Feb. 17, 1942. L. K. MAULSBY 2,273,759

NUT CRACKING MACHINE

Filed Nov. 19, 1940 4 Sheets-Sheet 1

Fig. 1

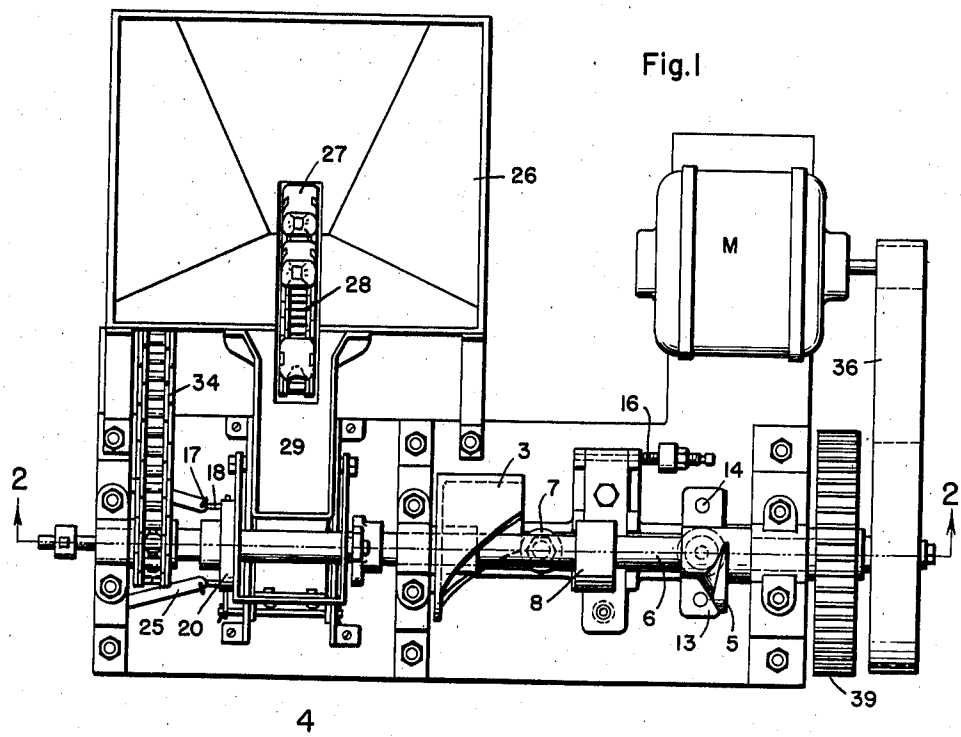
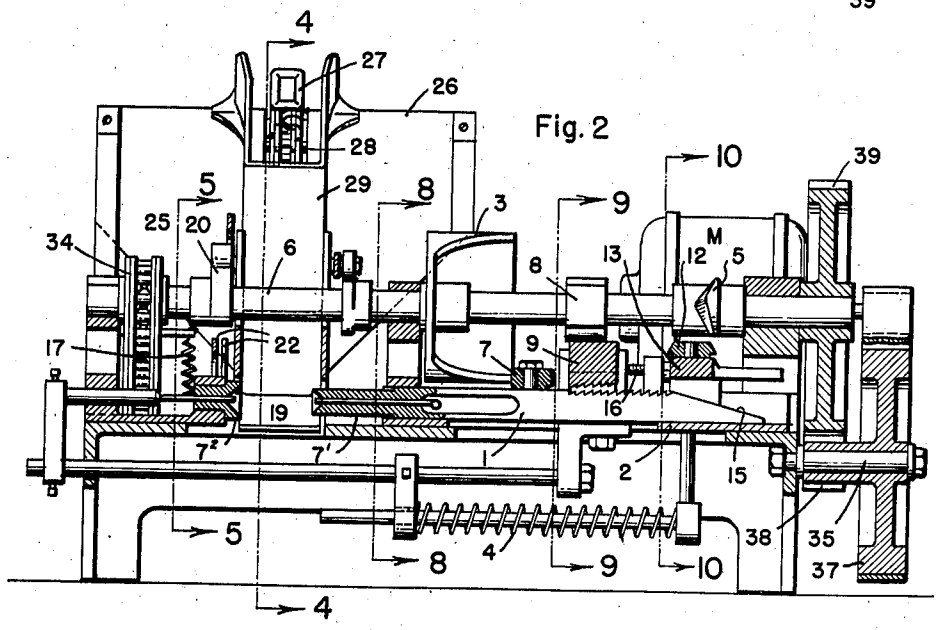


