June 15, 1937. J. J. CARROLL 2,083,775

METAL EXPANDING MACHINE

Filed Oct. 23, 1936

Fig. 3.

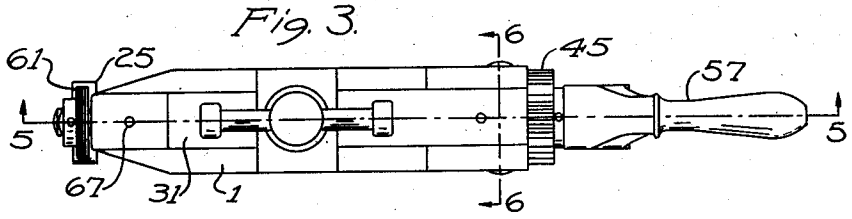


Fig. 2.

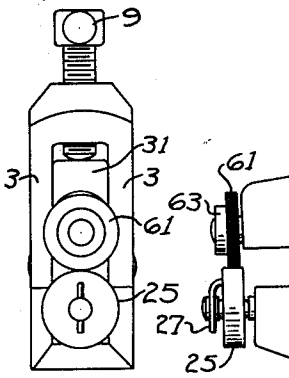
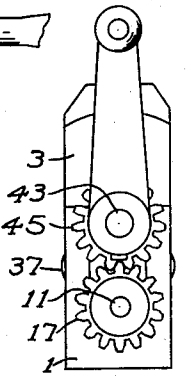


Fig. 1.

Fig. 4.



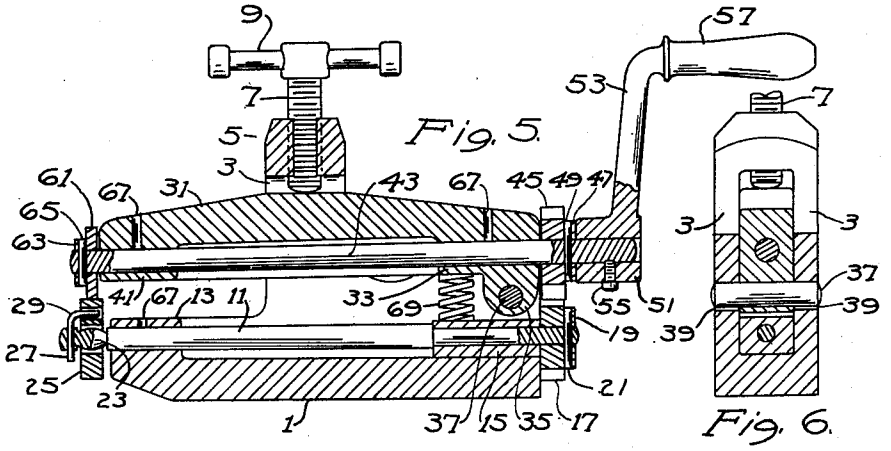


Fig. 5.

Fig. 6.

INVENTOR.
JAMES J. CARROLL
BY Ralph A. Dinno.
ATTORNEY.

Patented June 15, 1937 2,083,775

UNITED STATES PATENT OFFICE

2,083,775

METAL EXPANDING MACHINE

James J. Carroll, Detroit, Mich.

Application October 23, 1936, Serial No. 107,170

9 Claims. (Cl. 80—5)

My invention pertains to expanding and rolling metal and more particularly to an improved metal working machine for expanding pistons.

It is an object of my invention to provide a metal working machine comprising a drive shaft journalled in a housing which is pivotally secured at one end to a countershaft housing for driving a countershaft journalled therethrough and comprising mechanical power driving means interconnected between the ends of the shafts projecting from adjacent ends of the two housings, metal rolling rollers secured upon the ends of the shafts projecting from the opposite ends of said housings and a stop limit for limiting the spaced apart relation of said rollers as a piece of metal is passed therebetween.

It is also an object of my invention to provide a metal rolling machine of the above type wherein one of the metal rolling rollers is oscillatably journalled upon a bulged portion of its shaft and driven through a loose connecting driving member whereby the oscillatable roller is free to wobble on the shaft whereby contact pressure is eased when a lump or burr approaches the rollers whereby the formation of a defect or rough spot in the spun metal is avoided. Similarly, this feature accommodates metal which has surfaces that are not parallel.

It is a further object of my invention to provide a metal rolling machine of the above type wherein the connecting means between the joined ends of the housings comprises a slack motion pivot connection and by inserting a compression spring to react between said housings intermediate the pivotal connection and the stop limit means, the housings are automatically releasable to permit a wider separation of said metal rolling rollers when an excessive pressure is developed therebetween.

