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FIG.8.

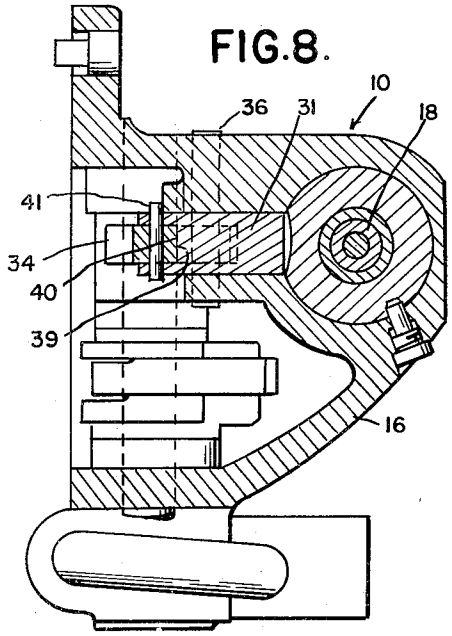
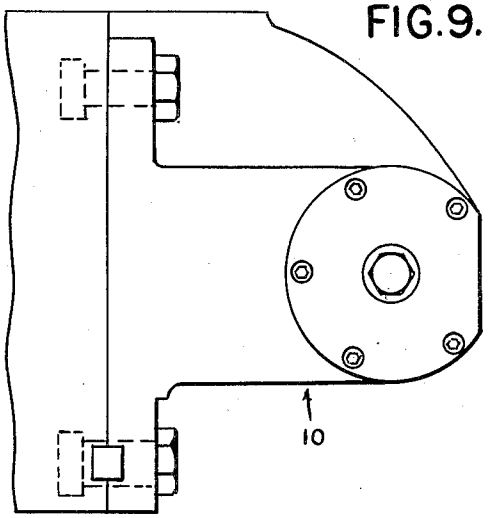


FIG.9.



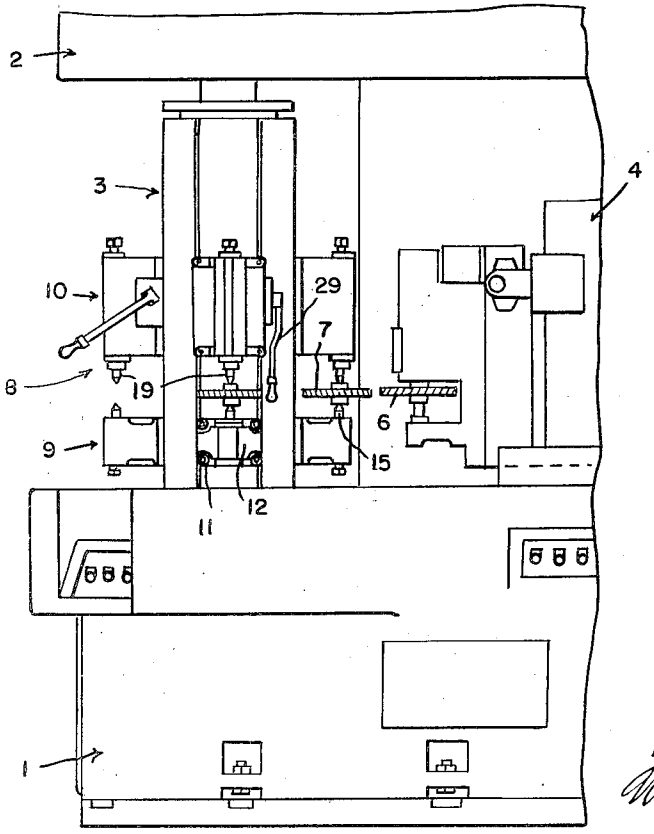


FIG.1.

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FIG.4.

