June 28, 1966 F. M. LITTELL 3,258,263

INTERMITTENT FEEDING MECHANISM FOR STRIP MATERIAL

Filed Jan. 7, 1965

2 Sheets-Sheet 1

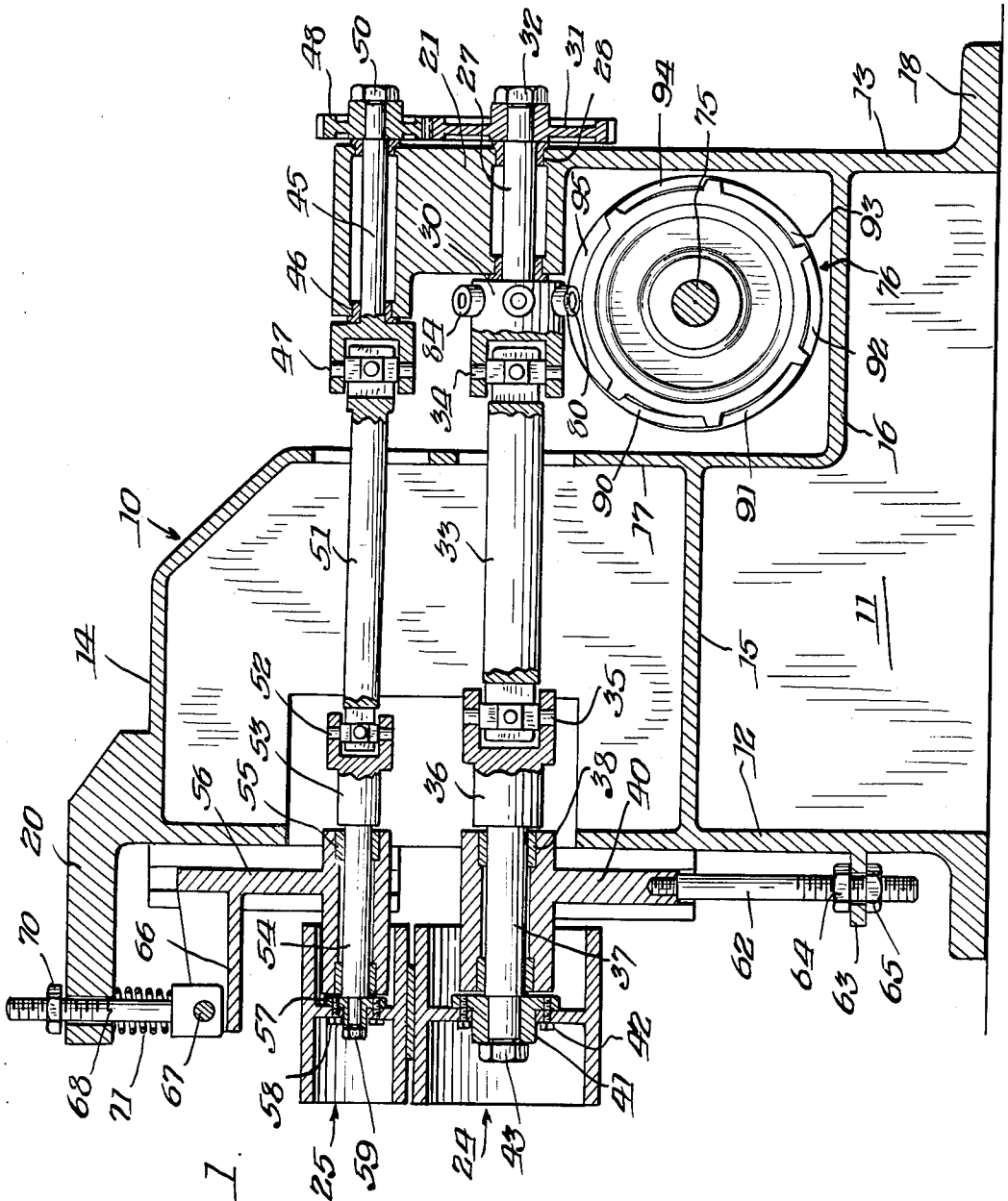

Fig. 1

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Fig. 2.