A further object of my invention is the provision in such a machine of spring means in such a position that the driving gears are automatically relieved of pressure when adjustment of the rollers is being made, the gears being thrown sufficiently out of pitch diameter mesh to keep them from chattering, also to keep the rollers from rotating irregularly and to insure a tension pressure upon the gears at all times.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when read in connection with the accompanying drawing, in which:

Fig. 1 is a side elevational view of my metal expanding machine;

Fig. 2 is an end elevational view showing the metal rolling end of the machine;

Fig. 3 is a plan view thereof;

Fig. 4 is an end elevational view showing the driving end of the machine;

Fig. 5 is a longitudinal sectional view taken vertically through the machine on section line 5—5 of Fig. 3; and

Fig. 6 is a transverse sectional view thereof on line 6—6 of Fig. 3.

Referring more specifically to the figures of the drawing, my improved metal working machine comprises a countershaft housing 1 which is a casting of suitable metal of substantial thickness to provide the necessary strength and rigidity. The housing 1 has upstanding bracket arms 3 cast integral therewith and projecting upwardly from both sides of the housing at an intermediate position thereon.

The upper ends of the brackets 3 are joined by a bridging member 5 which is provided with a vertical aperture suitably threaded for receiving a threaded limit stop shaft 7 therein. Upon the upper end of the limit stop shaft 7, I provide a transversely disposed handle 9 whereby the shaft may be turned and adjusted vertically in the stop limit bracket 3.

The countershaft housing 1 is adapted to journal a countershaft 11 in bearings 13 and 15 which are provided in opposite ends of the housing. The bearing 15 comprises a suitable inserted block and the end of the shaft 11 which is journalled therein is turned to a small diameter to provide a shoulder abutting the adjacent end of the bearing block 15. The ends of the shaft 11 project from the housing, and upon the end of the shaft projecting from the bearing 15, I provide suitable power driving means, such as a gear wheel 17, which comprises an extended hub portion 19 which is provided with a suitable aperture through which a pin 21 is passed through a corresponding aperture in the end of the shaft for securing the gear wheel rigidly thereon.

The other end of the shaft 11 which projects outwardly from the bearing 13 in the housing is provided with a bulged portion 23 which provides a spherical bearing surface near the end of the shaft. Upon the spherical bearing 23 on the end of the shaft 11, I mount a roller 25 which is provided with a cylindrical bore passing axially

therethrough of a suitable diameter to fit oscillatably thereon. The terminal portion of the shaft extending outwardly from the bearing surface 23 is provided with a transverse aperture for receiving a driving pin 27 which extends radially therethrough. The outermost end 29 of the driving pin 27 is turned at right angles in substantially parallel relation to the axis of the shaft 11 and fits freely into an aperture of suitable diameter which is provided in the roller 25.

A drive shaft housing 31 is provided which is preferably a heavy casting of sufficient thickness to provide the necessary strength and rigidity. The drive shaft housing 31 is relatively narrow and passes freely between the stop limit bracket members 3 between which it is freely adjustable against the stop limit shaft 7.

At the right hand end of the drive shaft housing 31, a depending bearing portion 33 is provided which comprises a depending pivot lug 35 adjacent the outer end thereof. A pivot pin 37 is provided which passes through a suitable aperture in the lug and both ends of the pivot pin 37 project from the drive shaft housing 31 where they are journalled loosely in apertures 39 provided in opposite sides of the countershaft housing 1.

In this manner the drive shaft housing 31 is pivotally mounted at one end upon one end of the countershaft housing 1, and the pivot pin bearing apertures 39 in the countershaft housing are sufficiently larger in diameter than the diameter of the pivot pin 37 to provide a predetermined degree of slack motion between the housings.

At the left hand end of the drive shaft housing 31, as viewed in the drawing, I provide a second bearing 41 depending therefrom. The depending bearing portions 33 and 41 adjacent the ends of the housing 31 provide suitable bearings in which a drive shaft 43 is journalled extending therefrom at both ends.

Upon the end of the shaft 43 projecting from the drive shaft housing 31 adjacent the pivotally mounted end thereof, I mount a gear wheel 45 for operatively meshing with the teeth of the gear wheel 17 provided on the adjacent end of the countershaft 11, while providing sufficient slack motion between the gears to permit pivotal movement of the housing 31 relative to the housing 1. For securing the drive gear 45 on the drive shaft 43, the gear is provided with a hub 47 projecting therefrom and suitably apertured to receive a pin 49 which passes through a corresponding aperture provided in the shaft, as will be readily understood. The outer end of the drive shaft 43 is sufficiently extended to receive the hub 51 of a crank 53 which is secured to the shaft in any suitable manner as by a set screw 55. The outwardly projecting end of the crank 53 is provided with a convenient handle 57 whereby the crank can be conveniently manipulated for rotating the drive shaft 43.