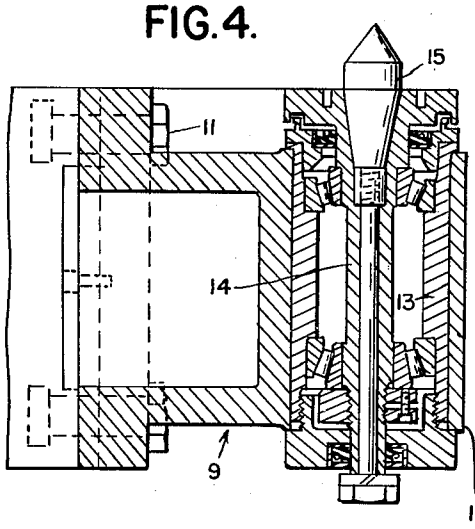


FIG.2.

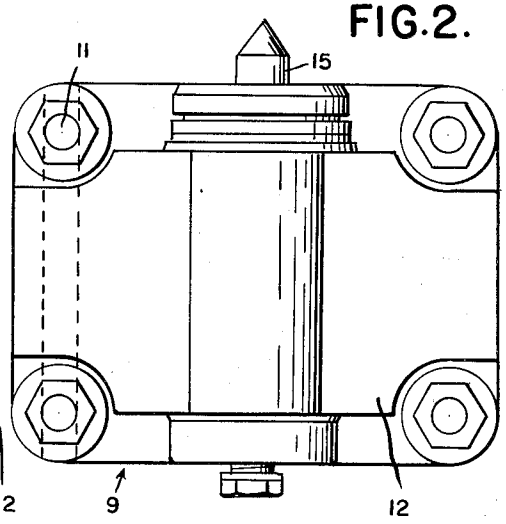


FIG.3.

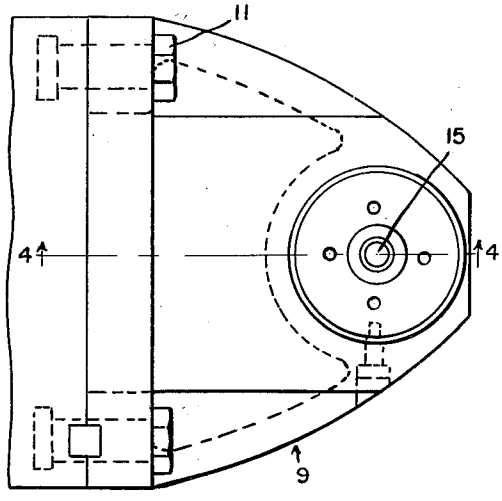
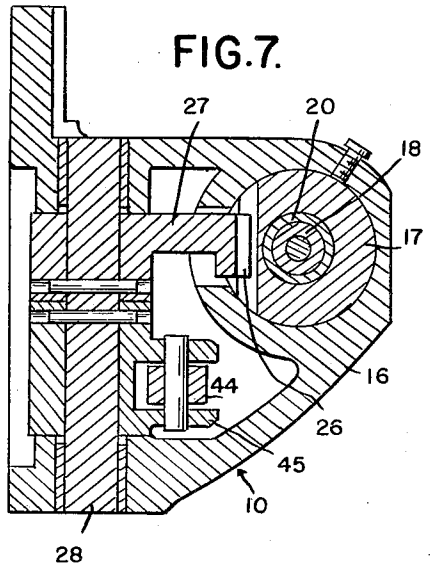


FIG.7.