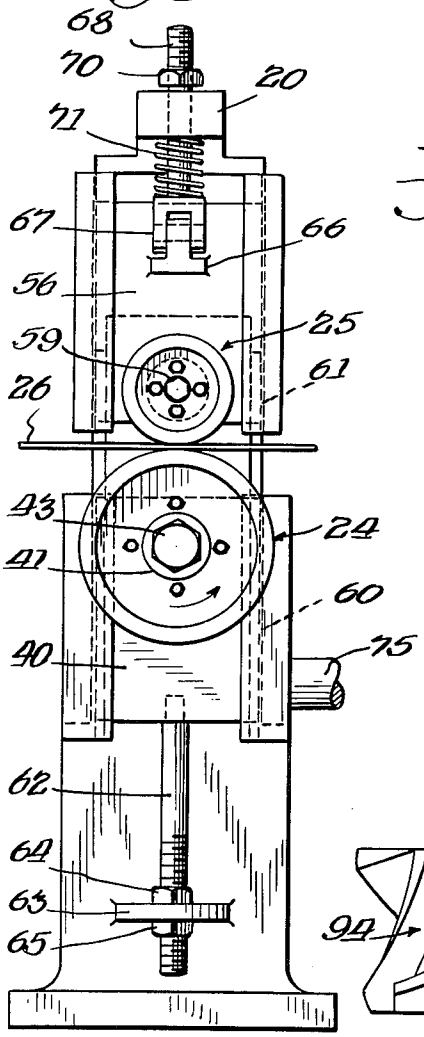


Fig. 3.

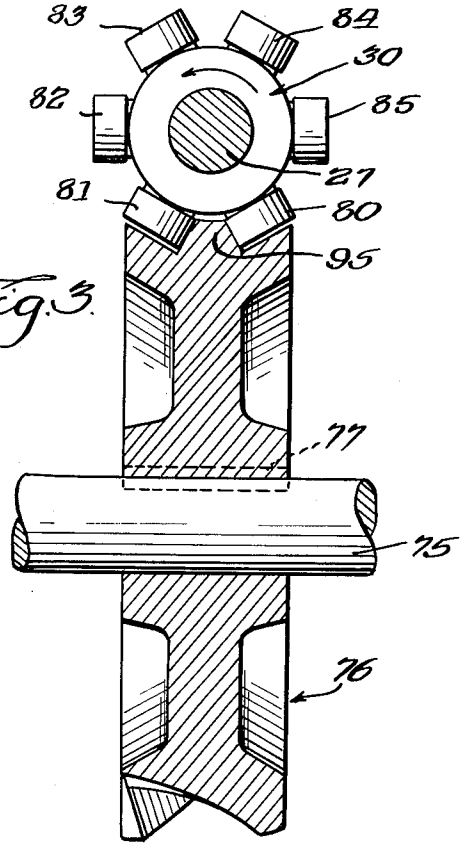


Fig. 4.

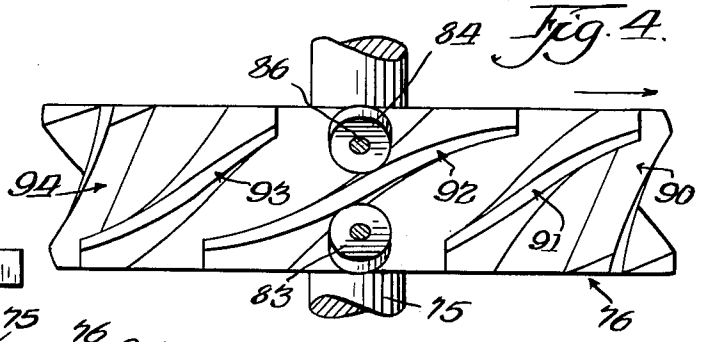
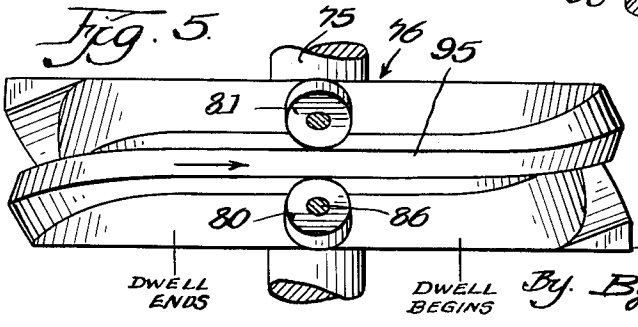