Fig. 2



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NUT CRACKING MACHINE

Filed Nov. 19, 1940 4 Sheets-Sheet 2

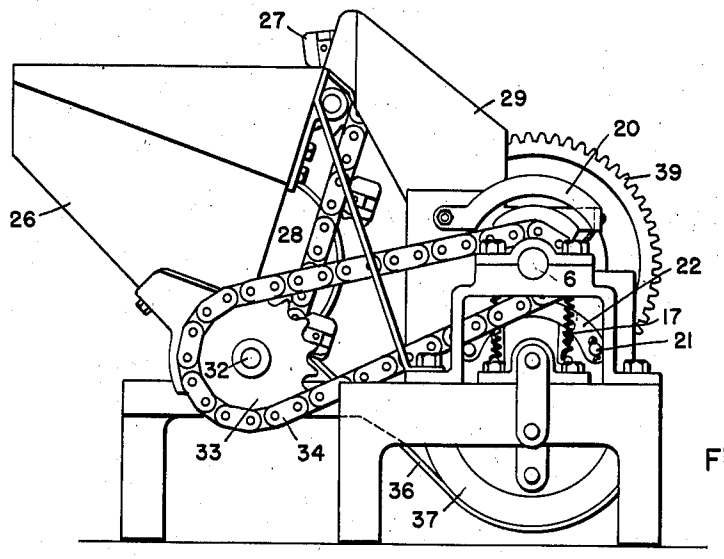


Fig. 3

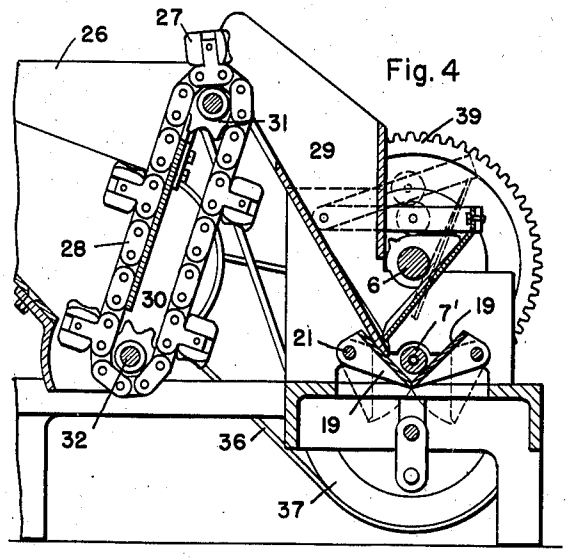


Fig. 4

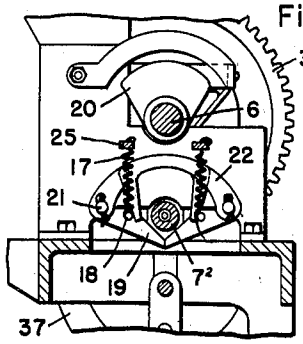


Fig. 5

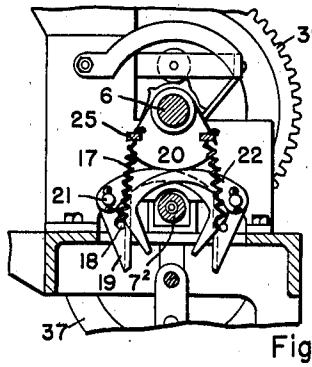


Fig. 6

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NUT CRACKING MACHINE

Filed Nov. 19, 1940 4 Sheets-Sheet 3

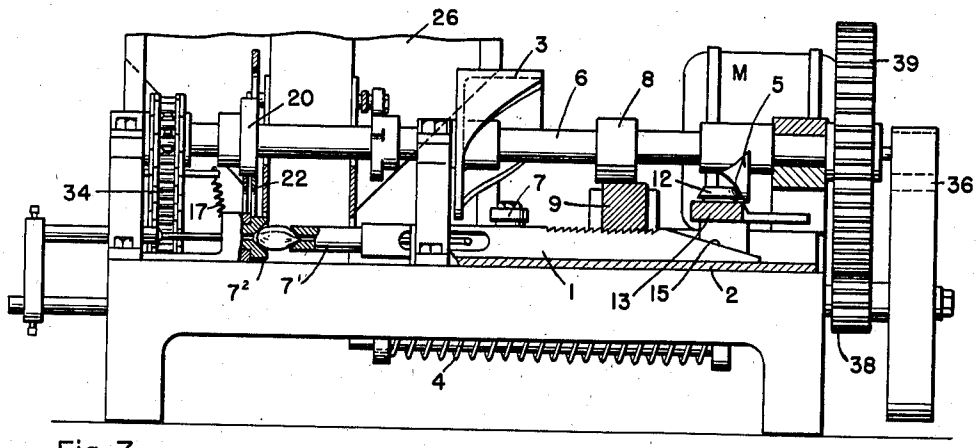


Fig. 7

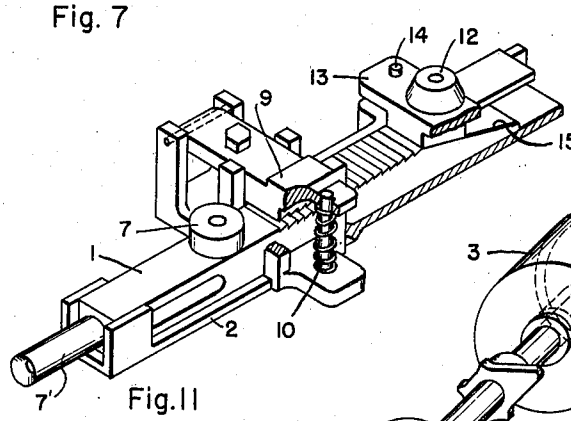


Fig. 11

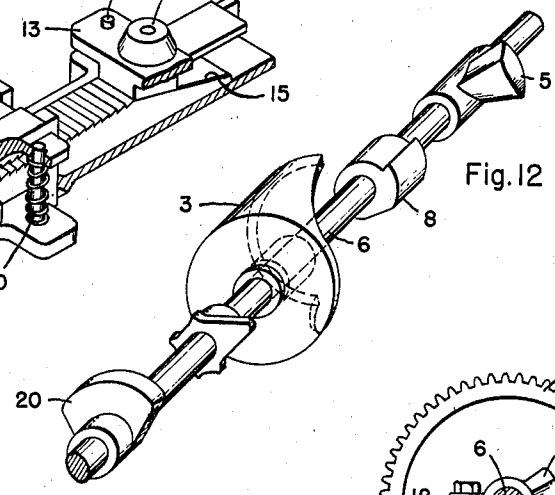


Fig. 12

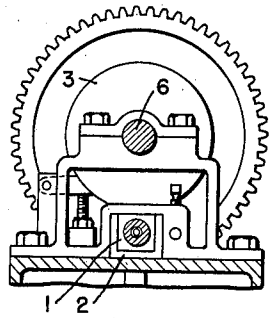


Fig. 8

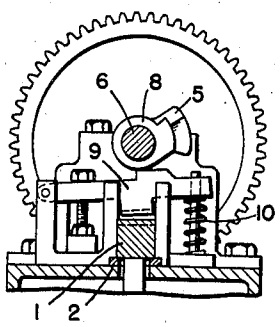


Fig. 9

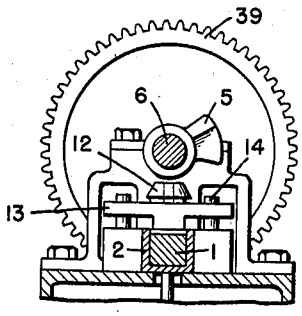


Fig. 10

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NUT CRACKING MACHINE

Filed Nov. 19, 1940 4 Sheets-Sheet 4

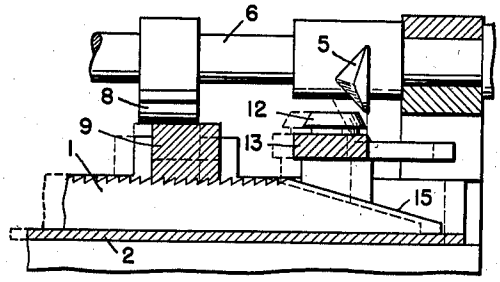


Fig. 13

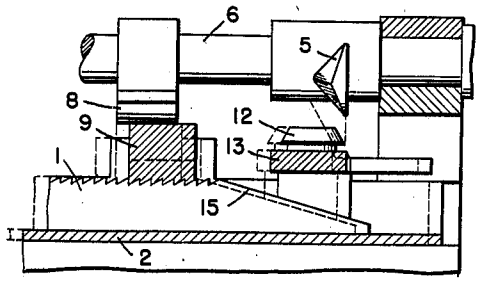


Fig. 14

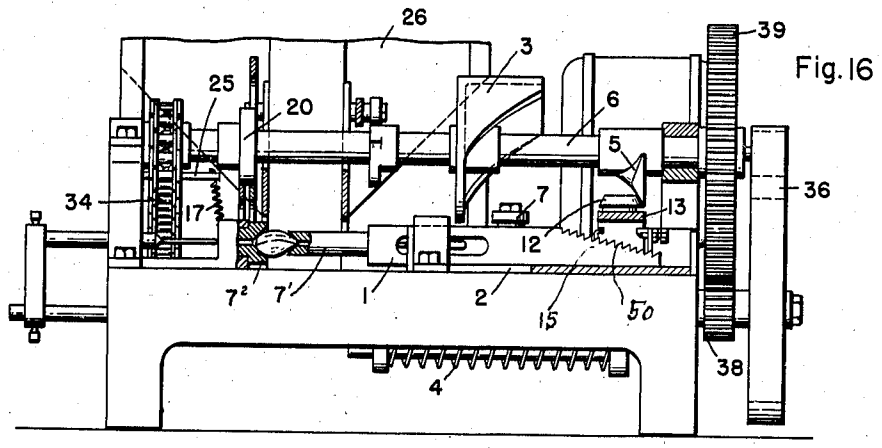


Fig. 16

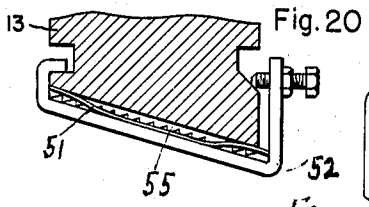


Fig. 20

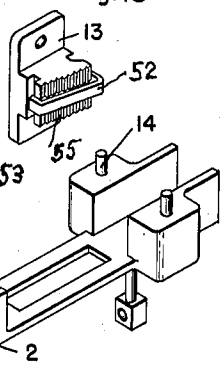


Fig. 18

Fig. 17

Fig. 19

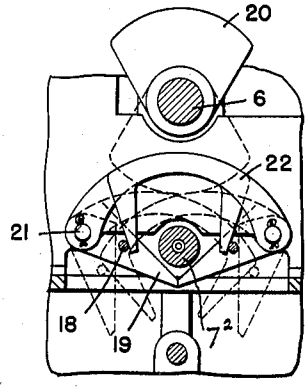


Fig. 15

