May 14, 1963 S. BUDLONG 3,089,345

DRIVE ARM STRUCTURE FOR RECIPROCATING MECHANISM

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Fig. 2.

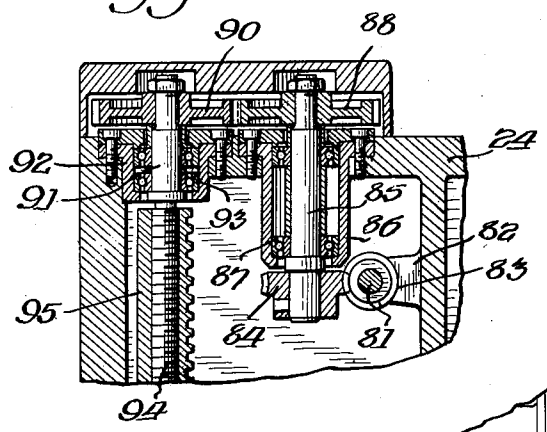


Fig. 1.

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Fig. 3.

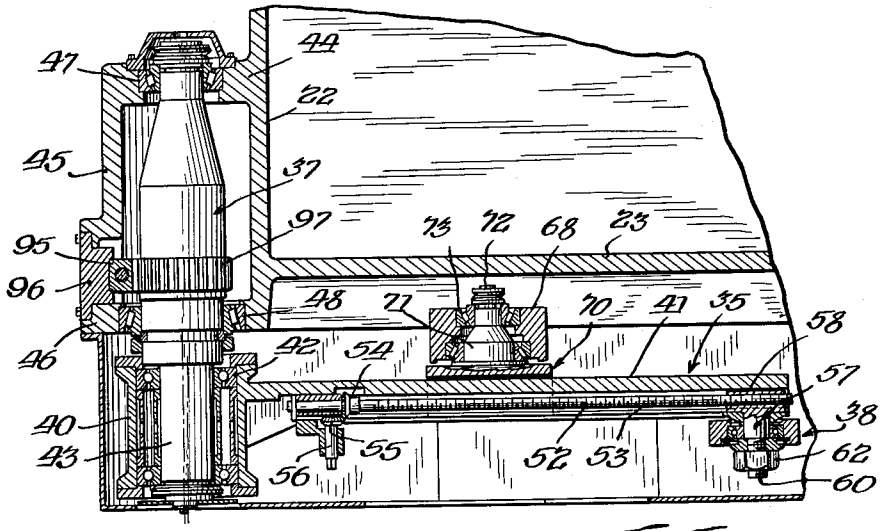


Fig. 4.

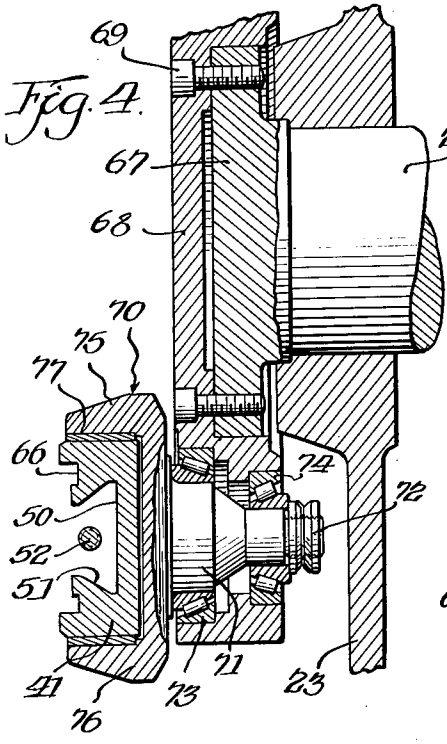
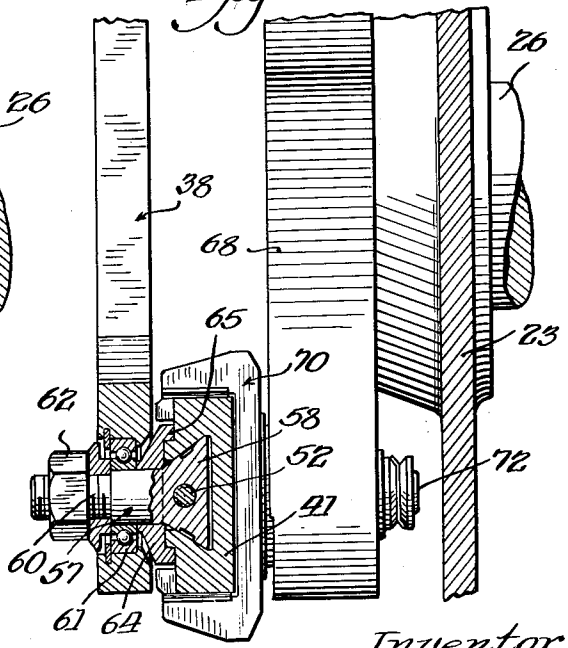


