POWER PRESS DRIVING MECHANISM

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This invention relates to certain features involved in the application of power to presses designed either as punch presses or die presses, for the purpose primarily of compensating against wear in the driving connections which are subjected to heavy duty and to varying strain during the cycle of operations.

If preserving this character, it is customary to provide a driving pulley which is adapted to be clutched to the power shaft which drives the pitman for the application of pressure to the die head or punch as the case may be. During the cycle of operations, the resistance builds up to the point where the upstroke has been completed. When the pitman is suddenly released at the medial point where the upstroke begins, which results in a sudden reversal of movement and the sudden release of pressure.

The present invention is designed to counteract this wearing effect by the provision of supplementary clutching mechanism, which acts effectively at the instant during which the downward thrust of the driving elements on the pitman is transformed into a lifting pull or tension to prevent this reversal of action from effecting wear on the clutching elements, unless counteracted will progressively increase as the lost motion is accentuated.

Further objects and details will appear from a description of the invention in conjunction with the accompanying drawings, wherein—

Figure 1 is a front elevation of the upper portion of a power press showing the driving connections;

Fig. 2 is an enlarged fragmentary detail taken on line 2 of Fig. 1;

Fig. 3 is a longitudinal sectional elevation showing a portion of the fly wheel pulley, crank shaft, and associated parts;

Fig. 4 is a cross section taken on line 4—4 of Fig. 3, showing the wedge clutch elements in unclutched relation;

Fig. 5 is a similar view showing a readjustment of the restoring ring which provides for release of the wedge clutch elements after engagement;

Fig. 6 is a partially sectioned view taken on line 6—6 of Fig. 3;

Figs. 7 and 8 are two sectional views of a modified form of supplemental clutch; and

The mechanism is applied to the upper portion of a power press comprising standards having spaced guide bars 11—11, which furnish a vertical guideway for the reciprocations of the head 12, which carries a die or punch as the case may be. The head is operated by means of a pitman 13 provided at its lower end with a ball 14 operating in a socket 15 in the usual manner. The pitman at its upper end is provided with a split journal head 16 which engages the crank 17 formed on a crank shaft 18 suitably mounted within journals 19—19 at the upper ends of the standards. These features are of conventional form and do not require additional description.

The crank shaft 18 is provided with a bushing 20 which furnishes a mounting for a fly wheel pulley 21 driven by a belt, not shown. The shaft 6 is provided with a flange collar 22 through which is entered a pin 23 adapted to be thrust inwardly to engage with any one of a series of circular recesses 24 in the hub of the fly wheel, each of which recesses forms the terminus of a sloping approach surface 25 adapted to facilitate the entrance of the pin 23 into the selected recess 24.

The pin is actuated by a lever 26 under the control of foot treadle mechanism 27, which forms the subject-matter of an application, Serial No. 568,232, filed December 26, 1931, and since the present invention is in no sense directed to the particular means employed for actuating the clutch pin 23, it is not deemed necessary to describe these features in detail. The clutch pin 23 operates to impart the driving load from the fly wheel to the crank shaft through the connection afforded between the pin 23 and the recess 24.

For convenience in the adjustment of the dies or punch members, it is desirable to afford a slight amount of lost motion in the fly wheel in order to enable the operator to turn the fly wheel slightly by hand before it is engaged in driving contact with the crank shaft and the heavy parts actuated thereby. This necessitates that the recess 24 shall be slightly larger than the diameter of the pin to allow the necessary lost motion, and it is this circumstance that renders desirable the employment of the features which more especially constitute the subject matter of the present invention, since lost motion at this point, whether provided intentionally for the purpose of permitting convenient hand operation of the fly wheel or resulting from a wearing of the parts, will tend to induce excessive wear and reduction in the diameter of the pin or in enlargement of the recess unless counteracted or compensated in such a way as to prevent the lost motion from being transformed into a heavy blow or impact.
at the instant when the downward motion of the die or punch head is transformed into an upward lift through the action of the pitman.

Fig. 2 illustrates a condition in which the pin 33 has been worn to a considerable extent, so that it has been deformed from a condition of true cylindrical form, and that a relationship of parts might be characteristic of an old machine newly equipped with compensating features of the present invention, although where such compensating features are provided in the first instance, the effects of wear on the pin will be prevented, although as before stated, a certain amount of lift motion at this point is usually desirable in order to permit of a slight rotation of the fly wheel by hand in adjusting the parts for operation. The compensating features of the present invention will now be described.

