Aug. 20, 1935. E. H. SHAFF 2,011,877

RIVETING TOOL

Filed Oct. 4, 1933

Fig. 1

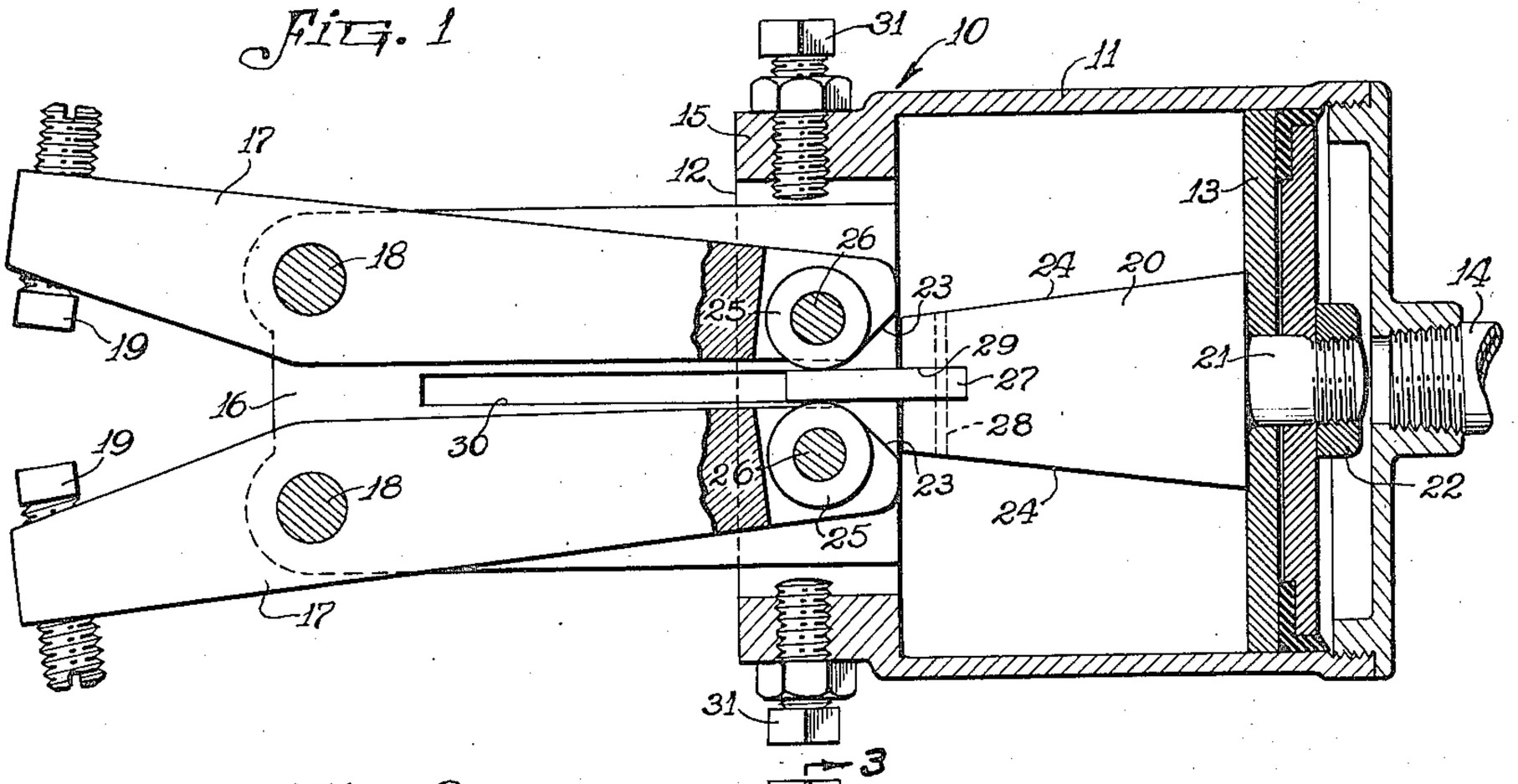
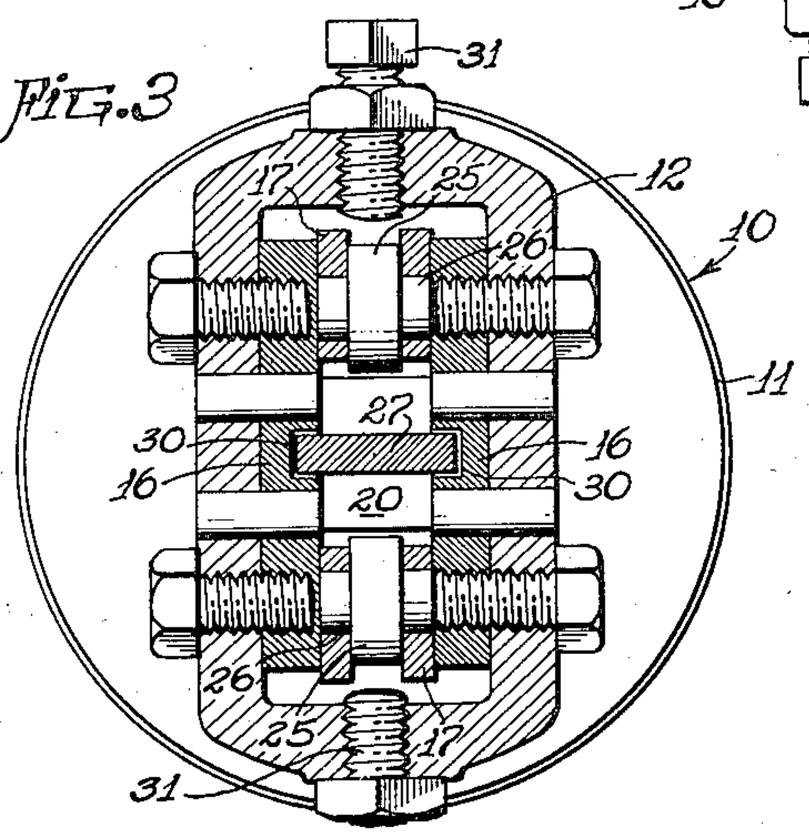


