Sept. 16, 1958 H. D. KESLER ET AL 2,852,061

RETURN FLANGE FORMING MACHINE

Filed Jan. 3, 1956 3 Sheets-Sheet 1

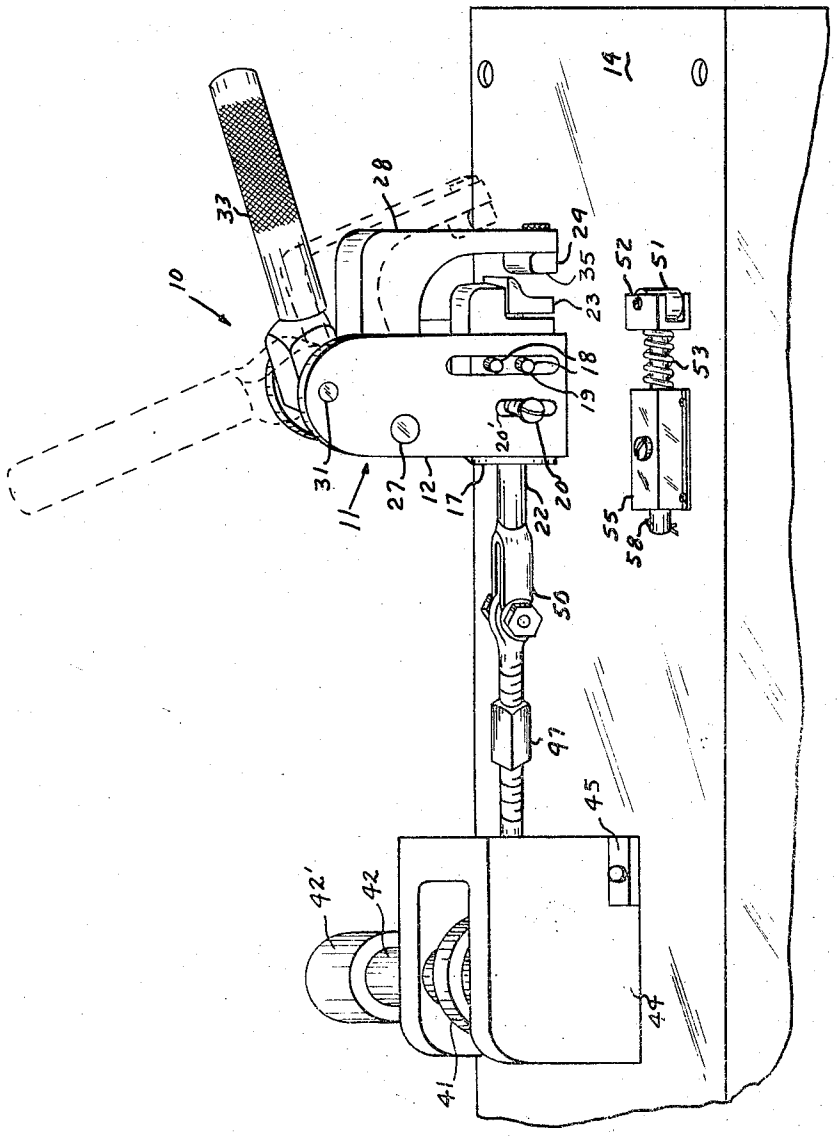


Fig. 1

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RETURN FLANGE FORMING MACHINE

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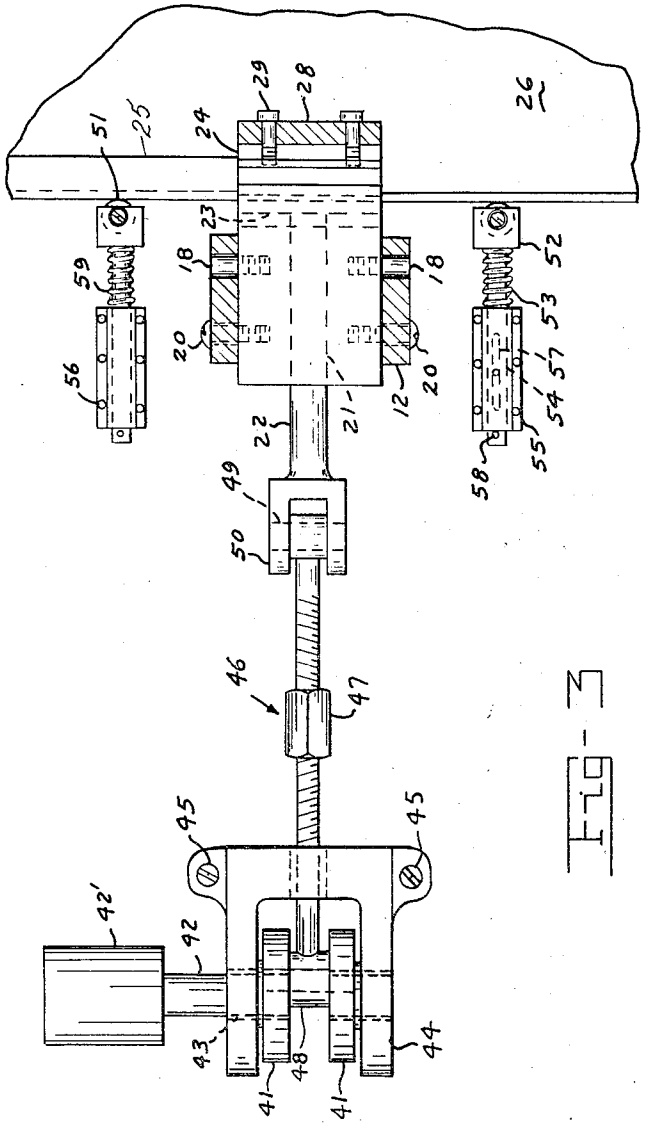


