April 8, 1952 S. AIJALA 2,591,993

MULTIPAWL FEED MECHANISM

Filed Oct. 7, 1947 2 SHEETS—SHEET 1

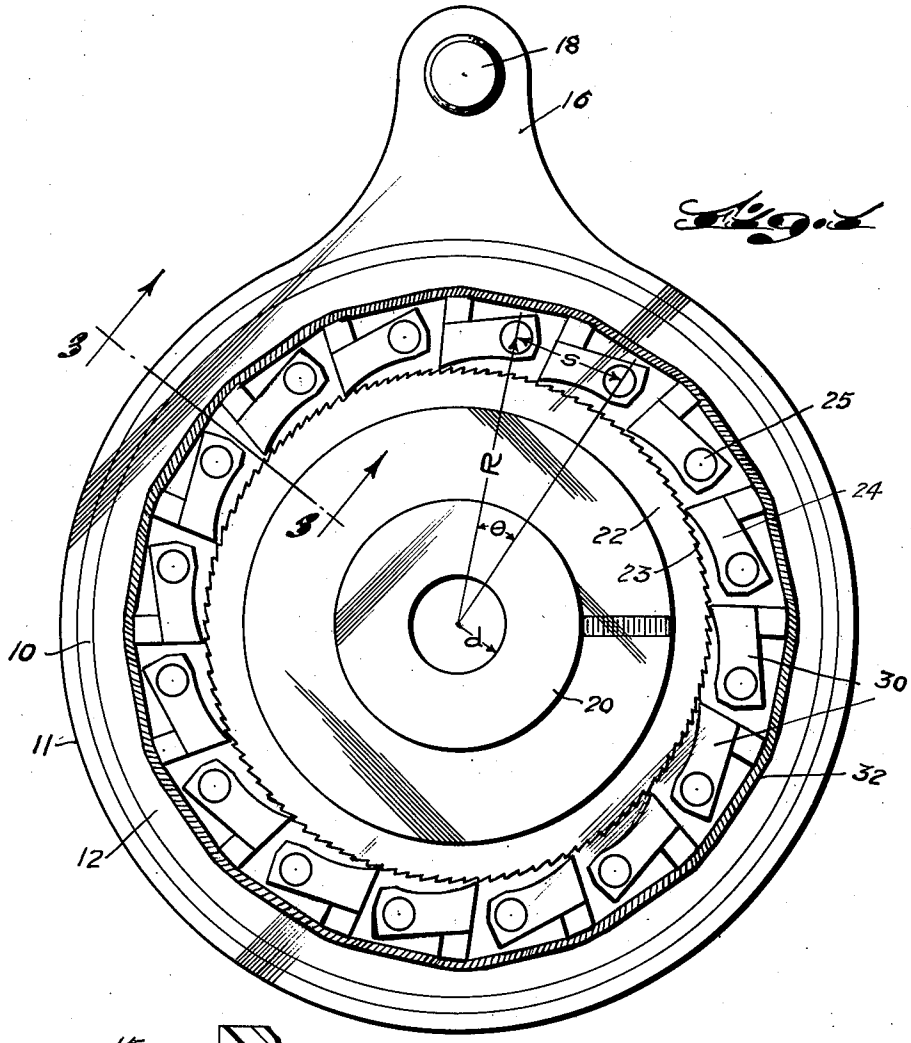



Fig. 1

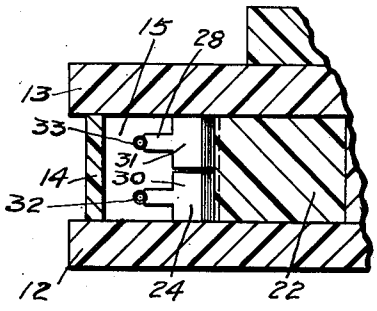



Fig. 3

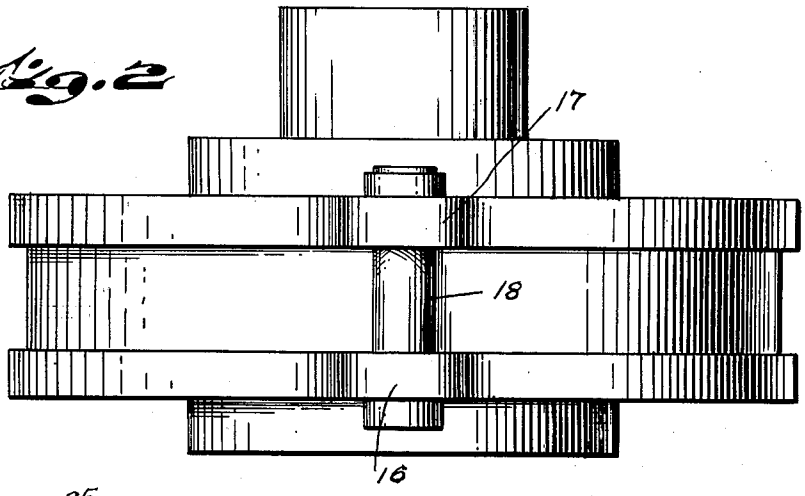
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Fig. 2



