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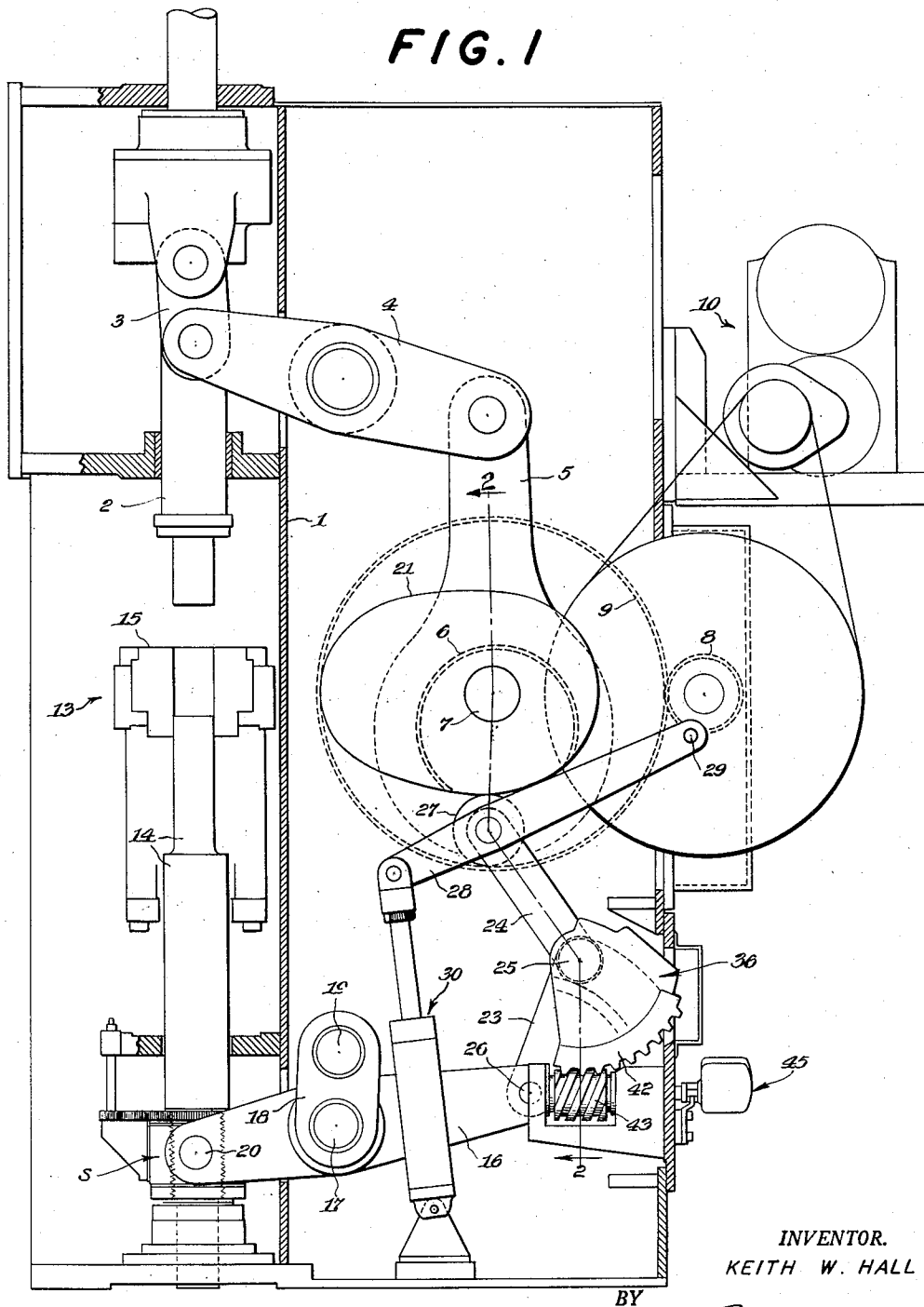
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EJECTION STROKE ADJUSTING MEANS FOR POWDERED METAL PRESSES