Fig. 5.



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INTERMITTENT FEEDING MECHANISM FOR STRIP MATERIAL

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4 Claims. (Cl. 271—51)

This application is a continuation-in-part of my copending application Serial No. 277,371, filed May 1, 1963 and entitled "Intermittent Feeding Mechanism for Strip Material."

The invention relates to feeding machines for feeding strip material to punch presses, cutting devices and the like and has reference in particular to a new and improved roller gear drive for intermittently rotating the feeding rolls of such feeding machines.

An object of the invention is to provide feeding mechanism for feeding strip material and which will have very little mass so that relatively high speeds can be obtained and which will feed the strip material intermittently in predetermined feed lengths, the accuracy of which can be maintained for all speeds of the mechanism.

Another object resides in the provision of coacting feed rolls having intermittent rotation for feeding measured lengths of strip material and wherein each measured length will be precisely equal to the periphery of one of said feed rolls, that is, the roll having connection with and being driven directly by the roller gear drive. Since the size of said feed roll thus determines the measured length of the strip material as fed by the machine, it will be understood that when it is desired to change the feed length it is necessary to change the feed roll for one of a different size such as will have a periphery equal to the feed length desired.

In view of the foregoing, the invention contemplates the provision of roller drive mechanism which will rotate the feed rolls in an intermittent manner and wherein deceleration and acceleration to and from the dwell period will be accomplished in a smooth manner thus eliminating shock and vibration on the feed rolls such as might destroy the accuracy of the measured feed lengths.

A more specific object is to provide a roller gear drive for intermittently rotating the feed rolls of the feeding machine and wherein each revolution of the input shaft to the roller gear drive will produce one complete revolution of the output shaft plus a dwell period and which may exist for approximately sixty degrees of rotation of the input shaft.

Another object is to provide an improved roller gear drive wherein at least two rollers on the driven output shaft will always have engaging relation with at least one of the camming teeth on the driving gear and wherein the same two rollers on the output shaft will always engage the same tooth on the driving gear for effecting the dwell period.

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.

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

FIGURE 1 is a longitudinal sectional view taken substantially vertically through a strip feeding machine and illustrating in connection therewith the several improved features of the invention;

FIGURE 2 is a front elevational view of the feeding machine as shown in FIGURE 1;

FIGURE 3 is a detail sectional view taken through the roller gear drive and which basically illustrates the mode of operation of the same;

FIGURE 4 is a plan view, parts being shown in section, illustrating the transverse arrangement and contour of the camming teeth provided by the driving input gear; and

FIGURE 5 is a plan view, parts being shown in section, illustrating the dwell portion of the driving input gear.

The feeding machine selected for illustrating the invention is shown in FIGURE 1 as including a frame or housing **10** having side walls **11**, a front wall **12**, a rear wall **13** and a top wall **14**. The housing **10** is reinforced internally by the horizontal partition walls **15** and **16** and by the vertical partition and connecting end wall **17**. The side, front and rear walls are provided with a base extension **18** which forms a supporting foot for the housing. At the top of the front wall **12** an overhanging extension **20** is provided and which may be integral with both the front and top wall. However, the journalling portion **21** is part of the rear wall **13** only, being preferably formed integral with said wall.