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Patented Feb. 17, 1942 2,273,759

UNITED STATES PATENT OFFICE

2,273,759

NUT CRACKING MACHINE

Leon K. Maulsby, San Antonio, Tex.

Application November 19, 1940, Serial No. 366,311

15 Claims. (Cl. 146—12)

My invention relates to an improvement in nut cracking machines.

This invention is of the same general type as the one disclosed in Patent No. 2,226,475, granted to me December 24, 1940, as assignee of Delbert La Ferney.

The present invention seeks to very materially simplify the above-mentioned invention, and as it has been reduced to practice, its efficiency has been thoroughly tested and approved.

In the main it consists in an improved lock mechanism for locking the slide with relation to the carriage during the time that the nut is being cracked.

It further consists in an automatic crushing mechanism which governs the crush imparted to the nut, so that the amount of crush-travel will be directly proportional to the length of the nut, since a relatively long nut requires more crush-travel for proper cracking than a shorter nut, and, conversely, a short nut requires relatively less crush-travel than a long nut in order to prevent breakage and impairment of the meat of the nut, which is a desideratum.

Another important feature of which my present invention consists is a novel trap opening mechanism which opens the trap for discharge of the nut after it has been cracked.

In the accompanying drawings:

Fig. 1 is a plan view;

Fig. 2 is a vertical longitudinal section on the line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is an end view;

Fig. 4 is a transverse vertical section on the line 4—4 of Fig. 2, looking in the direction of the arrows;

Fig. 5 is a similar section on the line 5—5 of Fig. 2, looking in the direction of the arrows and showing the trap in closed position to receive and hold the nut in position for cracking;

Fig. 6 is a section on the same line but showing the trap open for the discharge of the nut after cracking;

Fig. 7 is a side elevation corresponding to Fig. 2, with parts in section and parts broken away and showing the slide and carriage in the position when the nut is in the act of being crushed;

Figs. 8, 9 and 10 are transverse vertical sections on the lines 8—8, 9—9, and 10—10, respectively, of Fig. 2, looking in the direction of the arrows;