Fig. 3

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RETURN FLANGE FORMING MACHINE

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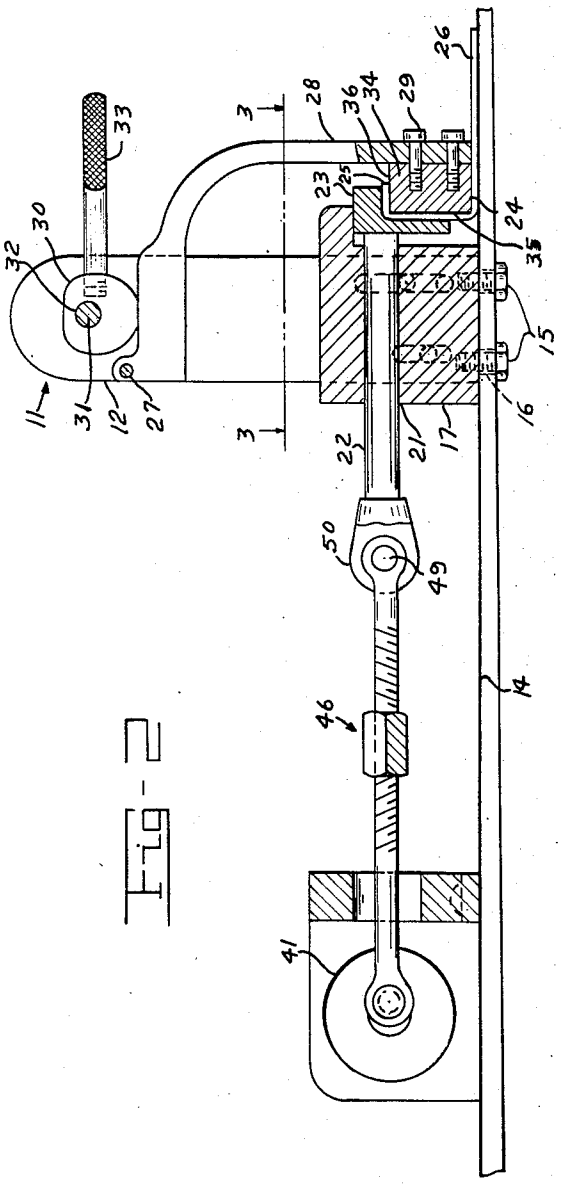


Fig-2

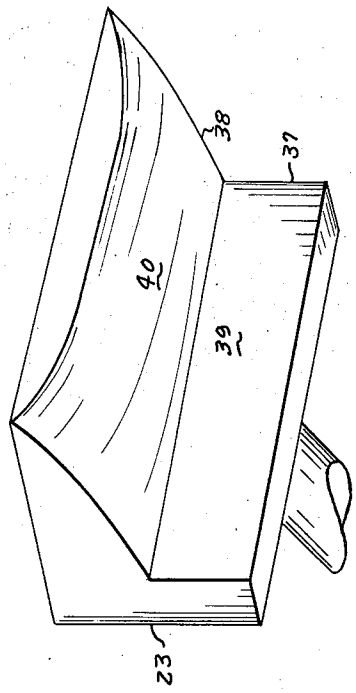


Fig-4

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RETURN FLANGE FORMING MACHINE

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Application January 3, 1956, Serial No. 557,218

4 Claims. (Cl. 153—25)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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

This invention relates to return flange forming machines, and more particularly, to machines of this sort which may be employed for forming a return flange on the border of a sheet or sheet metal rib by power.