Two driven shafts are journalled by the housing **10** and the said shafts at their forward projecting end carry the feeding rolls **24** and **25** of the feeding machine. When the metal strip material **26** is engaged by the feeding rolls **24** and **25** and assuming that roll **24** is rotated in a counter-clockwise direction as shown in FIGURE 2, then the strip material will be fed in a direction towards the left. The intermittent rotation of the feed rolls will advance the material in measured feed lengths. During the dwell period of the feeding rolls, the strip material will remain at rest and various machine operations may then be performed on the material, or the material may be cut into individual lengths each having the same precise measurement as determined by the feeding action of the feed rolls.

Each of the driven shafts are sectional having journalled end portions joined to an intermediate connecting member by means of universal joints. This structure is required since the rolls **24** and **25** are vertically adjustable for separation in order that the strip material **26** may be initially inserted between the rolls in the operation of setting up the machine.

Considering first the shaft for feed roll **24**, it will be seen from FIGURE 1 that the rear portion **27** is journalled in the section **21** by means of bearings **28** and that said shaft portion is fixed at its projecting left-hand end to a roller member **30**. The shaft portion and roller member may be suitably keyed to each other or the parts may be formed as an integral unit. The projecting right-hand end of shaft **27** is reduced in diameter for receiving the gear **31** which is keyed to the shaft and held in assembled relation by the nut **32**. The roller member **30** is provided

with a recess which receives the end of the connecting member 33 and the parts are joined, as previously mentioned, by a universal joint including the pins 34. The forward end of the connecting member 33 is also provided with a universal joint which employs the pins 35. The said universal joint connects with the rear part 36 of the shaft portion 37 which is journalled by the bearings 38 in the adjustable member 40. The forward end of shaft portion 37 is reduced in diameter and said reduced end receives the hub 41 to which is fixedly secured the feed roll 24 by means of the bolts 42. The nut 43 is threaded to the end of shaft portion 37 for locking the feed roll 24 to said shaft.

The shaft for the upper roll 25 includes the rear shaft portion 45 which is journalled in the section 21 by the bearings 46. The left-hand end of the shaft portion is preferably integral with the housing of a universal joint which includes the pins 47, whereas the right-hand end is reduced in diameter and said reduced end receives the gear 48. Said gear is keyed to the shaft and held in assembled relation by the nut 50. The connecting member 51 is joined at its left-hand end by a universal joint including the pins 52 and provided by the part 53 having the shaft portion 54 integral therewith. The shaft portion 54 is journalled for rotation by the bearings 55 in an adjustable member 56. The forward end of the shaft 54 is reduced in diameter for receiving the hub 57 and the roll 25 is fixed to the hub by the bolts 58. The hub is held to the shaft portion 54 by the nut 59.

The members 40 and 56 are adjustable in a vertical direction in order that the feeding rolls may be separated to initially receive the strip material. Member 40 rides in guideways 60 and member 56 rides in similar guideways 61, FIGURE 2. Adjustment of member 40 is effected by means of the depending bolt 62, the threaded end of which extends through the ledge 63 provided by the front wall 12. The nuts 64 and 65 maintain the bolt and thus the member 40 in adjusted position which, however, can be varied by changing the position of the nuts.

The ledge 66 of member 56 has pivotally connected thereto at 67 the bolt 68 which projects through an opening in the over-hanging extension 20. The projecting threaded end of the bolt 68 receives the nut 70 and the coil spring 71 is confined between the base of the bolt and the said extension. When the parts are positioned as shown in FIGURE 1, the coil spring 71 exerts a resilient force on member 56 which thus maintains the top roller 25 in resilient contact with the strip material during the feeding operation. The bite of the rolls on the material is thus accentuated to insure the feeding of the material when the rolls are rotated.