Fig. 5.



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DRIVE ARM STRUCTURE FOR RECIPROCATING MECHANISM

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9 Claims. (Cl. 74—45)

The invention relates to feeding mechanism for feeding strip material and has reference in particular to drive arm structure for reciprocating a rack which in turn drives a pair of coacting feed rolls through a ratchet or overrunning type of clutch.

In the feeding of metal strip material for cutting, punching and similar operations, it is conventional procedure to employ coacting feed rolls and which are actuated intermittently from a main drive shaft through a one-way clutch of the ratchet or overrunning type. The feed rolls are accelerated from an idle position to maximum speed during each operative stroke of the reciprocating rack, and said rolls remain at rest during the return or inoperative stroke of the reciprocating rack.

The drive arm structure of the invention comprises an improvement over that shown in the patent to Wiig 2,756,994 granted July 31, 1956, which employs an oscillatable member for reciprocating the rack and which has a relatively slow feeding stroke for a major portion of each cycle with a quick return or inoperative stroke for a minor portion of the cycle. However, the oscillatable member of the patent consists of a rack arm and a gear arm which have considerable mass so that the speed of the member is necessarily restricted. Accordingly an object of the invention is to provide improved drive arm structure wherein the various parts and elements thereof are more compactly arranged so that their mass will be reduced, and wherein higher speeds can be obtained.

Another object of the invention is to provide drive arm structure comprising relatively few parts and which will be economical to manufacture although highly efficient in operation.

Another object of the invention is to provide an oscillatable member for reciprocating a rack for intermittently feeding strip material and wherein said member will essentially comprise a single arm having a rotatable screw located centrally of the arm for adjusting the position of the pivot connection for the reciprocating rack and which will also have a driving yoke mounted for reciprocating movement on the exterior surfaces of the arm for producing the oscillating movements of the arm.

A more particular object of the invention is to provide drive arm structure of the character as described wherein the oscillatable member is located within the driving yoke and which rides with the minimum of friction on the exterior surfaces of the member.

A further object of the invention resides in the provision of an eccentric pivot for mounting the oscillatable member for movement and wherein the eccentric pivot has connection with adjusting means for effecting minute adjustments in the movement of the member and in the operative stroke of the reciprocating rack so that a high degree of accuracy in the feeding of the strip material can be obtained.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is an end elevational view of strip feeding mechanism of the intermittent type, the same incorporating the improvements of the invention;

FIGURE 2 is an enlarged sectional view showing the adjusting means for the eccentric pivot which provides the journalling means for the oscillatable member;

FIGURE 3 is a sectional view taken longitudinally through the oscillatable member and eccentric pivot substantially along line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged detail view showing the driving yoke and its operative association with the crank arm and the oscillatable member, and

FIGURE 5 is a sectional view taken substantially along line 5—5 of FIGURE 1, showing the pivot connection for the reciprocating rack.