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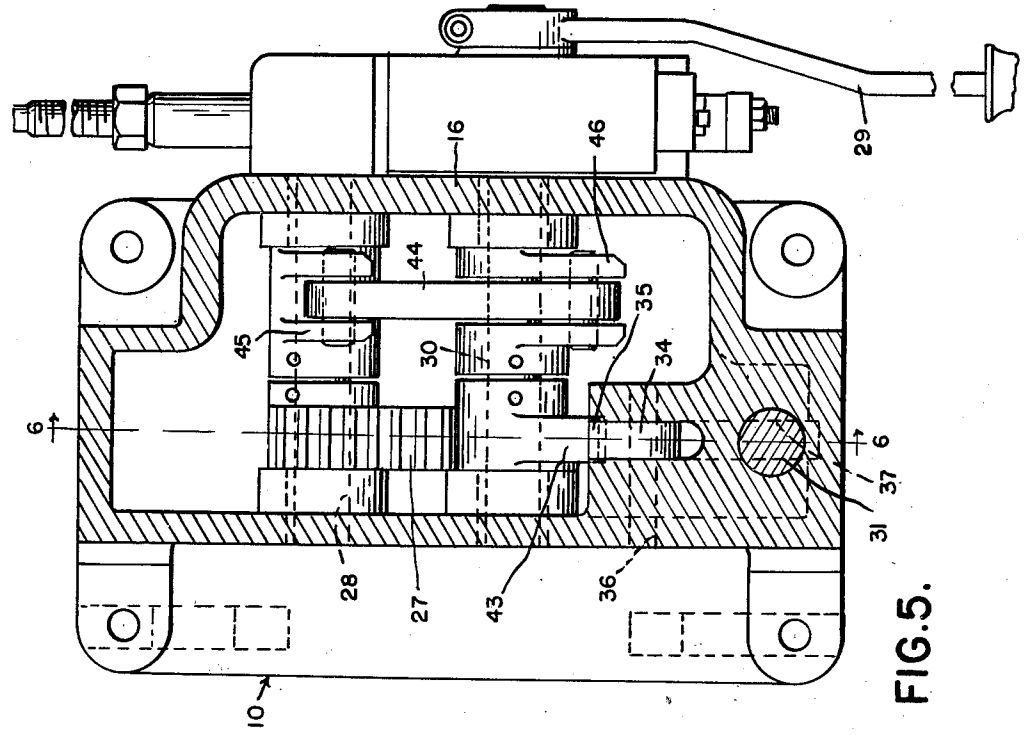


FIG.5.

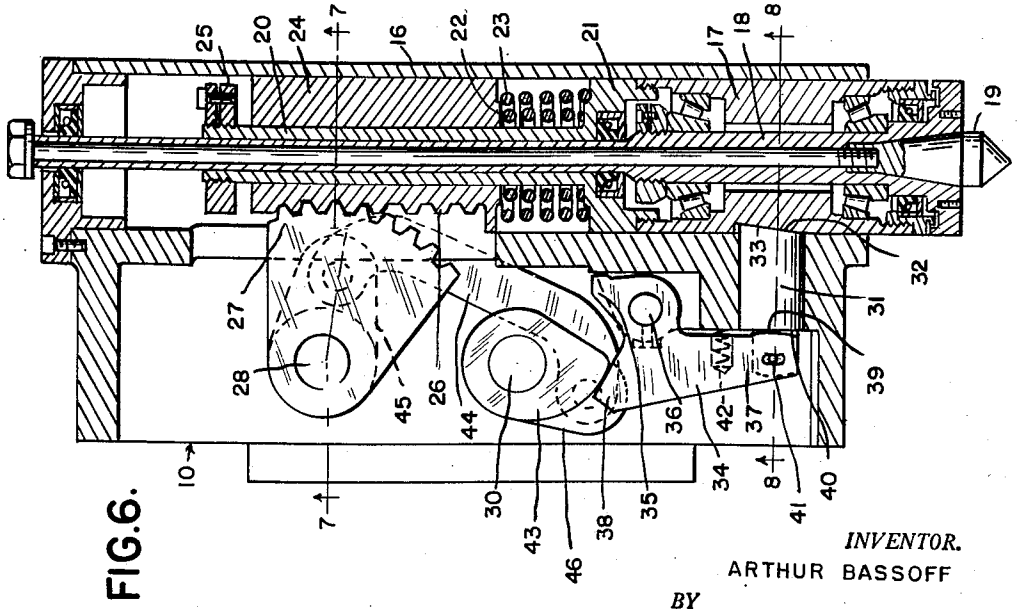


FIG.6.

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UNITED STATES PATENT OFFICE

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TAIL STOCK

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Application May 14, 1946, Serial No. 669,679

4 Claims. (Cl. 82—31)

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The invention relates to work holding devices and refers more particularly to work holding devices comprising cooperating holding members relatively movable toward and away from each other.

The invention has for some of its objects to provide an improved construction of work holding device in which the work holding members are relatively movable toward each other to work holding position and are adapted to be held in work holding position independently of the means for effecting the relative movement; and to provide an improved construction of work holding device in which the work holding members are relatively moved toward each other under a predetermined pressure to work holding position.

