

PATENT SPECIFICATION

DRAWINGS ATTACHED

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Jump feed apparatus for a sliding clasp fastener chain making machine.

COMPLETE SPECIFICATION

I, TADAO YOSHIDA of 339, 2-chrome, Suwadacho, Ichikawa-shi, Chiba-ken, Japan, a Japanese citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to a jump feed apparatus for use in conjunction with a machine for making sliding clasp fastener chains.

The apparatus according to the invention provides means whereby it is possible to feed tape continuously into a machine for making sliding clasp fastener chains and to regulate the input of teeth elements so that chains are produced predetermined lengths of which carry no teeth.

The apparatus according to the invention comprises a jump feed apparatus for a machine for making sliding clasp fastener chains which comprises a gear including forward and reverse driving members, which gear is connected to the crank shaft of the chain making machine, a shift key whereby forward or reverse gear can be automatically engaged, a graduated circular plate, driven through the gear and axially mounted on a feed screw, controlling the input of teeth to the chain making machine, the graduations on the plate corresponding to the number of teeth fed to the chain making machine, a graduated scale mounted on the graduated circular plate and adapted to activate at predetermined intervals a plunger connected to means for stopping the input of teeth to the chain making machine, and means for accurately adjusting the position of the plunger by way of a screw of the same pitch as the feed screw.

A preferred embodiment of the invention is shown in the accompanying drawings in which:

Figure 1 is a side elevation of the apparatus, partly in section.

(Price 3s. 6d.)

Figure 2 is a diagrammatic partly sectional view of the gear train in the gear box.

Figure 3 is a side elevation of Figure 2 when looking in the direction indicated by arrows A—A.

Figure 4 and Figure 5 show the jump feed mechanism partly in section.

Figure 6 is a side elevation of part of Figure 4 looking in the direction indicated by arrows B—B.

Figure 7 is a side elevation of a part of Figure 4 looking in the direction indicated by arrows C—C.

Figure 8 is a side elevation of part of Figure 5 looking in the direction indicated by arrows D—D.

Figure 9 is a side elevation of part of Figure 8 looking in the direction indicated by arrows E—E.

Figure 10, A and B, show the solenoid and its operation.

Figure 11 shows the operation of the ratchet.

Referring now to the drawings, explanations will be given as under:

(1) Power transmission mechanism:

A shaft 1 is connected to the crank shaft of a machine for making sliding clasp fastener chains, and rotates a gear 2 mounted on a shaft 3, which also carries a gear wheel 4. The gear 4 engages with a gear 5 mounted on a shaft 6, on which is also mounted a change gear wheel 7. The gear wheel 4, as shown in Figure 3, drives a gear wheel 8 directly, and, as illustrated in Figure 4, the gear wheel 8 only revolves in the direction indicated by the arrow *a* while a gear wheel 9 mounted coaxially with gear wheel 8, only revolves in the direction indicated by arrow *b*. The gear wheels 8 and 9, are engaged or disengaged by the motion of a shifting key 10, whereby the direction of rotation of a shaft 12 can be reversed. The shifting key 10 is held in position by a pin 11 which is acted by a spring 13. When the shifting key 10 is

placed into the gear wheel 8, the shaft 12 revolves, as shown in Figure 4, in the same direction (indicated by an arrow A) as the gear wheel 8, and a toothed part 12a in the shaft 12, which engages with the toothed circumference of a graduated circular plate 14 and revolves the graduated circular plate 14 and the associated nut 15 about a feed screw 17 so that the circular plate moves along the feed screw 17 in the direction of arrow c. When the graduated circular plate 14 has moved a certain distance in the direction of arrow c a stop 28 on the circular plate comes into contact with a stop 34 on the casing of the machine and the rotation of the graduated circular plate 14 is arrested.

However, when the circular plate 14 ceases to rotate the gear wheel 8, which is driven directly by the gear wheel 4, tries to continue to rotate and the shifting key 10 is forced out of a V-shaped groove 40, and allows the pin 11, under the action of spring 13, to move into a V-shaped groove 41, and the pin 11 moves out of a slot x in the shifting key 10 and into a slot y. Referring now to Figure 4 and Figure 6, when the shifting key 10 enters the V-shaped groove 41 of gear wheel 9, the shaft 12 rotates in the same direction as gear wheel 9 as indicated by an arrow b. Therefore, the circular plate 14 rotates in the direction indicated by an arrow d, until, as shown in Figure "c" part of a plate 29 fixed to the circular plate 14 makes contact with a stop 33 fixed to a plunger shield 25, and the shifting key shifts from the gear 9 to the gear 8 and the graduated circular plate 14 rotates and moves in the direction indicated by the arrow c. (Refer to Figure 5 and Figure 8).

The above described sequence is repeated continuously.

(2) Regarding the jump feed mechanism:

On the back and front faces of the graduated circular plate 14, there are, as shown in Figure 7 and Figure 8, a horse shoe shaped graduated bat 18 fixed with a collar 20 and a horse shaped graduated bar 19 fixed with a plate 21.