The feeding machine selected for illustrating the present invention is generally conventional in design, although incorporating improved drive arm structure and which has variating means in combination therewith so that greater speeds during operation of the feeding machine can now be obtained. Also as a result of the variating means the operator can adjust the oscillating strokes of the member during operation, and accordingly it is possible to maintain accurate control of the feeding strokes. Referring in particular to FIGURE 1 the frame **20** consists of a base portion **21** side walls **22**, a front wall **23**, and a top wall **24**. The frame journals the main drive shaft **26**, and the top wall **24** supports the feeding rolls **27** and **28** which in turn are suitably journalled by the supports **30**. The feeding rolls are geared to rotate in unison and with the strip material **31** located between and gripped by the feed rolls, the said strip material will be fed in the desired manner as the rolls are caused to rotate. The top roll **27** is journalled by the shaft **32**, whereas the bottom and driven roll **28** is journalled by the shaft **33**. The pinion **34** is supported by the shaft **33** for independent rotation thereon, the said pinion comprising part of a one-way clutch arrangement whereby rotation of the pinion in a counter-clockwise direction only is imparted to the shaft **33** and to the feed rolls **27** and **28**, for a feeding operation. When the pinion **34** is rotated in a clockwise direction, the pinion merely rotates on shaft **33** due to the clutch device and accordingly the rolls remain at rest. Reference is made to the Wiig Patent 2,756,994 for a disclosure and explanation of the rack and pinion structure with clutch device as herein referred to and employed as elements of the present combination.

Referring again to FIGURE 1 the oscillatable member **35** is journalled at **36** by means of the pivot shaft **37**, FIGURE 3, and thus the member is suitably supported for oscillating movements in a generally vertical plane and which movements are imparted to the rack **38** having meshing relation with the pinion **34**. The rack is caused to reciprocate and in doing so the pinion **34** is rotated first in a clockwise direction and then in a counter-clockwise direction to intermittently drive the feeding rolls **27** and **28**. The oscillatable member **35**, its mounting on the pivot shaft **37**, and the pivot connection between the oscillatable member and the rack **38**, is best shown in FIGURES 3 and 5 and this structure will now be described in detail.

The oscillatable member **35** essentially comprises a single element and which may be cast of any suitable metal as a unit, with the same including the pivot or journalling portion **40** and the arm portion **41**. The journalling portion **40** is tubular in a transverse direction considering the entire member **35**, whereas the arm portion **41** extends longitudinally at right angles to the axis of the portion **40**. By means of the ball bearing assemblies **42**, the portion **40** of the oscillatable member **35** is rotatably supported for substantially frictionless movement on the projecting eccentric end **43** of the pivot shaft

37. The said pivot shaft is in turn journalled in the frame 20 by means of the front wall 23 and the auxiliary walls 44, 45 and 46. The rear auxiliary wall 44 retains the bearing assembly 47 which mounts the rear end of the pivot shaft 37, whereas the wall 46 retains the bearing assembly 48 and which mounts the pivot shaft at a location intermediate its length.

The oscillatable member 35 is formed with a longitudinal groove or recess 50, FIGURE 4, and which extends on one side for approximately the length of the arm portion. The groove is substantially dovetail in cross sectional shape and as a result the diagonal surfaces 51 are provided. Adjacent the journalling portion 40 and in alignment with the recess 50, the arm portion 41 journals one end of an adjusting rod 52, the other end of which is threaded as at 53. The bevel gear 54 is fixed to the journalled end of the rod and said gear has meshing relation with bevel gear 55 fixed to the stud shaft 56. By applying a suitable tool to the squared end of the stud shaft 56 the adjusting rod 52 can be rotated in either direction.