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2 Sheets-Sheet 1

FIG. 1



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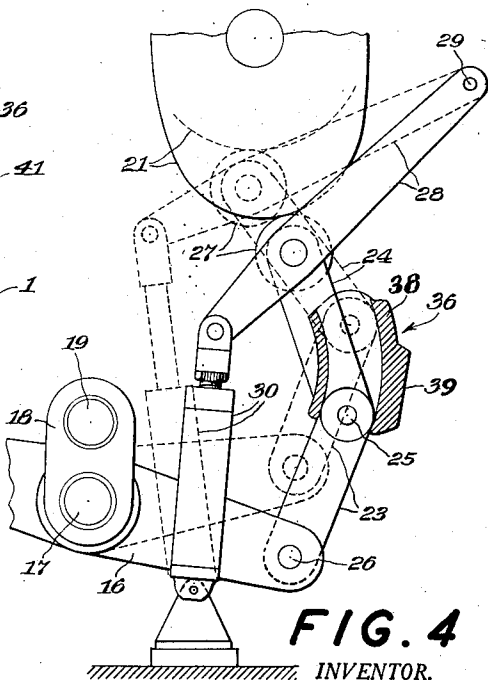
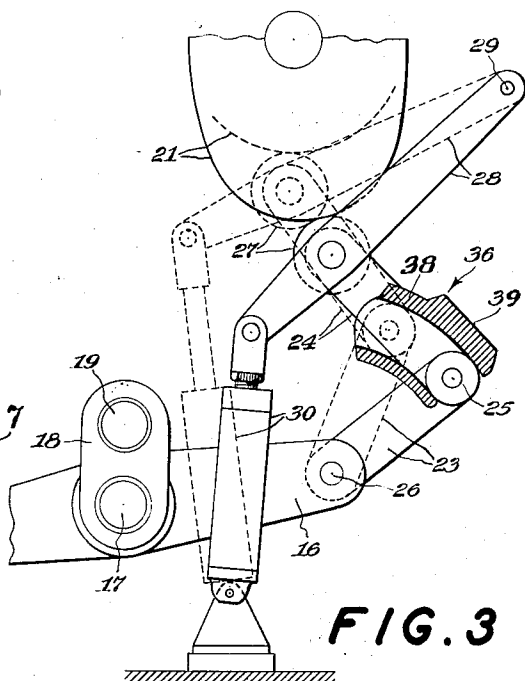
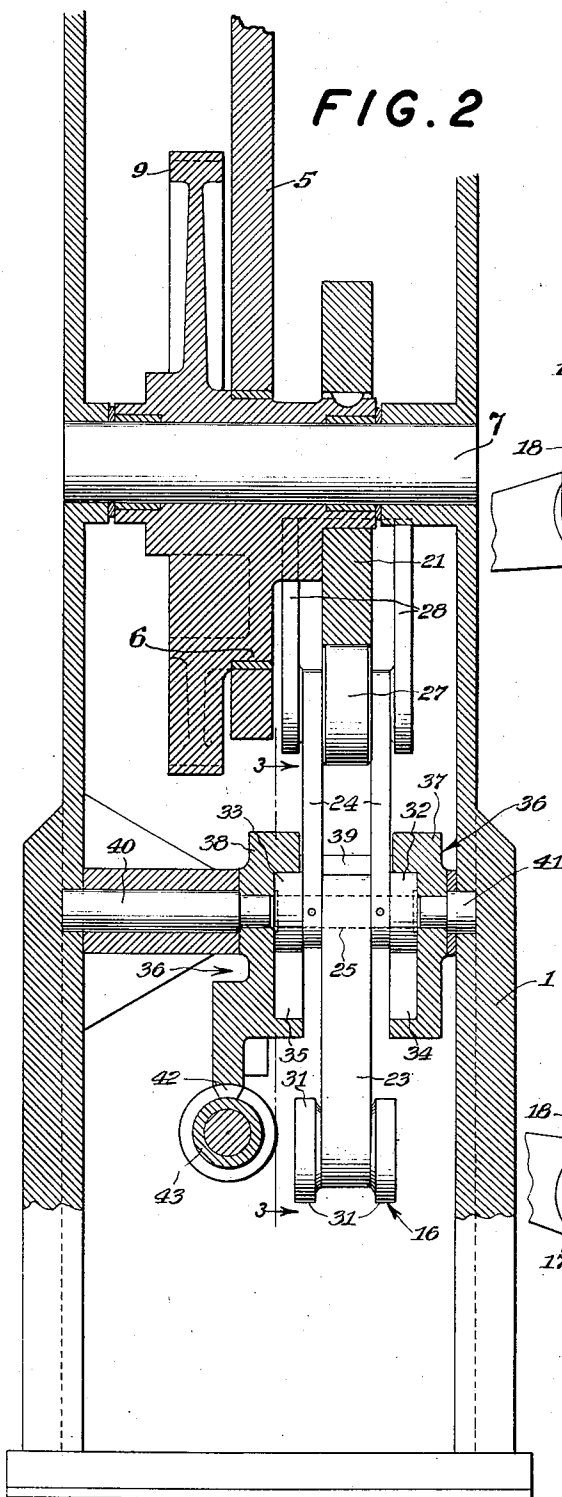
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2 Sheets-Sheet 2



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EJECTION STROKE ADJUSTING MEANS FOR POWDERED METAL PRESSES

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2 Claims. (Cl. 18—16.5)

This invention relates to presses and more particularly to a press of the cam and lever type for compacting powdered metal articles.

