view of the core member of the lower die;

FIGURE 6 is a plan view of the same;

FIGURES 7a, b, c are front, top and side views, on a larger scale, of one of the cutter elements;

FIGURE 8 is a sectional view of a clutch element;

FIGURE 9 is a section on the line 9—9 of FIGURE 8;

FIGURE 10 is an enlarged fragmentary sectional view of a lower die and cutter for tubular stock; and

FIGURE 11 is a similar view of a modified upper die to cooperate therewith.

In FIGURES 1 and 2 are illustrated a riveting machine having a base 20 and a rigid overhanging arm 12. The base supports a lower die assembly 24 which is ver-

tically movable by hydraulic means. The arm 22 supports an upper die assembly which is directly above the lower die and is vertically reciprocable by conventional hydraulic means.

Material for the rivets is in the form of solid or tubular wire W which is drawn from a reel 30 mounted on a frame member 32 which also supports the lower die assembly 24 so that if a different size of rivet is desired, the reel 30, frame 32, and lower die assembly 24, and a stop member 34 can be removed as a unit from the machine and replaced by another unit.

The lower die assembly 24 is vertically slidable on two fixed guiding pillars 36, 38 and is actuated by hydraulic means in a cylinder 40 (FIGURE 2). Its lowermost position is shown in FIGURE 3, against the stop member 34.

The lower die assembly 24 and the stop member 34 have aligned central bores through which the stock wire W passes upward. Each is provided with a one-way clutch to advance the wire when the die 24 is moved upward and to prevent retrograde movement of the wire when the die 24 moves downward.

The clutch in the die 24 consists of a cylindrical block 46 containing three balls 48 in radial bores, these balls being arranged to bear against the wire W and to be pressed inward by the tapering wall surface 50 within the die to grip the wire when the die moves upward. Such upward movement of the die advances the wire upward by substantially the same amount, this being the length of the rivet before its ends are upset. A similar one-way clutch 52 is within the stop member 34, this clutch having two sets of balls at different levels. This serves to take the curve out of the wire which comes from the reel 30 on which it was wound and to prevent retrograde movement of the stock when the lower die assembly 24 descends. The clutch blocks 46 and 52 are pressed upward by springs 54 and 56, respectively, of sufficient strength to prevent jamming.

The lower die assembly 24 includes an anvil 60 surrounded by a sleeve 62 (FIGURES 3 and 4). The sleeve 62 is pressed upward by a spring 64, upward movement being limited by a screw 66 which engages under a shoulder on the anvil 60. The inner wall surface of the sleeve 62 near its upper end is upwardly tapered, as at 68, and is engaged by balls 70 which press against cutters 72 (FIGURES 3, 4 and 7) which are horizontally slidable in opposed apertures 73 through the walls of the sleeve 62. When the sleeve 62 is forced down relatively to the anvil 60, the cutters 72 are forced inward by the tapered surface 68 to sever the wire W between them.

Cooperating with the lower die 24 is the upper die 26 which comprises a ram 74 operated by conventional hydraulic means 76, and a sleeve 78 which surrounds the ram 74 and is independently operated by a piston 80 in a cylinder 82. The lower end of the ram 74 has a central recess 84 to shape the upper end of a rivet.

To operate the machines, pre-punched plates which are to be riveted together are placed on the upper end of the sleeve 62 so that the projecting end of the wire W extends into or through aligned holes in the plates. The hydraulic devices are then activated to raise the lower die assembly 24 and lower the upper die assembly 26. The opposed ends of the sleeves 62 and 78 clamp the plates between them and press them tightly together. Further upward movement of the anvil 60 relative to the now stationary sleeve 62 cams the cutters 72 together, severing the wire W. The cutters now become the lower surface in the shape-forming recess in the anvil. Simultaneous downward movement of the ram 74 and upward movement of the anvil 60 cause both ends of the rivet to be upset. The shapes of the rivet heads are determined by the shapes of the recesses in the lower face of the ram 74 and the upper face of the anvil 60.

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The upper die is then retracted, releasing the riveted plates and allowing the lower clamping sleeve to move upward so that the cutters can move outward when the lower die assembly descends. When the lower die assembly 24 is stopped by engagement with the stop member 34, the end portion of the wire W again projects above the upper end of the sleeve 62 as illustrated in FIGURE 3. If a longer rivet is desired, as for use in riveting thicker plates, the stop member 34 is lowered to lengthen the stroke of the lower die assembly 24, the stop member 34 being threaded for this purpose.

If tubular stock is supplied for the formation of tubular rivets or eyelets, a modified ram 74' (FIGURE 11) is employed having a stem 90 adapted to enter the end of the tubular stock to support the walls against the pressure of the cutters. A modified anvil 60' is also employed (FIGURE 10). The upper end portion is split by narrow slots 92, preferably four or more, dividing the upper end into segments. Each segment has an arcuate cutting edge 94 normally engaging a tubular wire stock extending through the anvil. These edges are pressed inward against the tubular wire when the anvil 60' moves upward relatively to the sleeve 62 after the stem 90 has entered the end of the hollow wire. This severs the wire and the ends of the severed piece are then simultaneously upset to complete the rivet, the recesses 96 in the ram 74' and 98 in the anvil 60' being shaped to curl the ends of the severed piece of hollow wire outward.

I claim:

1. A riveting machine comprising a main frame, a lower die assembly vertically movable a limited distance on said frame, said assembly including an anvil having a central bore for wire stock and a fixed stop member beneath said anvil with a bore aligned with the bore in the anvil, one-way clutches in said anvil and stop member for causing upward advance of said stock when said assembly moves upward and preventing retrograde movement to the stock when the assembly descends, said assembly also including cutting elements within said anvil movable inward to sever the stock wire projecting up through said anvil and then to act as a header to upset the cut end of the severed piece, and a sleeve surrounding said anvil and

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movable relatively thereto for operation of said cutters, and an upper die assembly supported by said frame above said lower assembly and vertically movable relatively thereto, said upper die assembly including a ram, a sleeve surrounding said ram, and means for moving said ram and sleeve separately.

2. A riveting machine as claimed in claim 1, said stop member being vertically adjustable to vary the length of vertical movement of said anvil.

3. A riveting machine as claimed in claim 1, said cutting elements being radially arranged and horizontally movable toward each other, said sleeve about said anvil having a tapered inner surface for camming said elements inward when said anvil moves upward relatively to the sleeve around it.

4. A riveting machine as claimed in claim 1, the upper end of said anvil being split into a number of segments each having an inwardly directed arcuate cutting edge normally engaging tubular wire stock extending through said anvil, the sleeve surrounding said anvil having an upwardly tapering inner surface to cam said segments inward when the anvil moves upward relatively to said surrounding sleeve.

5. A riveting machine as claimed in claim 4, said ram having a downwardly projecting stem arranged to enter the end of the tubular wire stock extending upward through said anvil when said ram descends.

6. A riveting machine as claimed in claim 1, a reel for wire stock, and a frame on which said reel, said lower die assembly and said stop member are mounted for removal as a unit from the machine.

References Cited

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GRANVILLE Y. CUSTER, JR., Primary Examiner

U.S. Cl. X.R.

72—453; 227—51, 62