In forming a return flange on a sheet metal rib, heretofore, it has been customary to use a die and to bend the border of a sheet metal rib over the die by hand operated tools. Such an operation usually requires considerable skill and care on the part of the operator and considerable time in producing the final product. Furthermore, the work is fatiguing and, consequently, both the quantity and the quality suffer therefrom.

It is therefore the purpose of the present invention to provide a machine whereby the forming of return flanges on sheet metal work or aircraft ribs by manually operated tools is eliminated by the use of power forming dies. A return flange forming machine, according to the present invention, is further characterized by its advantages, for example, of expediting the operation of progressive shaping or forming of the return flanges and of improving the accuracy and speed of the operation while relieving the operator of this arduous work, which operator may devote his entire time and attention to the properly placing of the work piece with respect to the bending dies and, generally, with the supervision of the proper functioning of the return flange forming machine. Also, any strains set up in the flange during the operation of bending the sheet metal work by manually operated tools, which strains usually cause buckling or distorition of the sheet metal work, are completely eliminated by the use of the return flange forming macine of the present invention.

According to the present invention, the return flange forming machine comprises a die pivotally mounted on a supporting frame and locked in a stationary position, and a power driven cooperating die slidably supported by the supporting frame for reciprocation toward and from the locked die, the dies having cooperating bending surfaces, whereby a return flange may be formed on the border of sheet metal work positioned between the dies. This machine may be powered by operating the movable die by an electric motor. However, a pneumatic drill motor may also be employed for power with excellent results.

These and other features of the present invention are described in detail below in connection with the accompanying drawing, in which like reference characters refer to like parts in the several figures:

Figure 1 is a view in perspective of a return flange forming machine embodying the present invention;

Figure 2 is a vertical longitudinal section of the machine shown in Figure 1, parts thereof being shown in elevation;

Figure 3 is a plan view, partly in section taken along the line 3—3 in Figure 2; and

Figure 4 is an enlarged view in perspective of the movable die provided in the machine of the present invention shown in Figure 1.

Referring now in detail to the drawings, the embodiment of the return flange forming machine of the present invention illustrated in Figure 1 is indicated generally by the reference numberal **10**, and, as shown, comprises a supporting frame **11** consisting of members **12**, which members **12** are attached rigidly to a platform **14** or the like, as by bolts **15** extending through openings **16** in the platform **14** and screwed into the bottom side of the members **12**, or the members **12** may be attached by welding if so desired.

The frame **11** is adapted to support a vertically slidable supporting block **17** arranged between the frame members **12** and guided thereon for vertical movement by pins **18** secured in the sides of the block **17** and extending through guideways **19** on the frame members **12** for a reason which will be explained further below.

The block **17** is also provided with locking bolts **20** extending through slots **20'** on the frame members **12**, whereby the block **17** may be adjustable retained at any desired elevation by tightening the bolts **20** against the sides of the frame members **12**. The block **17** is further provided with a bore **21** through which extends a piston rod **22** of a movable cooperating die **23** for reciprocation toward and from a cooperating die **24** while forming a return flange **25** one the border of a sheet metal rib, indicated at **26**, which is positioned between the dies **23** and **24** as shown in Figures 2 and 3. Die **24** is a removable and interchangeable die, made in different size heights for use in forming different flange heights on sheet metal parts.

At an intermediate part of the members **12** above block **17** there is pivotally mounted by a pin **27** an arm **28**, which arm **28** carries the stationary die **24** attached thereto as by bolts **29**, whereby the arm **28** with the stationary die **24** may be swung to a raised position, as shown in dotted line on Figure 1, for positioning the sheet metal rib **26** between the dies **23** and **24** for forming the return flange **25** thereon. After the sheet metal work or rib **26** is placed in position, the die **24** may then be lowered by swinging the arm **28** to the lower position, whereby the die **24** will about the sheet metal rib **26** and hold the same in place. In order that the arm **28** with the die **24** be locked in the lower position, locking means are provided, including a cam lock **30** pivotally supported on the frame members **12** by pins **31** extending through holes **32**, the cam lock **30** bearing against the upper surface of the arm **28** substantially adjacent its pivot pin **27** when the arm **28** is in the lower position as shown in Figure 2. The cam lock **30** may easily be operated by a handle **33** fixed thereto.

In the embodiment of the invention herein illustrated, the die **24** is formed of a rectangular plate or die block **34** having a substantially vertically disposed bending surface **35**, which bending surface **35** is adapted to support the sheet metal rib or work **26** by butting the same during the bending operation to prevent buckling thereof, and a substantially horizontally disposed bending surface **36** against which the flange **25** is formed by the bending action of the movable die **23**.