In compacting powdered metal it is usual to control the depth of fill of the die by adjusting the lower position of the ejection punch and then adjusting the stroke of such punch so that its upper end will stop at the level of the top surface of the die during the ejection stroke. Many arrangements have heretofore been proposed and used but they have involved either complicated mechanisms or, where cam and lever actuation of the ejection stroke was employed, there resulted varying degrees of lost motion depending upon the depth of fill.

It is an object of my invention to provide an improved powdered metal compacting press of the cam and lever type in which the depth of fill is controlled by usual axial adjustment of the lower punch and the length of the ejection stroke of such punch can be adjusted in such a manner that the top of the punch always terminates in the plane of the upper surface of the die during the ejection stroke regardless of the depth of fill and without involving any lost motion action.

Another object is to provide an improved cam and lever type actuating means for the ejection stroke that is adapted to adjust the ejection stroke while the press is running and without introducing any lost motion action for varying extents of ejection stroke.

A further object is to provide an improved ejection punch operating means of the lever type in which a fixed pivotal relation may be utilized between the lever and punch unit and still obtain the many other advantages and results herein disclosed.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a vertical sectional view of a compacting press embodying my improved ejection stroke actuating and adjusting means with the driving pinion and bull gear removed but shown in phantom dotted lines for purposes of clarity;

Fig. 2 is a vertical transverse section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a view of the ejection operating mechanism shown generally in the same zero stroke position as in Fig. 1 and taken generally on line 3—3 of Fig. 2 with certain parts broken away for clarification; and

Fig. 4 is a view of the stroke adjusting mechanism similar to Fig. 3 but adjusted to have maximum stroke.

The press in which my invention is incorporated is of the same general type disclosed and described in detail in an application of Byron B. Belden et al., Serial No. 607,503 filed August 31, 1956, and, hence, it will suffice only to describe such press generally. It includes a frame 1 having an upper ram 2 suitably guided for vertical movement and actuated by a link 3 and lever 4 which has a connecting rod 5 mounted on a rotating eccentric 6 journaled on a stationary shaft 7. The eccentric is suitably driven by pinion 8 and bull gear 9 from

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a motor driven variable speed unit diagrammatically indicated at 10. A die holder, preferably floating, generally indicated at 13, has a lower ejection punch 14 which can be vertically adjusted in a usual manner by an axially adjustable screw and nut, diagrammatically indicated at S, to determine the depth of fill in the die. Such adjusting means and operation are well known in the art.

To reciprocate the lower punch 14 to effect an ejection stroke and to have the stroke of the lower punch adjustable so that its upper end can terminate in the plane of the top surface 15 of the die 13, regardless of the length of the ejection stroke, I have provided the following adjusting means in a cam and lever type actuating mechanism. A horizontally floating lever 16 is pivoted at 17 to a hanging link 18 whose upper end is supported on a stationary frame pivot 19. The lever 16 is pivotally connected at 20 to the lower end of the punch structure 14 so that the pivotal connection normally remains fixed relative to the punch except for adjusting its normally fixed position. The hanging or pendant link 18 permits the lever 16 to float horizontally in response to the straight line vertical movement of pivot 20 and to the arcuate movement of lever 16 during oscillation thereof. The other end of lever 16 is operatively connected to a cam 21 which is secured to the hub of bull gear 9 for continuous rotation therewith, the axis of the cam and said other end of lever 16 being disposed in superimposed planes. This operative connection is accomplished by the provision of two links 23 and 24 pivotally connected to each other by a common shaft 25. The lower end of link 23 is pivotally connected at 26 to lever 16 while the upper end of link 24 has a cam follower wheel 27. The upper end of link 24 is supported upon a lever 28, the right end of which has a fixed pivot 29 secured to the press frame and the left end is yieldingly biased upwardly by any suitable means such as an air piston and cylinder generally indicated at 30 or by a spring, thereby to maintain the cam follower 27 in contact at all times with cam 21.