Fig. 2

Fig. 3



Inventor
Ernest H. Shaff
By Chisholm, Parker & Gardner.
Attorneys

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RIVETING TOOL

Ernest H. Shaff, Grand Haven, Mich., assignor to William H. Keller, Inc., Grand Haven, Mich., a corporation of Michigan

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3 Claims. (Cl. 78—42)

The invention relates to riveting tools of the type in which both ends of a rivet blank may be simultaneously upset.

An object of the invention is to provide an improved tool of this character in which the work performing members may be caused to move relatively rapidly into engagement with the work after which a relatively slow work performing movement is imparted thereto, and in which the transition between the two speeds is accomplished gradually with minimum movement of the driving or actuating means.

More specifically stated, an object is to provide a riveting device embodying pivoted levers which are engageable by an actuating means for swinging the levers toward each other to perform a working operation, said levers having cam surfaces thereon cooperating with said actuating means for causing a relatively rapid approach of the levers, and the actuating means including cam surfaces which cooperate with antifriction rollers on the levers to produce a relatively slow and powerful working movement of the levers, said parts being so related that the shift from one set of cam surfaces to the other set is gradual.

Another object resides in the provision of a tool having improved structural arrangements whereby a compact and sturdy tool embodying few parts may be produced for manufacture and sale at a low cost.

Other objects and advantages will become apparent in the following description and from the accompanying drawing, in which:

Figs. 1 and 2 are similar longitudinal central sections through a device embodying the features of the invention, and showing the parts in two operative positions.

Fig. 3 is a transverse section through the device as indicated by the section line 3—3 in Fig. 2.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawing, in which a particular form of tool has been shown merely in illustration of the invention, 10 designates generally a frame which comprises a housing section 11 and a supporting section 12. Since the present device is adapted for actuation by fluid pressure the housing section is a cylinder within which a piston assembly 13 of conventional design is reciprocably mounted. Pressure fluid is introduced behind the piston through a suitable conduit 14. The side of the housing 11 in front of the piston has a rectangularly shaped aperture therein which is defined by an outstanding flange 15 constituting the base part of the supporting section. Two spaced parallel supporting plates 16 of substantial width are suitably secured, one to each of the longer sides of the flange to extend outwardly and forwardly therefrom.