The movable die **23** is likewise formed with a substantially vertically disposed member **37** and a substantially horizontal member **38** angularly disposed with respect to the vertically disposed member **37**, the members **37** and **38** having corresponding bending surfaces **39** and **40**, respectively, arranged to form obtuse angles (greater than 90°) at the ends of the die **23**, which obtuse angles

graduate or progressively decrease to a right angle at substantially near the center of the die **23** as clearly shown in Figure 4. In view of this arangement of the bending surfaces **39** and **40**, the flange **25** is gradually formed or progressively bent on the border of the sheet metal rib **26** as the sheet is advanced by increasing the curvature gradually until the desired contour is obtained as the dies **23** and **24** approach each other during the bending operation, permitting a sharp bend or curve to be formed but without strains or wrinkles.

Reciprocatory movement of the movable die **23** toward and from the die **24** is effected by means of a crank **41** rigidly secured to the end of a power shaft **42** adapted to journal in a bore **43** of a support member **44**, which member **44** may be rigidly attached to the platform **14** or the like by screws **45**, or any other means such as welding. As mentioned above, the power shaft **42** may be operated by a high speed electric motor, diagrammatically shown at **42'**; or may also be operated by a pneumatic drill motor in place of an electric motor.

The crank **41** is further connected to the reciprocating piston rod **22** by a pitman **46**. The pitman **46** may, as shown, be formed in two oppositely threaded sections joined by a nut **47**, one of the threaded sections being pivotally connected to the crank **41** as indicated at **48**, and the other to the piston rod **22** by a pin **49** extending through apertures on a yoke **50** at the end of the piston rod **22**. The pitman **46** is arranged to function as a turnbuckle whereby the relation of the bending dies **23** and **24** may be both adjusted by the vertical adjustment of the block **17** on the frame **11** and the adjustment of the length of the pitman **46** for compensating for the sheet metal thickness.

Preferably the upright side of sheet metal work or rib **26** may further be supported as it is fed between the bending dies **23** and **24** by pressure rollers **51** provided one on each side of the supporting frame **11**, as shown in Figures 1 and 3. The pressure rollers **51** are each rotatably supported by a pin and yoke arrangement, as indicated at **52**, at the end of a rod **53** slidably extending through a bore **54** formed on a flanged upright **55**, the upright **55** being attached to the platform **14** or the like by screws **56** as shown in Figures 1 and 3. The rod **53** may be restrained from rotating by a groove and key arrangement, indicated generally by the reference numeral **57**, and is also retained in the bore **54** by a pin **58** at the end thereof which extends from the bore **54**. Each rod **53** is further provided with a coiled spring **59** adapted to yieldably retain the pressure roller **51** in the extended position, whereby the sheet metal rib **26** may be held in proper position by the pressure of the rollers **51** exerted thereon for accurately forming the flange return **25**.

The present invention has been described in detail above for the purpose of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.

We claim:

1. A return flange forming machine comprising a supporting frame, a die pivotally mounted on said frame, locks means on said frame for locking said pivotal die in a stationary position, an adjustable block slidably engaging said frame, guide means on said adjustable block and guideways on said frame engaged by said guide means, and adjusting means between said block and said frame for adjusting said block vertically on said frame, a movable cooperating die slidably supported by said block, and power means for reciprocating said movable die to and from said pivotal locked cooperating die for forming a flange on the border of sheet metal work placed between said dies.

2. A return flange forming machine as defined in claim 1 wherein said movable die has a piston rod slidably supported in said adjustable block, and an adjustable connection between said piston rod and said power means for adjusting said movable die relative to the position of said adjustable block on said supporting frame.

3. A return flange forming machine as defined in claim 1 and further characterized in that pressure rollers are yieldably mounted adjacent the opposite ends of said dies, said pressure rollers disposed for abutment with the sheet of metal work for supporting the same while being fed between said dies.

4. A return flange forming machine comprising a supporting frame, a cooperating die pivotally mounted on said frame, lock means on said frame for locking said pivotal die in a stationary position, a power driven cooperating die slidably mounted on said frame for reciprocation toward and from said locked die, said cooperating dies having an entrance end and an exit end, said power driven cooperating die having a substantially vertically disposed member having a flat bending surface, and an angularly disposed member having a bending surface forming an obtuse angle with said flat surface of said substantially vertically disposed member at the entrance end of said power driven die and with said obtuse angle graduating to substantially a right angle near the center of said power driven die, whereby a flange may be formed on the border of sheet metal work fed between said dies.

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