As shown in Fig. 2, each link 24 and lever 28 is divided into pairs with the cam follower roller 27 disposed between the same. The single link 23 is disposed between the pair of links 24 and between a bifurcated end 31 of link 16. Journaled on the pivot shaft 25 outside of each link 24 are rollers 32 and 33 movable respectively in arcuate grooves 34 and 35 of a stroke adjusting means. This means, generally indicated at 36, consists of two members 37 and 38 cross connected by a relatively heavy portion 39, Fig. 3, to form an integral unit in which the arcuate grooves 34 and 35 are formed in opposed relation to each other. This integral unit in turn is rotatably supported, Fig. 2, on coaxial shafts 40 and 41 suitably secured in the frame structure 1. Fixed to this integral unit to angularly adjust the same is a worm gear segment 42 with which a stationarily mounted worm 43 meshes. Any suitable manual or motor driven means, generally indicated at 45, Fig. 1, may be employed to rotate worm 43 to angularly adjust the stroke adjusting means 36.

When this stroke-adjusting means 36 is in one of its extreme positions, shown in Fig. 1, the punch 14 will have zero movement throughout rotation of cam 21 because in this position the curvature of grooves 34 and 35 have the center of their radii coincide with the axis of pivot 26 of lever 23 thus allowing lever 23 to merely idly oscillate upon reciprocation of lever 24 without producing any movement of punch lever 16. When the stroke-adjusting means 36 is angularly adjusted to its other extreme position, shown in Fig. 4, then maximum movement is transmitted through links 24 and 23 to the punch lever 16 during rotation of cam 21. Any inter-

mediate position of the adjusting means 36 will produce corresponding variations in the length of the ejection stroke, thereby permitting the upper end of the ejection punch 14 to be always adjusted so that its upper stroke stops with its upper end at the plane of the top surface 15 of the die. This adjustment can take place while the press is operating. Adjustments for depth of fill and for ejection stroke during operation of the press, that is while the press is compacting parts, should be made preferably at the same time or by small amounts one after the other so that the uppermost position of the lower punch is always reasonably close to the top surface of the die 15. During operation of the punch the lever 16 pivots about its shaft 17 and also swings laterally about pivot 19.

From the foregoing disclosure it is seen that I have provided an extremely effective and relatively simple and economical construction for adjusting the ejection stroke of a powdered metal press without the presence of any lost motion connection regardless of the length of the punch stroke and even though a cam and lever operating mechanism is employed. My invention allows the stroke adjusting mechanism to be formed in a very rugged as well as compact manner without in any way reducing its flexibility of adjustment or operation while at the same time insuring ease of inspection and repair for maintenance purposes.

It will, of course, be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A powdered metal compacting press having a die, an upper compacting punch, a lower ejection punch whose lowermost position in the die may be varied to determine the depth of die fill, a pivoted lever having one end operatively connected to the lower punch to reciprocate the same upon oscillation of the lever, a rotatable cam, a pair of links whose inner ends are connected together by a common pivot, the outer end of one of the links being pivotally connected to the other end of said lever and the outer end of the other link having a follower continuously engageable with said cam, the axis of the cam and said other end of the lever being dis-

posed in superimposed planes, means providing a guiding surface for said common pivot, and means for angularly adjusting the position of said guiding surface so as to transmit a variable amount of said lengthwise link motion to the link that is connected to said lever, thereby to adjust the punch stroke while maintaining the cam follower in contact with the cam at all times.

2. A powdered metal compacting press having a die, an upper compacting punch, a lower ejection punch whose lowermost position in the die may be varied to determine the depth of die fill, a pivoted lever having one end operatively connected to the lower punch to reciprocate the same upon oscillation of the lever, a rotatable cam, a pair of links whose inner ends are connected together by a common pivot, the outer end of one of the links being pivotally connected to the other end of said lever and the outer end of the other link having a follower continuously engageable with said cam, the axis of the cam and said other end of the lever being disposed in superimposed planes, means providing a curved guiding surface for said common pivot, the curvature of said surface having a radius substantially equal to that of the length of the link which is connected to said lever, and means for angularly adjusting said curved surface so that when it is in a position that its center of curvature substantially coincides with the axis of the pivotal connection between the lever and the link connected thereto the only motion transmitted to such link will be a substantially swinging movement about its pivotal connection with the lever but when said surface is adjusted with its center of curvature toward the cam a longitudinal motion will be transmitted from the cam follower link to the other link while maintaining the cam follower in contact with the cam at all times, whereby reciprocation of the ejection punch is effected to whatever extent may be necessary for stopping the upper end of the ejection punch at the top of the die regardless of the initial fill position of the ejection punch.

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