The two shafts generally designated by numerals 33 and 51 are geared to rotate in unison and to an equal extent by means of the gears 31 and 48 which have meshing relation with each other. The same ratio as regards the diameter of roll 25 to roll 24 is maintained in connection with the pitch diameter of the gear 48 to gear 31. Thus, the feeding action of the two rolls on the strip material is equal at all times. It is also contemplated by the invention that the feeding lengths of the strip material as fed by the machine will equal the peripheral length of feed roll 24. Thus, each feeding operation requires only one complete revolution of the roll 24. When a different feed length is desired, the feed rolls 24 and 25 are removed and a feed roll having the desired peripheral length is substituted for roll 24. A substitution will also be required for roll 25 and since the ratio between the diameter of the rolls is accordingly changed, gears 31 and 48 must also be removed and replaced by gears of different diameters. The pitch diameters of the replaced gears must be such as to maintain the same ratio with respect to the gears as exists with respect to the feed rolls.

The roller gear drive for rotating the feeding rolls

24 and 25 is designed to produce intermittent rotation of the rolls from a continuously rotating input shaft. More particularly, the drive mechanism contemplated by the invention will rotate the roll 24 for a complete revolution plus a dwell period for each revolution of the input shaft. In the illustrated embodiment it is therefore necessary for the roll 24 to rotate three hundred sixty degrees while the input shaft is rotating three hundred degrees with the remaining sixty degrees forming the dwell period during which the roll 24 will remain at rest.

The input shaft 75 is continuously driven at the desired uniform speed by any suitable form of power and it will be understood that the shaft is journalled for rotation by the side walls 11 of the housing 10. Within the compartment formed by the rear wall 13 and by the partition walls 16 and 17 the input shaft 75 has a drive gear 76 keyed thereto at 77, the said drive gear having a plurality of specially contoured camming teeth and a dwell tooth formed on its periphery as will be presently described. The said teeth of the drive gear are adapted to coact with a plurality of individual rollers of a roller assembly carried by the roller support 30. The said rollers as best shown in FIGURE 3 are indicated by the numerals 80 to 85, inclusive. Each roller is journalled for rotation on a stud shaft such as 86 provided by the roller support 30 and during operation each individual roller is caused to selectively engage the camming teeth 90, 91, 92, 93 and 94 formed on the periphery of the drive gear 76. Since the camming teeth have a general transverse direction on the periphery of the driving gear, they eflect a camming of the engaged rollers and thus, the roller assembly 30, the shaft 33 and the feed roll 24 are given rotation. The camming of any pair of rollers such as rollers 83 and 84 as shown in FIGURE 4 will effect sufficient rotation of the roller assembly 30 to cause the next adjacent roller 85 and then roller 86, et cetera, to enter their respective spaces between the camming teeth so that said rollers will be similarly cammed as rotation of the drive gear 76 continues. Each of the camming teeth 90, 91, 92, et cetera, are disposed transversely of the driving gear at approximately a thirty degree angle. However, this specific angular positioning is not critical since the same may vary from thirty to forty-five degrees depending on the character of rotation desired of the output shaft 27. It will also be observed that each camming tooth has a special contoured shape which has been designed to promote the desired rotation of the output shaft 33 by the camming action imparted to the rollers. For approximately three hundred degrees, the periphery of the drive gear will be equipped with camming teeth such as 90, 91, 92, et cetera, as described and it will be understood that the said teeth are so constructed and arranged that during the three hundred degrees of rotation of the drive gear, the roller assembly 30 will be rotated for three hundred and sixty degrees thereby giving a complete rotation to the feed roll 24. During rotation of the drive gear for the remaining sixty degrees, the rollers 80, 81 are caused to engage the dwell tooth 95 as best shown in FIGURE 5. For producing the dwell period the tooth 95 is disposed parallel to the sides of the drive gear 76 or, in other words, the dwell tooth 95 will be parallel to the output shaft 33. Accordingly, although the drive gear 76 continues to rotate, the rollers 80 and 81 are not cammed by reason of the parallel disposition of tooth 95 and accordingly, the roller assembly 30 and the rolls 24 and 25 remain at rest.