The invention has for other objects to provide an improved construction of work holding device having a manually operable member which serves both to relatively advance the work holding members to holding position and to lock these members in this position; and to provide an improved work holding device employing an off center locking arrangement for locking one of the work holding members in advanced or holding position.

With these and other objects in view the invention resides in the novel features of construction and combination and arrangements of parts as more fully hereinafter set forth.

In the drawings:

Figure 1 is a side elevation of a machine employing a work holding device embodying the invention;

Figure 2 is an enlarged view of a portion of Figure 1;

Figure 3 is a top plan view of Figure 2;

Figure 4 is a cross section on the line 4—4 of Figure 3;

Figure 5 is an enlarged view partly in section of another portion of Figure 1;

Figure 6 is a cross section on the line 6—6 of Figure 5;

Figures 7 and 8 are cross sections on the lines 7—7 and 8—8 respectively of Figure 6;

Figure 9 is a top plan view of Figure 6.

While the work holding device embodying the invention may be employed to hold various types or kinds of work, it is, as illustrated in the present instance, designed for use in a gear finishing machine to hold a work gear.

The gear finishing machine in general comprises the base 1, the turret overhead support 2, the vertical turret 3 between the base and overhead support, and the main slide 4 horizontally slidable on ways on the base toward and away from the turret and carrying the cutter 6 which

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is engageable with the semi-finished or roughed-out work gear 7 held in the work holding device 8 on the turret.

The work holding device comprises the cooperating lower and upper work gear holding fixtures 9 and 10 respectively which are secured to a face of the turret by suitable means such as the bolts 11. Each lower fixture 9, commonly known as a head stock, comprises the housing 12, the sleeve 13 having a tight fit within the housing, the spindle 14 journaled in the sleeve and the work gear holding member 15 which is mounted in an enlarged end of the spindle and which, as shown, is a center. Each upper fixture, commonly known as a tail stock, comprises the housing 16, the sleeve 17 longitudinally slidable within the housing, the spindle 18 journaled in and longitudinally movable with the sleeve and the work gear holding member 19 which is mounted in an enlarged end of the spindle and which, as shown, is a center. The sleeve 17 has threaded to its upper end the tubular member 20 which encircles and preferably clears the reduced stem of the spindle 18. The tubular member has at its lower end the enlargement 21 which forms an abutment for the concentric inner and outer coil springs 22 and 23 respectively, the upper ends of which abut the slide 24 which slidably engages and is longitudinally movable within the housing 16. A collar 25 is threaded on the upper end of the tubular member 20 and forming an abutment engageable with the upper end of the slide 24 so that upon upward movement of the slide it contacts the collar and through the collar raises the tubular member and with it the spindle and work gear holding member.

To move the upper work gear holding member 19 toward and away from the lower work gear holding member 15, the slide 24 has preferably formed integrally therewith the longitudinally extending rack 26 and this rack is engaged by the gear segment 27 which is secured to the shaft 28 journaled in the housing 16. A manually operable handle 29 is secured to the shaft 30 outside the housing 16, the shaft being journaled in the housing. The handle upon being swung downwardly by the operator effects resilient downward movement of the upper work gear holding member toward the lower work gear holding member to exert a predetermined pressure upon the work gear.

For the purpose of locking the upper work gear holding member 19 in its adjusted holding position independently of the coil springs 22 and 23 means are provided to engage the sleeve 18 and hold it in its adjusted position. This means comprises the pin 31 which is slidable in the housing 16 transversely of and into engagement with the

sleeve 17 after it has been advanced to advance the work gear holding member to its holding position. The pin 31 has the tapered face 32 engageable with a corresponding face 33 on the sleeve 17, these faces being inclined toward the axis of the spindle in a direction opposite to that taken by the spindle in being moved to its holding position.