The pivot connection for the rack 38 is formed by the member 57, FIGURE 5, and which has a base 58 of dovetail shape substantially similar to the shape of the groove 50. The base 58 is located within said groove and the same has connection with the threaded end 53 of the adjusting rod 52. Accordingly as the adjusting rod may be rotated, the pivot connection 57 will be adjustably positioned along the length of the arm portion 41 of the oscillating member. The pivot end 60 of the connection 57 extends outwardly of the groove 50 and said end carries a ball bearing assembly 61 and nut 62 for rotatably mounting and locking the reciprocating rack 38 on said pivot end 60. The bridging plate 64 is interposed between the bearing assembly 61 and the arm portion 41. Lugs 65 are provided on the top and bottom edges of the bridging plate for location in the recesses 66 formed in the arm portion. In tightening the nut 62 in order to securely lock the pivot member 57 in adjusted position on the arm portion of the oscillatable member 35, the pressure on the diagonal surfaces 51 may be such as to spread the terminal edges defining the groove 50. To prevent this, bridging plate 64 is provided and the lugs 65 thereon hold the edges in their original spaced relation notwithstanding the pressure that may be applied to the pivot connection 57.

The crank arm structure for oscillating the member 35 has such operative connection with the arm portion 41 and its direction of rotation is such as to effect an operative feeding stroke of the reciprocating rack 38 for approximately 240 degrees of rotation, and an inoperative stroke for the remainder of the cycle or for approximately 120 degrees of rotation. Thus the feed rolls are driven relatively slow in a feeding direction to achieve maximum accuracy in the feed and which is followed by a quick return. The shaft 26 has the flange 67 formed integral therewith, and the driving disc 68 is secured to the flange by the screws 69. The connection between the driving disc 68 and the arm portion 41 essentially consists of the driving yoke 70 which provides the journalling portion 71 preferably integral therewith and which includes the threaded end 72. The portion 71 has several bearing surfaces which receive the bearing assemblies 73 and 74, the said assemblies in turn having inserted relation in the driving disc 68. Thus the structure rotatably connects the yoke 70 with the driving disc 68 to form a crank arm arrangement which is driven by the shaft 26 in a clockwise direction.

In accordance with the invention the driving yoke 70 includes the top arm 75 and the bottom arm 76, the said arms having contact respectively with the top and bottom surfaces of the arm portion 41. The yoke thus rides on the smooth top and bottom surfaces of the arm portion having reciprocating movement thereon. However, in order to reduce friction, it is desirable that a wear plate of special metal such as 77 be interposed between the coacting parts, the plates being fixed to the respective arms of the yoke on the inside surfaces thereof.

It will be understood that although the drive shaft 26 may rotate continuously, the feeding of the strip material 31 is intermittent, with the feeding taking place in a highly accurate manner. In advance of operating the machine it is necessary to position the pivot connection 57 longitudinally of the arm portion 41 so that the reciprocating rack 38 will produce the desired feeding lengths. This is accomplished by rotating the stud shaft 56 which produces rotation of the adjusting rod 52 and with the nut 62 loosened in order to free the pivot connection, the same can be moved within the groove 50 in either direction. When the desired location of the pivot connection has been obtained, the screw 62 is again tightened to lock the pivot connection to the arm portion 41.

Upon rotation of the drive shaft 26, the crank arm structure including the yoke 70 will produce oscillating movement of the member 35 and wherein the same will have an operative stroke in a downward direction for the major portion of the cycle followed by a quick return upstroke for a minor portion of the cycle. In the event the feeding lengths of the strip material are not precisely accurate, it is possible to change the feeding action of the rack 38, within limits, to either increase the feed lengths or to decrease the same with respect to the particular adjusted postion of the pivot connection 57. This is accomplished by the variating means including the eccentric portion 43 provided by the pivot member 37. The portion 43 journals the member 35 for oscillating movement and due to its eccentricity the pivot axis can be varied to effect microadjustments in the feed lengths.