As shown in Figs. 4, 5 and 6, the hub 28 on the outer side of the fly wheel is surrounded by a heavy collar 29 which projects outwardly beyond the hub and embraces a flange 30 at the inner end of a cap 31, which fits upon and is keyed to the outer reduced end 32 of the crank shaft 18. In order to afford a rugged interlock for the cap, the parts are secured in place by a cross pin 33 which passes through the reduced shaft 32 and a key pin 34 which is socketed in part within the side face of the reduced shaft and in part within the inner wall of the cap.

The cap flange, at three points in its periphery, is provided with notches each having a flat base 35 and an abrupt end wall 36, which notches in conjunction with the surrounding collar 29 furnish wedge-shaped apertures for the reception of ground wedge rollers 37, one for each aperture. In order to properly retain the rollers in position, a split spring ring 38 is provided, which lies within the grooves in the equidistantly spaced rollers 37 and also within a groove 39 in the periphery of the flange 30. This arrangement facilitates the adjustment of the cap flange 30 in position within the collar 29, after which the rollers are enclosed by a ring 40 which bears against the outer face of the cap flange and against the face of the collar 29, being held in place by pins 41, which, however, permit the rotation of the ring.

The ring serves as a means for temporarily forcing back the rollers 37 toward the enlarged ends of the wedge-shaped apertures, within which they operate, thus unwedging the parts and affording the slight degree of lost motion desirable in turning the fly wheel by hand. This result is accomplished by the provision of inwardly projecting pins 42 which are positioned to bear against the respective rollers and force the same backwardly as the restoring ring is rotated in a counter-clockwise direction in Figs. 4 and 5.

The rollers 37 bear against plungers 43 which operate within recesses 44 formed in the abrupt end walls 36 of the wedge apertures, and each of the plungers is backed by a spring 45, the plunger being bored to receive the forward end of the associated spring.

In order to rotate the ring and release and disable the rollers for hand operation, the eccentric mechanism shown in Fig. 9 is employed. This comprises a pintle 46 which rotates within a cross bore 47 in the cap flange, and in order to hold it either in one of two positions, it is provided on each side with a flattened face 48 which is engaged by a button 49 backed by a spring 50 operating within a bore 51. The pintle 46 is provided on its outer end with an eccentrically positioned cylindrical stud 52 terminating in a squared head 53 adapted to receive a wrench or the like. The stud operates within a radially elongated slot 54 formed in the ring 40 (see Fig. 6), so that as the pintle 46 is rotated, the eccentric stud will be given an arcuate movement which imparts an outward thrust to the ring and causes the pins 42 to move the rollers from their normal position and hold them against wedging action until the power operation is resumed.

An alternate form of construction is illustrated in Figs. 7 and 8. In this construction, in place of the wedge rollers 37, pawls 55 are provided, each of which is mounted upon a pivot 56 and operates within a recess 57 formed in the periphery of the cap flange. Each of the pawls is actuated upon by a spring 58 socketed within a recess 59, and in position to impart an outward thrust to the free end of the pawl to bring it into engagement with the serrated inner face 60 of the collar 29. The free ends of the pawls are released and restored against spring tension by the pins 42 carried by a ring substantially identical with the one previously described. In other respects the mechanism shown in Figs. 7 and 8 is a duplicate of that previously described.

Operation

In operation, with the fly wheel constantly traveling in the counter-clockwise direction indicated in Figs. 4 to 6 inclusive, rotation will be imparted to the crank shaft by the clutch afforded by the engagement of the pin 23 within the recess 24. On the downward stroke of the pitman 13, the resistance will build up and the driving force (see Fig. 2) will be in the nature of a thrust imparted by the wall of the recess 24 to the fly wheel against the pin 23, which will continue until the medial point in the movement of the pitman is reached. During this period in the operating cycle, the rotation of the collar 29, which is preferably shrunken onto the hub of the fly wheel, will be in a direction to prevent clutching engagement between the wedge rollers 31 or the pawls 55 as the case may be, but as the medial point is reached in the downward movement of the pitman, and as the restoring movement of the punch or die begins, the driving impetus will tend to transfer to the opposite side of the pin 23, and if the parts are loosely fitted this will result in a shift in the relative position of the cap flange 30 relatively to the collar 29, so that there will be a tendency for the wedge rollers to roll toward the reduced ends of the wedge apertures, with a resultant gripping or wedging of the parts which prevents the pin 23 from shifting within the recess 24, and hence prevents impacting or rolling due to lost motion in the normal operation of the machine.