In the illustrated embodiment of the invention a dwell period of approximately sixty degrees is contemplated. It is, of course, possible to design drive gears which will produce a dwell period ranging from approximately thirty degrees of rotation of the input shaft to approximately ninety degrees of rotation. The inclination of the camming teeth and the length of the dwell tooth for the drive gear are factors of design which will have to be ascertained for any particular dwell period. In all cases,

however, the camming teeth will occupy the major portion of the periphery of the drive gear, with the dwell tooth occupying the minor portion.

For inserting the strip material **26** between the rolls **24** and **25**, the adjustable member **40** can be lowered or member **56** can be elevated. When the parts have been returned to original position as illustrated in FIGURE 1 the machine is ready for a feeding operation and continuous rotation of the input shaft **75** takes place. With rotation of the drive gear **76** the camming teeth will cam the rollers of the member **30** in the manner as described and the shaft **33** for the feed roll **24** will accordingly rotate. Due to the meshing relation of gear **31** with gear **48**, the shaft **51** is also rotated and said rotation is further effected by the bite of the feed rolls **24** and **25** on the strip material. However, the peripheral speed of the roll **25** is maintained equal to that of roll **24** since the pitch diameter of the gears has the same ratio one to the other as the diameters of the said rolls.

The rotation of the feed rolls will continue until one complete revolution of feed roll **24** has taken place. In the embodiment as disclosed, this operation will require approximately three hundred degrees rotation of the drive gear **76**. For the remaining sixty degrees of rotation of the drive gear, the tooth **95** will be in contact with the rollers **80** and **81**, and the feed rolls will remain at rest during this dwell period.

It will be observed that the invention provides a cantilever arrangement for the feeding rolls **24** and **25** and which materially facilitates the initial insertion of the strip material between the rolls. In order to produce this cantilever arrangement the portions **37** and **54** of the output and secondary shafts, respectively, extend beyond their bearings **38** and **55**. The feed rolls **24** and **25** are releasably secured to the said extending portions **37** and **54** of the journalled shafts. As a result of this structure the feed rolls are readily available to the operator, and it is relatively easy to effect their separation and insert or remove the strip material which is to be fed by the rolls.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In a feeding machine for feeding strip material, in combination with a pair of feeding rolls comprising a main roll and a secondary roll adapted to engage a strip of material located between the rolls, a journalled output shaft for the main roll and to which the roll is non-rotatably secured, a second journalled shaft to which the secondary roll is non-rotatably secured, spaced bearing means for journalling the shafts, respectively, the said bearing means for each shaft being located inwardly of the roll secured to the shaft, whereby the roll is carried by that portion of the shaft extending beyond the bearing means, a gear fixed to each shaft at the end opposite the feed roll and said gears having meshing relation, universal joint means incorporated in each shaft between the said spaced bearings thereof whereby the feeding rolls may be separated for initially receiving the strip material therebetween, means for driving the said journalled output shaft comprising a continuously rotating input shaft, a roller assembly on the journalled output shaft, and a gear drive on the input shaft having operative connection with the rollers of the roller assembly, said gear drive having a plurality of camming teeth and a dwell tooth on its periphery, and said teeth being so constructed and arranged as to produce a complete revolution of the output shaft plus a dwell period for each complete revolution of the input shaft.

2. In a feeding machine, in combination, a frame member, an output shaft journalled at its respective ends by the frame member, a main feeding roll fixed to one end of the output shaft, a gear fixed to the opposite end of the output shaft, a second shaft journalled at its respective ends by the frame member, a secondary feeding roll fixed to one end of the scond shaft and adapted to coact with the main feeding roll, a second gear fixed to the opposite end of the second shaft and adapted to have meshing relation with the gear on the output shaft, means for driving the output shaft to rotate the feeding rolls, said means comprising a continuously rotating input shaft, a roller assembly on the output shaft providing a plurality of rollers adapted to rotate on angularly spaced, radially disposed axes, and a gear drive on the input shaft having operative connection with the rollers of the assembly, said gear drive having a plurality of camming teeth on its periphery which are disposed generally transversely thereof and said gear drive also having a dwell tooth on its periphery, the camming teeth occupying approximately three hundred degrees of the periphery of the gear drive, the dwell tooth extending for approximately sixty degrees of the periphery of the gear drive, and the same two rollers on the roller assembly always having contact with the dwell tooth for producing the dwell period, whereby the roller assembly and the said gear drive are so constructed and arranged as to produce a complete revolution of the output shaft plus a dwell period for each complete revolution of the input shaft.