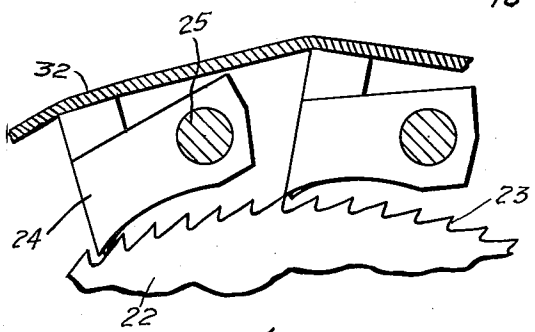




Fig. 4

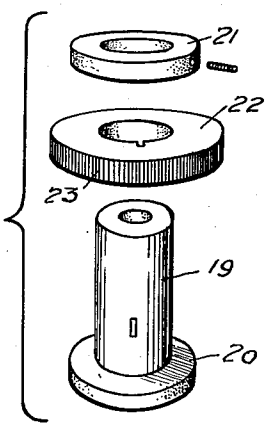



Fig. 6

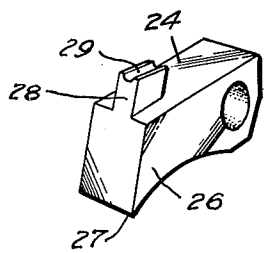



Fig. 5

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# UNITED STATES PATENT OFFICE

2,591,993

## MULTIPAWL FEED MECHANISM

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Application October 7, 1947, Serial No. 778,381

1 Claim. (Cl. 74—577)

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The present invention relates to feed mechanism for stamping presses and the like, and has particular reference to a multi-pawl feed having great accuracy.

The principal object of the invention is to provide a feed mechanism for stamping press feed rolls which provides a positive stock feed having an extremely small tolerance

Another object of the invention is to provide a feed mechanism which uses a large number of pawls, set to provide feeds accurate to two thousandths of an inch.

Still another object is to provide a simple feed mechanism which has a small number of readily manufactured and assembled parts.

With the above and other objects and advantageous features in view, the invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more specifically defined in the claim appended thereto.

In the drawings:

Fig. 1 is an elevation of a feed mechanism embodying the invention;

Fig. 2 is a top plan view of Fig. 1;

Fig. 3 is a partial section on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged detail of the ratchet parts;

Fig. 5 is a perspective view of one ratchet pawl; and

Fig. 6 is a perspective exploded view of the removable hub mounting for the feed roll shaft.

It has been found desirable to provide an accurate feed mechanism for the feed rolls of a stamping press, punch press and the like, which is positive in action, has no back lash, and is accurate to at least two-thousandths of an inch. To this end, I have devised a simple feed mechanism made of a small number of easily manufactured and readily assembled parts, which utilizes a main ratchet wheel and a large number of catch pawls so arranged that they progressively engage the teeth of the ratchet wheel for exact increments of feed travel.

Referring to the drawings, the feed mechanism 10 includes an outer housing 11 which may be made of transparent plastic if desired, and which has a front face plate 12, a rear face plate 13, and an annular shell 14 which is locked between the face plates to provide an annular compartment 15. The face plates have aligned extensions 16, 17 which receive a cross rod 18 on which a standard lever from the stamping press eccentric is pivotally mounted, whereby the housing is intermittently turned in accordance with the eccentric movement.

The face plates are bored to receive a removable hub 19, see Fig. 6, through which the shaft of a feed roll mechanism extends and is keyed,

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the hub having a fixed collar 20 at one end and a removable collar 21 at the other end, which seat against the outer surfaces of the face plates. A ratchet wheel 22 is keyed to the hub 19 and is housed between the face plates in the compartment 15, as shown in Fig. 2, the periphery of the wheel having a multiplicity of transverse ratchet teeth 23.