Upon the other projecting end of the drive shaft 43, I mount a metal expander and rolling roller 61 comprising a hub 63 suitably apertured to receive a pin 65 passing through a corresponding aperture in the end of the drive shaft, as will be readily understood. In this manner the rolling roller 61 is rigidly secured upon the end of the drive shaft for spinning metal against the guide roller 25 which is oscillatably mounted on the adjacent projecting end of the countershaft 11. The rolling roller 61, which is relatively narrow as compared with the guide roller 25, is provided on its outer rolling surface with serrations which extend circumferentially thereabout for working the metal as will be readily understood.

The bearings are provided with suitable lubricating apertures 67 and, as will be readily understood, a lining of any suitable bearing material may be provided. For convenience, the bearing plug 15 may be provided with any self-lubricating bearing, if desired.

For normally biasing the pivotally connected housings 1 and 31 apart and insuring proper tension pressure of the gears at all times, I provide a heavy compression spring 69 which reacts between the housings to push them apart. For this purpose the heavy compression spring 69 is disposed to react between the housings at a point adjacent the pivot pin 37 and between it and the limit stop member 7, and the inner portion of the depending bearing 33 of the housing 31 is provided with a smooth flat surface which is adapted to snugly receive one end of the compression spring 69. The upper surface of the bearing 15 in the countershaft housing 1 is likewise provided with a smooth, flat surface for snugly receiving the adjacent end of the biasing spring 69.

To prepare the machine for operation, the adjustable limit stop 7 is turned in its threadably engaged aperture in the brackets 3 to move the pivotally mounted drive shaft housing 31, which is continuously urged against the lower end of the shaft 7 by the biasing spring 69, until the rolling roller 61 is suitably spaced from the guide roller 25. The heavy compression spring 69 thus serves at all times to hold the pivotally mounted drive shaft housing firmly abutting the rounded lower end of the adjustable stop shaft 7 and also to normally take up the slack in the loose motion pivot connection in a predetermined direction.

In operation the metal to be worked by the machine is placed between the rollers and the adjusting handle 9 is turned to cause the rolling roller 61 to bear upon it with a suitable degree of pressure. By means of the handle 57, the crank 53 is then turned to rotate the drive shaft 43 and the countershaft 11. The narrow rolling roller 61 and the wide guide roller 25 are thus both simultaneously driven to pass the metal through between them. A circular or cylindrical metallic member may thus be worked continuously. Also my metal rolling machine is particularly useful for rolling the skirts of pistons for expanding the same. This is accomplished by inserting the edge of the piston skirt between the roller so that the narrower serrated roller 61 runs around the inside of the piston. The handle is then turned to work the rollers back and forth over the portion of the piston to be expanded while working it further between the rollers. It will be also understood that a flat piece of metal can be worked in my machine by passing it back and forth, and the machine may be successfully utilized for working metals, such as cast iron, steel, copper, aluminum, alloy and the like.

If too great a reduction is attempted, there is a tendency to roll a knuckle into the metal or to pull the metal to an excessive extent but in accordance with the arrangement of the rollers on my machine, the lower or guide roller is oscillatably mounted upon the bulged bearing surface upon the countershaft whereby it is free to wobble and thus to ease the contact pressure when a lump or burr approaches the contact point between the rollers. This operation tends to distribute the contact pressure and thus to

distribute the metal uniformly without injuring the work.

Also in accordance with my arrangement the work is still further safe-guarded by the slack motion pivotal connection between the housings. If during the operation the degree of pressure developed between the rollers becomes excessive, the pivoted drive shaft housing 31 is caused to oscillate about the contact point on the lower end of stop limit shaft 7 thus permitting the rolling roller 61 to recede from the guide roller 25. In this operation the pivotally connected ends of the housings, normally held apart by the spring 69, move together. This is possible because of the slack motion of the pivot pin 37 in the large pivoting apertures 39 provided in the housing 1.

Aside from the specific embodiment of the invention herein shown and described, it will be understood that numerous details of the construction may be altered or omitted without departing from the spirit and scope of the invention as disclosed and claimed, and that I do not desire to limit the invention to the exact construction herein set forth.

I claim:

1. A metal rolling machine comprising a countershaft housing, bearing means in said housing, a countershaft journaled in said bearing means and extending through said housing, a drive shaft housing, bearing means in said drive shaft housing, a drive shaft journalled in said bearing means and extending through said drive shaft housing, means for pivotally journalling one end of the drive shaft housing to one end of the countershaft housing, mechanical power driving means interconnected between the ends of said shafts projecting from the pivotally joined ends of said housings, metal rolling rollers disposed on the opposite ends of said shafts for rolling metal therebetween, and stop limit means for limiting the spaced relation of said rollers to produce a predetermined pressure upon metal rolled therebetween.