Two lever arms 17 are supported on pivots 18 between the plates and near the outer ends thereof, said lever arms preferably being located one on either side of and equidistantly from the axis of the piston. At their outer ends, the lever arms carry suitable riveting dies 19 or the like, while the inner portions of the lever arms extend between the plates 16 and terminate within the aperture defined by the flange 15. An operating member 20, which is secured through a stub shaft 21 and nut 22 to the piston assembly 13 for movement therewith, is arranged to cooperate with the inner ends of the lever arms to effect a separating movement of said inner ends with a resulting approaching movement of the outer ends when pressure fluid is admitted to actuate the piston.

The approaching movement of the outer ends of the levers 17 will carry the riveting dies 19 into engagement with a rivet placed therebetween and continued movement completes the riveting operation by upsetting the ends of the rivets. The approaching movement is preferably a rapid one, while the working movement should be considerably slower. The present device embodies an improved relationship between the lever arms and the operating member which is effective to produce the different speeds of lever arm movement. Moreover, the structure embodies means by which the transition from one rate of movement to the other is effected smoothly, gradually, and uninterruptedly yet occurs during a relatively short movement of the actuating piston.

In the present instance, the outer end or nose of the operating member 20 is of substantial width and when the structure is idle, as shown in Fig. 1, the nose is opposed by cam surfaces 23 formed one on each of the lever arms 17 and having relatively steep slopes. Considered together, these cam surfaces converge so that a separating movement of the lever arms is produced by movement of the operating member 20 therebetween. The steep slope of the cam surfaces 23 is predetermined to produce the desired rapid approach of

the riveting dies. Those surfaces of the operating member 20 which are alined with the lever arms 17 are fashioned to provide gentle sloping cam surfaces 24 which are engageable with the lever arms after the nose of the operating member has passed beyond the cam surfaces 23. These gently sloping cam surfaces 24 produce the slow, powerful, working movement of the riveting dies.

A preferred means for producing a gradual and smooth change from one speed to the other comprises, in this instance, antifriction rollers 25 or the like which are located near the ends of the lever arms and are so disposed that the cam surfaces 23 extend substantially tangentially from the rollers to the ends of the lever arms. Moreover, the rollers are located with peripheral portions thereof extending inwardly beyond the adjacent sides of the lever arms. Thus, the antifriction rollers have peripheral portions providing curved surfaces which are susbtantially continuations of the cam surfaces 23 and are engageable by the cam surfaces 24 as the nose of the operating member 20 passes beyond the cam surfaces 23. As a result, the transition from one cam surface to the other is relatively gradual, and occurs with exceeding smoothness. The antifriction rollers may be mounted on the lever arms in any suitable manner, as by bifurcating the ends of the arms and mounting the antifriction rollers on studs 26 between the arms of the yoke thus formed.

In order to guide the movements of the piston assembly 13 and the operating member 20, a transverse plate 27 is pinned, as at 28, in a slot 29 formed in the nose of the actuating member. The ends of the plate 27 engage opposed slots 30 formed in the inner faces of the plates 16. The plate 27 is preferably located intermediate the lever arm 17 so that the plate, in the idle position of the device, may be located between the antifriction rollers 25 for engagement thereby properly to locate the lever arms with respect to the nose of the operating member 20. Set screws 31 carried by the opposite ends of the flange 15 may be provided for limiting the extent of outward movement of the inner ends of the lever arms.

In operation, assuming that the parts have the relationship shown in Fig. 1, admission of pressure fluid to the cylinder causes the piston and operating member to move forwardly. The nose of the operating member engages the steeply sloping cam surfaces 23 and causes the riveting dies to be moved rapidly into engagement with a rivet blank. Approximately at the moment of such engagement, the nose of the actuating member passes smoothly from the cam surfaces 23 into engagement with the rounded surfaces of the antifriction rollers 25. Subsequently, the cam surfaces 24 engage the rollers and the working operation is performed by the resulting slow and powerful stroke.