A similar result will attend the use of the pawls in lieu of the rollers, although the rollers will afford a slightly more immediate and precise operation in effectively counteracting the lost motion which would otherwise occur.

In the operation above described, the compensating devices (rollers or pawls as the case may be) will tend to become tightly wedged or locked in position, but when it is desired to move the parts to unwedged position, the ring will be rotated by the application of a wrench or the like, so that the operator will be enabled to turn the fly wheel slightly by hand as occasion may require.

The device is one which serves to relieve the pin and recess connection 23-24 from wear in the first instance, or to counteract the further effects of
wear in cases where the parts are already worn, which is a matter of importance in heavy duty power presses of the kind to which the present invention is directed and in which the driving load builds up to a maximum and is suddenly released with consequent tendency to develop wear and introduce rocking strains into the mechanism.

Although the invention has been described with particularity as to detail, it is not the intention to limit the invention strictly to the mechanism shown, since variations may be introduced without departing from the principle of the invention.

We claim:

1. In power mechanism of the class described, the combination of a power shaft and reciprocating mechanism actuated thereby, a fly wheel freely mounted upon the power shaft, a main clutch comprising a movable pin and a coacting recess for establishing a clutch connection between the shaft and the fly wheel, said parts being proportioned to provide for restricted lost motion, a flanged cap keyed to the outer end of the shaft, a member carried by the fly wheel and overhanging the flange of said cap, the flange and overhanging member being configured to afford a tapering slot therebetween, and a wedge member mounted within said slot and adapted upon a shifting in the clutched relation of the parts to establish wedging contact therebetween to counteract the effects of lost motion in the main clutch connections.

2. In power mechanism of the class described, the combination of a power shaft and reciprocating mechanism actuated thereby, a fly wheel freely mounted upon the power shaft, a main clutch comprising a movable pin and a coacting recess for establishing a clutch connection between the shaft and the fly wheel, said parts being proportioned to provide for restricted lost motion, a flanged cap keyed to the outer end of the shaft, a member carried by the fly wheel and overhanging the flange of said cap, the flange and overhanging member being configured to afford a tapering slot therebetween, and a wedge member mounted within said slot and adapted upon a shifting in the clutched relation of the parts to establish wedging contact therebetween to counteract the effects of lost motion in the main clutch connections, and a ring rotatably mounted upon said cap and provided with an inwardly projecting member adapted to engage with the wedge member to hold it out of wedging contact.

3. In power mechanism of the class described, the combination of a power shaft and reciprocating mechanism actuated thereby, a fly wheel freely mounted upon the power shaft, a flange collar rigidly secured to the power shaft and provided with a clutch pin, the fly wheel being provided with a recess adapted to be engaged by said pin for establishing a clutch connection between the shaft and the fly wheel, said parts being proportioned to provide for restricted lost motion, a flanged cap keyed to the outer end of the shaft, a collar surrounding a hub on the fly wheel and overhanging the flange of said cap, the flange being provided with a plurality of notches affording tapering slots in conjunction with the overhanging collar, a wedge member mounted within each of said slots and adapted upon a shifting in the clutched relation of the parts to establish wedging contact therebetween to counteract the effects of lost motion in the main clutch connections, and movable means carried by said cap and adapted to engage with the wedge members to hold them out of wedging contact.

4. In power mechanism of the class described, the combination of a power shaft and reciprocating mechanism actuated thereby, a fly wheel freely mounted upon the power shaft, a flange collar rigidly secured to the power shaft and provided with a clutch pin, the fly wheel being proportioned to provide for restricted lost motion, a flanged cap keyed to the outer end of the shaft, a collar surrounding a hub on the fly wheel and overhanging the flange of said cap, the flange being provided with a plurality of notches affording tapering slots in conjunction with the overhanging collar, a wedge member mounted within each of said slots and adapted upon a shifting in the clutched relation of the parts to establish wedging contact therebetween to counteract the effects of lost motion in the main clutch connections, and a ring rotatably mounted upon said cap and provided with inwardly projecting members adapted to severally engage with the wedge members to hold them out of wedging contact.

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