3. In a feeding machine, in combination, a frame member, an output shaft journalled at its respective ends by the frame member, a main feeding roll fixed to one end of the output shaft, a gear fixed to the opposite end of the output shaft, a second shaft journalled at its respective ends by the frame member, a secondary feeding roll fixed to one end of the second shaft and adapted to coact with the main feeding roll, a second gear fixed to the opposite end of the second shaft and adapted to have meshing relation with the gear on the output shaft, means for driving the output shaft to rotate the feeding rolls, said means comprising a continuously rotating input shaft, a roller assembly on the output shaft providing a plurality of rollers adapted to rotate on angularly spaced radially disposed axes, and a gear drive on the input shaft having operative connection with the rollers of the assembly, said gear drive having a plurality of camming teeth on its periphery which are disposed generally transversely thereof and said gear drive also having a dwell tooth on its periphery, universal joint means on the output shaft and on the second shaft, respectively, and located between the journalled ends of said shafts, whereby the feeding rolls may be separated for initially receiving a strip of material therebetween, the camming teeth of said gear drive occupying approximately three hundred degrees of the periphery of the gear drive with each tooth being transversely disposed on an angle ranging from thirty to forty-five degrees, and the same two rollers on the roller assembly always having contact with the dwell tooth for producing the dwell period, whereby the roller assembly and the gear drive are so constructed and arranged as to produce a complete revolution of the output shaft plus a dwell period for each complete revolution of the input shaft.

4. In a feeding machine for feeding strip material, in combination with a pair of feeding rolls comprising a main roll and a secondary roll adapted to engage a strip of material located between the rolls, a journalled output shaft for the main roll and to which the roll is fixedly secured, a second journalled shaft to which the secondary roll is fixedly secured, spaced bearing means for journalling the shafts respectively, at least one of said bearing means for each shaft being located inwardly of the roll secured to the shaft, whereby the roll is carried by that portion of the shaft extending beyond the bearing means, means for driving the output shaft to rotate the feeding rolls, said means comprising a continuously rotating input shaft, a roller assembly on the output shaft providing a plurality of rollers adapted to rotate on an-

gularly spaced, radially disposed axes, a gear drive on the input shaft having operative association with the rollers of the assembly, said gear drive having a plurality of camming teeth on its periphery which are disposed generally transversely thereof and said gear drive also having a dwell tooth on its periphery, the camming teeth occupying the major portion of the circumference of the gear drive and the dwell tooth occupying the minor portion of the circumference, and the same two rollers on the roller assembly always having contact with the dwell tooth for producing the dwell period, whereby the roller assembly and the said gear drive are so constructed and arranged as to produce a complete revolution of the output shaft plus a dwell period for each complete revolution of the input shaft.

References Cited by the Examiner

UNITED STATES PATENTS

815,879	3/1906	Richards	74—84
1,284,733	11/1918	Maier	74—84
2,538,950	1/1951	Schryber	226—187 X
2,548,136	4/1951	Auer	226—187 X
3,007,345	11/1961	Hider	74—84 X
3,049,017	8/1962	McDonald et al.	74—84
3,069,058	12/1962	Haff	226—187 X
3,181,378	4/1965	Petroff	74—84

FOREIGN PATENTS

161,770	7/1905	Germany.

OTHER REFERENCES

Ferguson Machine Co., Catalog 107, 7–60.

References Cited by the Applicant

UNITED STATES PATENTS

1,284,733	11/1918	Maier.
2,548,136	4/1921	Auer.
3,007,345	11/1961	Hider.

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