Fig. 11 is an enlarged detail view in perspective and partly in section showing the mechanism for locking the slide and carriage together;

Fig. 12 is a detail in perspective showing the drive-shaft with the various cams thereon for actuating various parts of the machine at timed intervals;

Figs. 13 and 14 are two fragmentary sectional views showing the extreme opposed positions of the slide 1;

Fig. 15 is a transverse section corresponding to Fig. 5 but slightly enlarged and showing the trap closed in full lines, and open in dotted lines;

Fig. 16 is a side elevation of the main portion of the machine with parts in vertical longitudinal section in which there is a slight modification; and

Figs. 17 to 20 inclusive are details in perspective and cross-section of the modified construction shown at the right in Fig. 16.

It will be seen by referring to Figs. 1 and 2 that the movements of the slide 1 and the carriage 2 are normally independent of each other, the slide 1 being normally actuated by the cam 3 on the drive-shaft 6, in one direction, and the spring 4 in the opposite direction, while the carriage 2 is actuated by the cam 5 on drive shaft 6 in one direction and by the compression spring 4 in the other direction.

In other words, the spring 4 is a compression spring and as such is always under compression tending to move the carriage to the right and the slide 1 to the left as shown in the drawings, that is to say, the spring 4 tends to hold the carriage 2 in its rearmost position and the slide 1 in its forward position. The cam 3 allows the slide 1 to assume its forward position at the proper time for the cracking operation and returns the slide 1 against the resistance of the spring 4 for the admission of the next nut. The function of the spring 4 is, therefore, essential to the operation of the machine.

In operation, the rim of the cam 3 rotating with the drive shaft 6 by engaging the roller 7 on the slide 1 allows the slide 1, due to the action of the compression spring 4, to move forward until the cracking die 7' contacts the nut whereupon the slide 1 momentarily stops until further rotation of the drive-shaft 6 causes a cam 8 thereon to engage the back of a pawl 9 pivoted to the carriage 2, and provided on its under face with ratchet-teeth engageable with similar teeth cut in the upper face of the slide 1. Engagement of the pawl 9 with the teeth in the slide 1 serves to lock the slide 1 and the carriage together for

the cracking operation. The pawl 9 is normally held from engagement with the slide by the action of a compression spring 10 carried by the carriage and located under the front end of the pawl extension (see Figs. 9 and 11). After engagement of the pawl with the slide the cracking motion is imparted to the carriage, and consequently to the slide, by means of a cam 5 mounted on the drive-shaft 6 and acting against the roller 12. The cam 8 rotates sufficiently in advance of the cam 5 to insure engagement of the pawl 9 with the slide 1 before the cam 5 engages the roller 12 on the block 13 on the carriage 2, and the dwell of the cam 8 serves to hold the pawl 9 in its locked position until the nut has been cracked, after which the pawl is released to allow return of the slide by the action of the rim of the cam 3 on the roller 7 located on the slide 1.

In describing the action of the automatic crush mechanism, attention is invited to Figs. 2, 7 and 11. The roller 12 is carried by a block 13 mounted and guided for vertical movement on a pair of pins 14 on top of the carriage 2. The under face of the block 13 is shaped to correspond with an incline 15 provided at the rear end of the slide 1. Thus, it will be seen that when the slide is in its rearmost position, as shown in Figs. 2 and 11, the roller 12 will occupy its uppermost position which would correspond with the position of the roller when the cracking die contacts the longest nut capable of being cracked in the machine, and as the slide moves forward with relation to the carriage, the roller 12 will drop to a relatively lower position.

Attention is here invited to the shape of the face of the cam 5 which engages the roller 12 for imparting the crushing motion to the slide and carriage. (See Figs. 1, 2, 7, 11, 12, 13, 14 and 16.) It will be noticed in these figures that the roller engaging face of the cam 5 forms an obtuse angle with relation to the axis of the drive-shaft 6, the face of the cam advancing in a forwardly direction (or left-hand direction) from the periphery of the cam 5 as the distance to the longitudinal axis of the drive-shaft 6 is decreased. The shape of the cam face 5 is equally as important as the means of positioning the roller 12 in effecting an automatic crush mechanism since merely altering the position of the roller 12 with respect to the shaft 6 would not alter the amount of travel imparted to the slide 1 and carriage 2 by the cam 5 unless the face of the cam is so formed as to vary the amount of travel imparted to the carriage inversely as the distance of the roller position from the axis of the drive shaft. In other words, if the cam face were perpendicular, or at right-angles, to the axis of the drive-shaft, then, changing the position of the roller 12 with respect to the driveshaft 6 would not alter the amount of travel imparted to the carriage by the cam acting on the roller 12.