Rotation of the pivot member 37 to vary the position of the eccentric portion 43 is accomplished by rotating the hand wheel 80, FIGURE 1, which, in turn, effects rotation of the shaft 81 suitably journalled by the lug 82. The worm gear 83 is fixed to shaft 81 and meshes with the pinion 84 suitably fixed to shaft 85. The said shaft is mounted in the top wall 24, being journalled by the member 86 in a substantially frictionless manner due to the ball bearing assemblies 87. The end of shaft 85 projecting above wall 24 has suitably fixed thereto the gear 88 and which meshes with a similar gear 90 fixed to shaft 91. The shaft 91 is likewise supported from top wall 24, being journalled by member 92 which provides the ball bearing assemblies 93. The portion of shaft 91 depending below member 92 is threaded as at 94 and this threaded depending end operatively connects with the rack 95. As best shown in FIGURE 3, the rack 95 is interposed between the insert 96, having a secured relation to wall 45, and the gear 97 on the pivot member 37. Any movement of the rack 95 either up or down will produce rotation of the pivot member 37 and thus a change can be made in the position of the eccentric portion 43. The structure for rotating the pivot member 37 thus enables the operator to make micro-adjustments in the feeding action of the oscillating member and which feeding adjustments can be made during operation of the machine.

The improvements of the invention make it possible to materially increase the speed of the feeding machine and without any loss in the accuracy of the feed lengths. The central groove in the oscillatable member is employed for the rack pivot connection 57, whereas the exterior surfaces are employed for mounting the driving yoke 70. Accordingly only one arm portion is required and as a result the mass and weight are considerably reduced so that higher speeds are possible. Also, this simplification in the operating parts results in greater economy in manufacturing with the same high operating efficiency.

What is claimed is:

1. In apparatus of the character described, the combination with a rack adapted to be reciprocated, of an oscillatable member for reciprocating the rack, a main drive shaft adapted to rotate constantly during operation

of the apparatus, crank arm structure fixed to and rotated by the main drive shaft, a connection between the oscillatable member and the crank arm structure including a driving yoke, said yoke providing a pair of spaced arms located on and having sliding contact with the top and bottom surfaces of the oscillatoble member, whereby rotation of the crank arm structure causes the yoke to reciprocate on the oscillatable member and produce oscillating movement of the member.

2. In apparatus of the character described, the combination with a rack adapted to be reciprocated, of an oscillatable member for reciprocating the rack, a shaft mounting one end of the member and providing an eccentric axis with respect to which the member has oscillatable movement, a main drive shaft adapted to rotate constantly during operation of the apparatus, crank arm structure fixed to and rotated by the main drive shaft, a connection between the oscillatable member and the crank arm structure including a driving yoke, said yoke providing a pair of spaced arms located on and having sliding contact with the top and bottom surfaces of the oscillatable member, whereby rotation of the crank arm structure causes the yoke to reciprocate on the oscillatable member and produce oscillating movement of the member.

3. In apparatus of the character described, the combination with a rack adapted to be reciprocated, of an oscillatable member for reciprocating the rack, said member including a journalling portion and an arm portion extending at right angles to the journalling portion, a shaft mounted for rotataion and providing an eccentric portion, the said journalling portion of the member being mounted on the eccentric portion of the rotatable shaft, whereby the arm portion of the member is supported for oscillatable movement, a main drive shaft having rotation, crank arm structure fixed to and rotated by the main drive shaft, a connection between the oscillatable member and the crank arm structure including a driving yoke, said yoke providing a pair of spaced arms located on and having sliding contact with the top and bottom surfaces of the arm portion of the member, whereby rotation of the crank arm structure causes the yoke to reciprocate on the arm portion and produce oscillating movement of the member.