2. A metal rolling machine comprising a countershaft housing, bearing means in said housing, a countershaft journalled in said bearing means and extending through said housing, a drive shaft housing, bearing means in said drive shaft housing, a drive shaft journalled in said bearing means and extending through said drive shaft housing, means for pivotally journalling one end of the drive shaft housing to one end of the countershaft housing, mechanical power driving means interconnected between the ends of said shafts projecting from the pivotally joined ends of said housings, a first metal rolling roller secured on the opposite end of one of said shafts, a second rolling roller oscillatably mounted upon the adjacent end of the other shaft for rolling metal against said first metal roller, and stop limit means for limiting the spaced relation of said rollers as metal is rolled therebetween.

3. A metal rolling machine comprising a countershaft housing, bearing means in said housing, a countershaft journalled in said bearing means and extending through said housing, a drive shaft housing, bearing means in said drive shaft housing, a drive shaft journalled in said bearing means and extending through said drive shaft housing, means for pivotally journalling one end of the drive shaft housing to one end of the countershaft housing, mechanical power driving means interconnected between the ends of said shafts projecting from the pivotally joined ends of said housings, a first metal rolling roller secured on the opposite end of one of said shafts, a bulged bearing portion on the adjacent end of the other shaft, a second rolling roller oscillatably mounted thereon for rolling metal against said first metal roller, a slack motion driving member connected between said other shaft and said second rolling roller whereby the latter is free to wobble on the shaft to distribute the contact pressure when a lump or burr in the rolled metal approaches the contact point between said rollers, and stop limit means for limiting the relative separating movement of said housings and hence the spaced relation between said rollers as metal passes therebetween.

4. A metal rolling machine comprising a countershaft housing, bearing means in said housing, a countershaft journalled in said bearing means and extending through said housing, a drive shaft housing, bearing means in said drive shaft housing, a drive shaft journalled in said bearing means and extending through said drive shaft housing, slack motion connecting means for connecting corresponding ends of said housings, mechanical power driving means interconnected between the ends of the shafts projecting from the connected ends of said housings, metal rolling rollers disposed on the opposite ends of said shafts for rolling metal therebetween, a limit stop intermediately disposed for limiting the relative separating movement of said housings and hence the spaced relation between said rollers as metal passes therebetween, and a compression spring intermediate said stop and said connecting means to normally take up the slack in a predetermined direction whereby an excessive pressure generated between said rolling rollers spreads them beyond said spaced relation.

5. The combination in a metal rolling and expanding machine of a pair of rollers, means for pivotally supporting said rollers in adjacent relation comprising a shaft for supporting each one of said rollers, means for securing one of said rollers rigidly to its shaft, means for oscillatably supporting the other one of the rollers upon its respective shaft, and supporting means providing bearings for said shafts.

6. The combination in a metal rolling and expanding machine of a pair of rollers, means for pivotally supporting said rollers in adjacent relation comprising a shaft for supporting each one of said rollers, means for securing one of said rollers rigidly to its shaft, a bulged portion providing convex bearing surfaces on the other shaft, a cylindrical aperture disposed axially in the other roller for fitting freely over said bulged portion, a member loosely connected between said other roller and said other shaft, and supporting means providing bearings for said shafts.

7. The combination in a metal rolling and expanding machine of a pair of rollers, means for pivotally supporting said rollers in adjacent relation comprising a shaft for supporting each one of said rollers, means for securing one of said rollers rigidly to its shaft, means for oscillatably supporting the other one of the rollers upon its respective shaft, supporting housings providing bearing means for journalling each one of said shafts respectively, means for pivotally interconnecting said housings, and stop means for adjustably limiting the relative pivotal movement between said housings.

8. The combination in a metal rolling and expanding machine of a pair of rollers, means for

pivotally supporting said rollers in adjacent relation comprising a shaft for supporting each one of said rollers, means for securing one of said rollers rigidly to its shaft, a bulged portion providing convex bearing surfaces on the other shaft, a cylindrical aperture disposed axially in the other roller for fitting freely over said bulged portion, a member loosely connected between said other roller and said other shaft, supporting housings providing bearing means for journalling each one of said shafts respectively, means for pivotally interconnecting said housings, and stop means for adjustably limiting the relative pivotal movement between said housings.

9. The combination in a metal rolling and expanding machine of a pair of rollers, means for rotatably supporting said rollers in adjacent relation for rolling metal therebetween comprising a separate shaft for supporting each roller, supporting housings each providing bearing means for journalling a respective one of said roller supporting shafts, slack motion connecting means for connecting corresponding ends of said housings, a limit stop intermediately disposed for limiting the relative separating movement of said housings and the spaced relation of said rollers as metal passes therebetween, and a compression spring reacting between said housings at a point intermediate said stop and said connecting means to normally take up the slack in said slack motion connecting means whereby the rollers are automatically released to a greater separation when excessive pressure is generated between the rollers.

JAMES J. CARROLL.