Since the amount of crushing motion imparted by the cam 5 to the carriage and the slide depends upon the height of the roller 12, increasing the height of the roller increases the travel of the carriage and slide during the crushing action, and by decreasing the height of the roller it decreases the travel.

Therefore, it follows that the farther the slide must travel to contact the nut before the pawl 9 locks the slide, the lower will be the position of the roller 12, and the amount of crush is automatically decreased in proportion to the length of the nut.

After the nut is cracked, the cam 5 rotates out of engagement with the roller 12 and the action of the spring 4 returns the carriage 2 to its normal position against the stop screw 16 (Fig. 1). The slide 1 is returned to its original position, against the force exerted by the spring 4, by engagement of the cam 3 with the roller 7.

The operation is then repeated on the next nut and regardless of its length the correct amount of crushing is accomplished.

Prior to the forward movement of the cracking die 7', the nut lies in a trap (see Figs. 4, 5 and 6) composed of a pair of plates pivoted to the body of the machine and forming a trough whereby the nut is held in proper alignment with the dies 7' and 7^2. These plates are normally held in their closed position (see Figs. 4 and 5) by the action of springs 17 attached to pins 18 carried by the plates 19, and supported at their upper ends by bars 25 extending inwardly from the frame of the machine.

After the nut has been cracked, it is necessary to open this trap to discharge the cracked nut, and for this purpose a cam 20 is provided on the drive-shaft 6. Rotatably mounted upon the pivoting pins 21 are a pair of scissor-like arms 22 bearing at their outer ends contact portions for engagement with the pins 18. These arms are formed as shown in Figs. 5 and 6, so that when the trap is closed the arms will occupy their uppermost positions as in Fig. 5, but when acted upon by the cam 20 will serve to move the pins 18 downwardly and outwardly as in Fig. 6, thus opening the trap for discharge of the cracked nut.

All the above-described mechanisms are actuated by the cams 3, 5, 8 and 20 carried by the common driveshaft 6. Consequently, each action will be performed in its proper order.

The nuts are individually carried upwardly from the bin 26 by the elevators 27 on the elevator chain 28 and dropped into the hopper 29 whence they descend one by one to the trap at the lower end of the hopper, where they are treated individually as hereinbefore set forth. The elevator chain 28 is passed around sprocket-wheels 30 and 31, and the sprocket-wheel 30 is carried by stub-shaft 32. On this stub-shaft is mounted a larger sprocket-wheel 33, and this is driven by means of a chain 34 extending from the drive-shaft 6, as shown in Figs. 1, 2, 3 and 7.

A motor M drives the pulley 37, mounted on stub-shaft 35, by means of a belt 36, and on the hub of the pulley 37 is a pinion 38 in mesh with the gear-wheel 39 which is keyed to one end of the drive-shaft 6, and by which the latter is driven, as shown in Figs. 1, 2 and 7.

In Figs. 16 to 20 inclusive, the means for locking the slide and carriage together is shown as being slightly modified. In this construction, the rear or right-hand end of the slide 1 in addition to being inclined as shown in Figs. 13 and 14 is provided with ratchet teeth 50 with an intermediate groove or track 53, and the block 13 has teeth 55 on its under side to correspond with the teeth on the slide. A cantilever spring 51 is held in a transverse groove 56, as shown in Fig. 20, on the under side of the block 13 by a keeper 52, which spring 51 in operation rides in the groove 53 provided on the incline 15 at the rear end of the slide 1. During the operation of the machine, as the slide 1 moves forward to engage the nut, the block 13 carrying the roller 12 will descend along the incline 15, thereby giving the roller 12 its correct position, and engagement of the cam 5 with the roller will serve to engage the teeth

on the under side of the block 13 with the teeth 50, and thus impart positive power for crushing the nut.

By the use of this modified construction containing the locking mechanism and the crushing mechanism, the ratchet teeth on the slide 1 of the construction shown in Figs. 2, 7, 11, 13 and 14 are transferred to the incline 15 at the rear or right-hand end of the slide 1, thereby eliminating the need of the cam 8 and the pawl 9 disclosed in the foregoing figures, the cam 5 in the modified construction serving to depress the block 13 provided with teeth 55 on its under face (as shown in Fig. 18) into engagement with ratchet-teeth 50 on the inclined rear portion 15 of the slide 1 against the action of the cantilever spring 51, which normally holds the block 13 out of engagement with the slide 1.