4. In apparatus of the character described, the combination with a rack adapted to be reciprocated, of an oscillatable member for reciprocating the rack, a main drive shaft journalled for rotation, crank arm structure fixed to and rotated by the main drive shaft, a connection between the oscillatable member and the crank arm structure including a driving yoke, said yoke providing spaced arms located on and having sliding contact with the top and bottom surfaces of the oscillatable member, whereby rotation of the crank arm structure causes the yoke to reciprocate on the oscillatable member and produce oscillating movement of the member, a threaded adjusting rod extending longitudinally of the oscillatable member within a groove formed in the member and being journalled by the member, and a pivot member having location within the groove and being threadedly connected to the adjusting rod, said pivot member joining the rack to the oscillatable member.

5. In apparatus of the character described, an oscillatable member including a journalling portion and an arm portion extending at right angles to the journalling portion, said arm portion having smooth exterior surfaces on at least two sides thereof and having a longitudinal groove approximately centrally of arm portion, said groove having an opening in one of the remaining sides, a threaded adjusting rod disposed longitudinally within the groove and journalled at one end by the arm portion, a pivot member within the groove and adapted for adjustment longitudinally of the groove, said pivot member having threaded connection with the adjusting rod, whereby rotation of the said adjusting rod will move the pivot member along the length of the rod and thus longitudinally of the arm portion for said adjustment, a yoke having spaced arms in contact respectively with the smooth exterior surfaces of the arm portion and adapted to reciprocate on the same as movement of the oscillatable member takes place, and crank arm structure having connection with the yoke for effecting said reciprocation of the yoke and thus oscillation of the oscillatable member.

6. In apparatus of the character described, an oscillatable member including a journalling portion and an arm portion extending at right angles to the journalling portion, said arm portion having smooth surfaces on at least two sides thereof and having a longitudinal groove approximately centrally of the arm portion with an opening in one of the remaining sides, a threaded adjusting rod disposed longitudinally within the groove and journalled at one end by the arm portion, a pivot member within the groove having a part extending through the opening and adapted for adjustment longitudinally of the groove, said pivot member having threaded connection with the adjusting rod, whereby rotation of the said adjusting rod will move the pivot member along the length of the rod and thus longitudinally of the arm portion for said adjustment, a yoke having spaced arms in contact respectively with the smooth exterior surfaces of the arm portion and adapted to reciprocate on the same as movement of the oscillatable member takes place, a main drive shaft journalled for rotation, crank arm structure fixed to and rotated by the main drive shaft, said crank arm structure connecting with the yoke to cause the yoke to reciprocate and to thus cause oscillation of the oscillatable member.

7. Apparatus of the character as defined by claim 6, additionally including a shaft mounted for rotation and providing an eccentric portion, the said journalling portion of the member being mounted on the eccentric portion of the rotatable shaft, and manually actuated means for effecting rotation of said shaft.

8. In apparatus of the character described, an oscillatable member journalled at one end for oscillating movement, said member including an arm portion having smooth surfaces on at least two sides and having a longitudinal groove approximately centrally thereof and with an opening in one of the remaining sides, a threaded adjusting rod disposed longitudinally within the groove and journalled at one end by the oscillatable member, a pivot member adapted to ride within the groove and having a part extending through the opening, said pivot member having threaded connection with the adjusting rod, whereby rotation of the said adjusting rod will move the pivot member along the length of the rod and thus longitudinally of the arm portion for adjustably positioning the pivot member, means on said extending part for locking the pivot member in adjusted position, a bridging plate located between the said locking means and the arm portion, a yoke having spaced arms in contact respectively with the smooth exterior surfaces of the arm portion and adapted to reciprocate on the same as movement of the oscillatable member takes place, and crank arm structure connecting with the yoke for producing movement of the yoke in a circular path thereby producing said reciprocating movement of the yoke to cause oscillations of the oscillatable member.

9. Apparatus of the character as defined by claim 8, wherein the cross-sectional shape of the groove is approximately dovetail, and wherein the bridging plate engages the side edges of the opening to prevent spreading of the walls of the groove when pressure is applied thereto as a result of locking the pivot member in adjusted position.

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