A series of pawls 24 within the compartment 15 are eccentrically pivotally mounted on spaced cross studs 25 which are locked in the two face plates, the studs 25 being circularly positioned in the face plates as shown in Fig. 1. Each pawl is of block type, and its forward portion 26 has a depending catch tooth or edge 27 to selectively engage the ratchet teeth 23, and each pawl has an upstanding projection 28 which is grooved as indicated by the reference numeral 29; the pawls are arranged in two adjacent annular sets 30, 31, see Fig. 2, whereby coil springs 32, 33 may extend circularly over the pawl projections 27 and seat in the grooves 29 to resiliently press the forward portions 26 downwardly into engagement with the ratchet teeth 23.

As the face plates are intermittently turned in response to movement of stamping press eccentric, the pawls also move to turn the ratchet wheel, which turns the hub and the feed roll shaft keyed therein; the pawl teeth thus accurately and positively move the ratchet wheel forwardly with no back lash and with extreme accuracy.

The accuracy of the feeding movement is controlled by the number and the setting of the pawls which selectively lock with the ratchet wheel to produce the desired exact forward movement. The shortest possible feed depends on the diameter of the feed rolls, the number of pawls, and the number of teeth of the ratchet wheel, in accordance with the formula

$$F=\frac{\pi d}{PT}$$

wherein F is the feed interval, which may vary by as little as .0009 inch, $d$ the diameter of the feed rolls, which may be 2, 3 or 4 inches, for example, P the total number of pawls, and T is the number of teeth in the ratchet wheel.

The setting of the pawl studs is determined by the formula

$$\theta=\frac{360}{T}\frac{T}{N}+\frac{360}{TN}$$

wherein $\theta$ is the angular distance between adjacent pawl studs, N is the total number of pawl studs for the feed, and

$$\frac{T}{N}$$

is a whole number, dropping the fraction if any. The dropping of the fraction is necessary to

provide clearance, and ensures a substantially complete utilization of the pawl stud circle. The linear distance from center to center between pawl studs is determined by the formula

$$S=2R \sin\left(\frac{360}{2T}\frac{T}{N}+\frac{360}{2TN}\right)$$

wherein S is the linear distance between pawl studs and R is the radius of the pawl and circle, and

$$\frac{T}{N}$$

is a whole number, dropping the fraction, if any.

When two sets of adjacent pawls are used, as shown in Fig. 2, the two sets may be slightly displaced with respect to each other, or one set of pawls may be made slightly shorter, thus permitting the pawl studs to be common for both sets and to remain perpendicular to the plane of movement. The difference in size of the pawls of the two sets to obtain the preferred step by step pawl engagement is

$$Q=\frac{2\pi R}{TP}$$

where Q is the difference in set settings.

A larger number of adjacent sets of pawls may be used to obtain still smaller feed increments. Where more than two sets of adjacent pawls are desired it is preferred to provide a number of separate ratchet disks, which should be machined together to insure exact tooth registration, and to displace the disks according to the calculated difference in set settings; this construction has the advantage that the pawls are of identical size and are interchangeable.

The invention thus provides a multi-pawl feed mechanism which is adapted to be periodically actuated or oscillated by an eccentric of standard type, the feed mechanism consisting of a housing in which a ratchet wheel is rotatably mounted, the ratchet wheel being provided with peripheral teeth which are selectively engaged by an annular series of pawls, the pawls being pivotally mounted in concentric arrangement to the ratchet wheel, and being spring pressed into selective engagement with the ratchet wheel teeth by means of an annularly disposed coil spring.

It is thus clear that the invention permits use of a large number of pawls, so set that they engage with and move the ratchet wheel for any predetermined distance, with an accuracy of one-thousandth of an inch or less, while maintaining the size of the feed mechanism within practicable limits. Thus, the feed mechanism for obtaining a feed with the described accuracy need not be over six inches in overall diameter, and one and one-half inches in width, whereby it is readily mounted on small presses.



Although I have described a specific embodiment of the invention, it is obvious that changes in the novel arrangement of parts may be made to suit the requirements for different multi-pawl feed mechanism, without departing from the spirit and the scope of the invention as defined in the appended claim.

I claim:

In a multi-pawl feed mechanism, a housing comprising a front plate, a rear plate spaced therefrom, and an annular shell locked between said plates, said plates having aligned extensions, a cross rod between said extensions adapted to be oscillated, a hub rotatably mounted in said plates and adapted to receive a shaft, a ratchet wheel keyed to said hub having a plurality of transverse ratchet teeth on the periphery thereof, cross studs locked to the plates positioned between said ratchet wheel and the annular shell, pawls pivotally mounted on said studs and having teeth at their forward ends for engagement with the ratchet teeth, said pawls having upstanding projections on said forward ends provided with spring receiving grooves, and an annular coil spring seated in said grooves and resiliently urging the forward ends of the pawls towards the ratchet wheel.

SULO AIJALA.


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