Another feature to be noted in connection with the angularity of the cam face 5 is, that this forwardly advancing angle of the cam face 5 is essential in order to effect engagement of the teeth 55 on the under side of the block 13, with the teeth 50 on the incline 15 at the rear of the slide 1. Since the action of the spring 51 normally holds these teeth from engagement, some means must be provided to engage them at the beginning of the crushing operation. The angular cam face 5 acting against the conical periphery of the roller 12 thus provides the means of engaging the teeth 50 and 55 at the proper time.

I claim:

1. In a machine of the character described, the combination of a carriage and slide movable independently of each other, a locking mechanism which includes teeth on the slide and a toothed pawl movably mounted on the carriage, a main drive-shaft having means thereon for directly engaging the pawl at timed intervals to cause the teeth to engage each other and lock the slide and carriage together, a cam on the main shaft, a roller on the slide in position to be engaged by the rim of the last-named cam for retracting the slide, and a spring normally under compression extending from the carriage to the slide, which spring tends to move the carriage and slide in opposite directions.

2. In a machine of the character described, the combination of a carriage and slide movable independently of each other, a locking mechanism which includes teeth on the slide and a toothed pawl movably mounted on the carriage, a main drive-shaft having means thereon for direct engagement with the pawl at timed intervals to cause the teeth to engage each other and lock the slide and carriage together, a cam on the main shaft, a roller on the slide in position to be engaged by the last-named cam for retracting the slide, and means on the carriage and independent means on the drive-shaft for periodically engaging the means on the carriage to cause the slide and carriage to move together when in their locked position.

3. In a machine of the character described, the combination of a carriage and slide movable independently of each other, a locking mechanism which includes teeth on the slide and a toothed pawl movably mounted on the carriage, a main drive-shaft having means thereon for directly engaging the pawl at timed intervals to cause the teeth to engage each other and lock the slide and carriage together, means on the carriage and independent means on the drive-shaft for periodically engaging the means on the carriage to move the slide and carriage together when in their locked position, means on the drive-shaft for returning the carriage and slide to their normal positions and a spring normally under compression extending from the carriage to the slide which tends to move them in opposite directions.

4. In a machine of the character described, the combination of a drive-shaft having cams thereon, a carriage, a die-carrying slide independently movable with respect to the carriage, means actuated by one of the cams on the drive shaft for locking the carriage and slide together at predetermined intervals, a roller carried by the slide in position to be engaged by one of the cams on the drive-shaft for moving the slide in one direction independently of the carriage, one portion of the slide having an incline thereon, a block movably connected with the carriage and carrying a roller in position to be engaged by one of the cams on the drive-shaft, under the face of the block shaped to correspond with and rest upon the incline on the slide, whereby the position of the incline with respect to the block regulates the elevation of the block and the roller carried thereby and the position of the latter with respect to the last-named cam on the drive-shaft.

5. In a machine of the character described, an automatic crush mechanism including a movable carriage and slide independently movable with respect to the carriage and carrying a nut crushing die at one end and having an incline thereon, a drive-shaft having a cam for moving the slide with respect to and independently of the carriage, means for locking the slide and carriage together at predetermined intervals, a cam on the drive-shaft for actuating the locking means, means movably connected with the carriage, the elevation of which is determined by the position of the incline on the slide, which position is determined by the length of the nut to be crushed, and means on the drive-shaft for moving the die with the required force against the nut to be crushed during the interval when the slide and carriage are locked together.

6. In a machine of the character described, a feed hopper, a trap at the lower end thereof characterized by a pair of pivotally supported plates which normally form a trough to receive a single nut held in proper cracking alignment, dies for cracking the nut, a drive-shaft, means thereon for actuating one of the dies, and means for opening the trap to discharge the cracked nut, which last-named means includes a rotary cam on the drive shaft and scissor-like arms on the plates which are moved by the cam on the drive-shaft to depress the arms and open the plates of the trap.

7. In a machine of the character described, the combination of a drive-shaft, a cam, a slide and carriage independent of each other and movable with respect to each other, the slide having an inclined end, a slidably mounted block resting above and in proximity to the inclined portion of the slide, the block carrying a conical roller in position to be engaged by the cam when the roller is forced into the path of the cam by the position of the inclined portion of the slide beneath said movable block.