A multi-armed lever 34 is pivotally mounted in the housing 16 by the pin 36 and has a stop arm 35, the second arm 37 for moving the pin 31 toward and away from the sleeve 17 and the third arm 38 for swinging the lever in a direction to move the pin 31 toward the sleeve 17. The arm 37 is preferably formed with the rounded surface 39 engageable with the shoulder 40 on the pin 31 to urge the latter toward the sleeve 17. The arm 37 is also connected to the pin 31 by the pin 41 to effect retraction of the pin 31 by means of the coil spring 42 which abuts the housing 16 and extends into and abuts the arm 37. The arm 35 is engageable with the housing 16 to limit swinging of the multi-armed lever 34 when retracting the pin 31 under action of the spring 42. A cam 43 is secured to the shaft 30 and engageable with the arm 38 to effect swinging of the multi-armed lever 34 to produce the locking action upon the spindle when in its work gear holding position.

A link 44 is pivotally connected to the cranks 45 and 46 which are secured respectively to the shafts 28 and 30 and serving upon rotation of the shaft 30 by the handle 29 to rotate the shaft 28 and thereby advance the upper work gear holding member 19 to holding position through the intermediate mechanism including the gear segment 27, the slide 24, and the spindle 18. The pivots for connecting the link 44 to the cranks 45 and 46 are so located that when the gear segment has been swung forwardly a distance sufficient to firmly engage the upper work gear holding member with the work gear and firmly hold the work gear against the lower work gear holding member, the line connecting the pivots has passed over or beyond the axis of the shaft 30 to thereby effectively lock the parts in their adjusted positions.

With this construction the sleeve 17, rotatably carrying the spindle 18 and the upper work gear holding member 19 is resiliently advanced to advance the work gear holding member to holding position. At the same time the sleeve is locked in its advanced position independently of the spring means for advancing it. Also one manually operable handle serves both to advance the parts to work gear holding position and to lock the parts in this position. Furthermore, it is apparent when the parts are in work gear holding position the shaft 30 must be rotated in the reverse direction to move the link 44 to released position and thereby unlock the parts. After the parts are unlocked the shaft may be further rotated in the reverse direction either by raising the handle 29 or by raising the spindle through the work gear at which latter time the shoulder at the lower end of the reduced stem of the spindle engages the lower end of the tubular member 20.

What I claim as my invention is:

1. A clamping device comprising a guide way, a slide and a work engaging element independently movable along said guide way, a compression spring interposed directly between said slide and element, rack teeth on said slide, a pinion segment meshing with said teeth, an operating handle and crank, a link connecting said crank and pinion segment and adapted to reach an over-center locking position as said slide reaches fully advanced position, a locking plunger movable laterally into locking engagement with said element, and cam means operable as said link reaches over-center position to press said plunger into locking engagement with said element.

2. A clamping device comprising a longitudinally movable work engaging assembly including a part having a locking surface inclined at a small angle to the direction of movement of said device, a locking plunger movable transversely to said device having a correspondingly inclined locking surface engageable with said first mentioned surface, a compression spring engaging the rear of said device, operating means comprising means for initially compressing said spring to advance said device into contact with a work piece with a pressure equal to the spring pressure, and means operable thereafter for moving said plunger into locking engagement with said device.

3. A device as defined in claim 2, said last mentioned means comprising a rotary cam, a lever actuated by said cam and operatively engaging said plunger, said operating means comprising a handle, means operatively connecting said handle and said spring, and an over-center linkage, operatively connecting said handle and said rotary cam.

4. A clamping device comprising a frame including a longitudinally extending guideway, a work engaging element slidable along said guideway, a slide movable along said guideway, said slide having an opening therethrough, said work engaging element having an extension movably received in said opening and extending therebeyond, a rigid abutment on the end of said extension, a compression spring intermediate said slide and said element, locking means rigidly engageable with said work engaging element to lock said element in work engaging position, an operating handle, driving connections between said handle and said slide to effect longitudinal movement of said slide whereby movement of said slide toward said element advances said element into engagement with a work piece with a force dependent upon the effectiveness of said spring and whereby movement of said slide away from said element retracts said element as a result of engagement between said slide and said rigid abutment on said extension, and actuating means interconnecting said handle and said locking means effective to lock said locking means following advance of said element into engagement with a work piece upon movement of the handle in one direction and to unlock said locking means upon reverse movement of said handle and prior to engagement between said slide and said abutment.

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