It will be evident from the foregoing that the transition from one set of cam surfaces to the other set is gradually accomplished without shock or jar to the structure and during a relatively short movement of the piston. Moreover, the present device is efficient, sturdy and embodies few operating parts. Further, by forming one set of cam surfaces on the levers and another set on the operating member, the invention simplifies manufacture by eliminating the difficulties encountered when two cams of different slopes are formed on a single part.

I claim as my invention:

1. A riveting tool of the jaw type comprising, in combination, a tool body having a casing and a jaw supporting portion projecting a substantial distance forwardly from the casing, a pair of levers pivoted on the forward end of the jaw supporting portion in transversely spaced relation and providing opposed forwardly projecting jaws and opposed rearwardly projecting operating arms, said casing having an opening in its forward end for receiving the rear ends of said operating arms, and actuating means for said levers comprising a wedge member reciprocable in said casing in a direction longitudinally of and between the levers and having a pair of opposed cam surfaces gently sloping outwardly and rearwardly from its forward end, and a pair of rollers mounted on the rear ends of the operating arms, said arms having a pair of cam surfaces at their rear ends diverging sharply outwardly and rearwardly substantially tangentially of the rollers and engageable by the forward end of the wedge member to impart a rapid approaching movement to said jaw, and said rollers being disposed so that the inner peripheral portions of the rollers project inwardly from the inner side edges of the operating arms for engagement with said gently sloping cam surfaces on the wedge member in the movement of the latter forwardly between the arms.

2. A riveting tool of the jaw type comprising, in combination, a tool body having a casing and a jaw supporting portion projecting a substantial distance forwardly from the casing, a pair of levers pivoted on the forward end of the jaw supporting portion in transversely spaced relation and providing opposed forwardly projecting jaws and opposed rearwardly projecting operating arms, said casing having an opening in its forward end for receiving the rear ends of said operating arms, and actuating means for said levers comprising a wedge member reciprocable in said casing in a direction longitudinally of and between the levers and having a pair of opposed cam surfaces gently sloping outwardly and rearwardly from its forward end, a pair of rollers mounted on the rear ends of the operating arms, said arms having a pair of cam surfaces at their rear ends diverging sharply outwardly and rearwardly substantially tangentially of the rollers and engageable by the forward end of the wedge member to impart a rapid approaching movement to said jaw, and said rollers being disposed so that the inner peripheral portions of the rollers project inwardly from the inner side edges of the operating arms for engagement with said gently sloping cam surfaces on the wedge member in the movement of the latter forwardly between the arms, and a block projecting from the forward end of the wedge member and operative in the rearward position of the wedge member to space the rear ends of the operating arms apart with the rear ends of the sharply diverging cam surfaces disposed outwardly from the forward ends of said gently sloping surfaces of the wedge member.

3. A riveting tool of the jaw type comprising, in combination, a support having a pair of levers pivoted thereon in transversely spaced relation and providing opposed forwardly projecting jaws and opposed rearwardly projecting operating arms, and actuating means for said levers comprising a wedge member reciprocable in a direction longitudinally of and between the levers and having a pair of opposed cam surfaces gently sloping outwardly and rearwardly from its forward end, a pair of rollers mounted on the rear ends of the operating arms, said arms having a pair of cam surfaces at their rear ends diverging

sharply outwardly and rearwardly substantially tangentially of the rollers and engageable by the forward end of the wedge member in the initial forward movement thereof to impart a rapid approaching movement to said jaws, and said rollers being disposed so that the inner peripheral portions thereof project inwardly a short distance from the inner side edges of the operating arms for engagement with said gently sloping cam surfaces on the wedge member in the continued forward movement of the latter between the arms, and means operative in the rearward position of the wedge member to space the inner ends of the operating arms apart with the rear ends of the sharply diverging cam surfaces disposed outwardly from the forward ends of said gently sloping surfaces of the wedge member.

ERNEST H. SHAFF.