8. In a machine of the character described, the combination of a drive-shaft, a cam, a slide and carriage independent of each other and movable with respect to each other, the slide having an inclined end, a slidably mounted block resting above and in proximity to the inclined portion of the slide, the block carrying a conical roller

in position to be engaged by the cam when the roller is forced into the path of the cam by the position of the inclined portion of the slide beneath said movable block, the inclined portion of the slide being toothed and the under side of the block correspondingly toothed, and means for normally holding these teeth apart ready to be forced together at predetermined intervals by the cam.

9. In a machine of the character described, a feed hopper, a trap at the lower end thereof characterized by a pair of pivotally supported plates which normally form a trough to receive a single nut held in proper cracking alignment, dies for cracking the nut, means for actuating one of the dies, and means for opening the trap to discharge the cracked nut, which last-named means includes a cam and scissor-like arms on the plates which are moved by the cam to depress the arms and open the plates of the trap.

10. In a machine of the character described, the combination of a slide and carriage movable independently of each other, one of said parts carrying a cracking die, means for automatically locking said parts together at predetermined intervals, a spring normally under compression connected with said parts which tends to move the carriage and slide in opposite directions, the slide having an inclined end, a block movably mounted above said inclined end of the slide and carrying a roller, and a cam in position to engage the roller when the latter is moved into its path, whereby to move the slide and carriage in one direction when locked together.

11. In a machine of the character described, the combination of a slide and carriage movable independently of each other, one of said parts carrying a cracking die, means for automatically locking said parts together at predetermined intervals, a spring normally under compression connected with said parts which tends to move the carriage and slide in opposite directions, the slide having an inclined portion, the inclined portion being toothed, a block movably mounted above said inclined portion and having teeth in position to engage the teeth on the inclined portion of the slide, the block carrying a roller, means for normally separating the teeth on the slide and the block, and a cam in position to engage the roller when in its path and to force said teeth together, and thereafter move the slide and carriage in one direction when they are locked together.

12. In a machine of the character described, the combination of a carriage and a slide movable independently of each other, the slide having a cracking die at one end, a roller on the slide, means for locking the slide and carriage together preliminary to the nut cracking operation, a rotary cam in position to engage the roller on the slide and move the latter in one direction after the completion of the nut cracking operation, a spring connected with the slide and carriage, said spring always under compression and tending to move the carriage and slide in opposite directions, one portion of the slide inclined, a block movably connected with the carriage, located above the inclined portion of the slide and carrying a roller, and a rotary cam in position to engage the roller on the block when the roller is forced into its path due to the position of the inclined portion of the slide beneath the block.

13. In a machine of the character described, the combination of a carriage and slide slidably connected together, the slide carrying a nut crushing die, a main shaft having a plurality of cams thereon, certain of said cams so constructed and arranged that at timed intervals they control the relative positions of the slide and carriage and lock them together, a feed-hopper, a trap at the lower end thereof characterized by a pair of pivotally supported plates which normally form a trough to receive a single nut in proper cracking alignment with the nut crushing die, means for opening the trap to discharge the nut after being crushed, said last-named means including one of the cams on the main shaft, scissor-like arms on the plates in position to be engaged at a predetermined time by the last-named cam to open the plates of the trap, and means for restoring the trap to its closed position after the discharge of the crushed nut.

14. In a machine of the character described, the combination of a slide and carriage slidably connected together, the slide carrying a crushing die at one end and having an incline on the slide displaced from the die end, a rotary cam, a block movably mounted on the carriage, the block carrying a roller located between the incline and the cam, said block having a surface conforming to said incline, the position of the incline on the slide with relation to the conforming surface on the block being determined by the length of the nut to be crushed, said rotary cam designed and arranged to perform the double function of holding the conforming surface of the block against the incline and of moving the slide in the direction of the nut to be crushed, the distance of such movement being defined and determined by the relative position of the roller with respect to the contacting surface of the cam.

15. In a machine of the character described, the combination of a slide and carriage slidably connected together, the slide carrying a crushing die at one end and having a toothed incline on the slide displaced from the die end, a rotary cam, a block movably mounted on the carriage, the block carrying a roller located between the incline and the cam, said block having a toothed surface conforming to said toothed incline, the position of the toothed incline on the slide with relation to the conforming toothed surface on the block being determined by the length of the nut to be crushed, said rotary cam designed and arranged to perform the double function of holding the conforming toothed surface of the block against the toothed incline and of moving the slide in the direction of the nut to be crushed, the distance of such movement being defined and determined by the relative position of the roller with respect to the contacting surface of the cam.

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