When the graduated circular plate 14, is revolved by the gear wheel 8 and moved, as shown in Figure 4 in the direction indicated with an arrow c, the bar 18 contacts the head of a plunger 22 and presses it down. The bottom end of the plunger 22 presses down an L-shaped lever 26 supported by a spring 27, and actuates the lever 32a of a micro-switch 32 and an electric current, flows from the micro-switch 32 through a cable 42 to a solenoid 43 whereby an iron core 44 is driven in the direction of the arrow e. Shaft 48 is a roller shaft which drives the crank shaft of the means for feeding teeth for making the sliding clasp fastener chains. Shaft 48 is driven by a crank shaft by way of a swing arm 49, a connector 51 and a joint 50; drive

is finally transmitted through a clutch-like mechanism which comprises pawl 46 which engages with a ratchet wheel 47 fixed to the roller shaft 48, which pawl 46 swings with the swing arm 49 and transmits drive to the roller shaft 48 at regular intervals by means of the ratchet wheel 47. When the iron core 44 moves in the direction of the arrow e, the head of an adjustable bolt 45 fixed at the end of the iron core 44 disengages the pawl 46, as shown in Figure 11, from the ratchet wheel and stops the rotary motion of roller shafts 48. While the roller shaft is not rotating tape is fed continuously into the chain making machine so that a sliding clasp fastener chain is produced in which a part carries no teeth. (Refer to Figure 10 and Figure 11 of the drawings).

As the graduated circular plate 14 continues its rotary motion further, the aforementioned stop 28 contacts the stop 34 and the plate moves backward. As shown in Figure 7, if the horse shoe shaped graduated bar 18 pushes down the plunger 22 at f and changes the plate 14 reverses its rotary motion at g, when the stops 28 and 34 come into contact, it will mean that during the reciprocation, (twice the length of f-g) the feeding of teeth materials will be halted.

As is shown in Figure 5, when the graduated circular plate 14 is moving in the direction indicated the arrow d, the horse shoe shaped graduated bar 19 and plunger 23 work in a same way as mentioned above between i-h, thus producing a space corresponding to twice the length of i-h. Such motion is repeated continuously.

(3) Mechanism for adjustment of the space on the tape carrying no chains.

The gear train is arranged so that the graduated circular plate 14 will move only one graduation which graduation is marked on the external circumference, when the crank shaft of a fastener chain machine revolves once to fix one tooth of the chain.

As shown in the drawing, there are 100 graduations marked on the graduated circular plate 14 and the gear ratio is chosen so that when the crank shaft revolves 100 times, the graduated circular plate revolves once. Therefore, odd numbers under 100, for instance, such numbers as 99 or 65, are adjusted to the e part of the plate 29. Screw 30 is of the same pitch as the feed screw 17 which feeds the graduated circular plate 14, and by turning a knob 36, screw 30 can be turned to change the position of plunger shield 25. This controls the number of rotations of the graduated circular plate. Thus any required number of rotations can be obtained by setting one end 31 of the plunger shield 25 to the required position on scale 35, each division of which is equivalent to 100 divisions on plate 29, to obtain whole numbers of the rotation. The fractions of a



rotation can be set on the graduated circular plate with the scale 37 having 100 graduations. Refer to Figure 1, 8 and 9.

Since the horse shoe shaped graduation bars 18 and 19 could produce the required space in one rotation of the plate 29, and since any two of the graduations of these bars correspond to one graduation of the graduated circular plate 14, they can be set at numbers which indicate the number of teeth corresponding to the length of the required space, and be fixed by collars 20 and 21 respectively.

When, for example, the number of teeth to be set is 120 units, and the length of the space between blocks of teeth is 22 units, one complete rotation is therefore represented by 142 units. Therefore, the *e* part of plate 29 is set at 42 units, horse shoe shaped graduated bar at 22 units, pointer 31 of plunger shield 24 set at 1 and set the scale 37 of knob 36 at 42 so that by consecutive rotary motion of graduated circular plate 14, spaces could be obtained alternatively, wherein the number of graduations on the scale 37 of knob 36 is 100 while each graduation on the scale 35 represents 100 graduations of graduations scale 37 as one unit.

The machine according to the invention allows of the automatic provision of spaces of predetermined length between predetermined numbers of teeth.

Hitherto, all the teeth were attached first and a spacing device was used in order to remove the necessary teeth to provide the required spaces. Thus the machine according to the invention eliminates waste to a great extent, prevents damage to the tape and is more efficient.

40 WHAT I CLAIM IS:

1. A jump feed apparatus for a machine for making sliding clasp fastener chains which comprises a gear including forward and reverse driving members, which gear is connected to the crank shaft of the chain making machine, a shift key whereby forward or reverse gear can be automatically engaged, a graduated circular plate, driven through the gear axially mounted on a feed screw, and controlling the input of teeth to

the chain making machine, the graduations on the plate corresponding to the number of teeth fed to the chain making machine, a graduated scale mounted on the graduated circular plate and adapted to activate at predetermined intervals a plunger connected to means for stopping the input of teeth to the chain making machine, and means for accurately adjusting the position of the plunger by way of a screw of the same pitch as the feed screw.

2. A jump feed apparatus as claimed in claim 1, wherein the circular plate is provided with a stop which, when the plate has progressed a given distance along the feed screw, engages with a stop on a casing for the plunger, halts the rotation of the plate thereby actuating the shift key and reversing the direction of rotation of the circular plate.

3. A jump feed apparatus as claimed in claims 1 or 2, wherein the means for stopping the input of teeth to the chain making machine comprises a solenoid, a micro-switch through which current is supplied to the solenoid, which micro-switch is operated by the action of the plunger, an iron core axially mounted within the solenoid and capable of axial movement when current is supplied to the solenoid and a pawl adapted to drive a ratchet wheel attached to the drive of means for supplying teeth to the chain making machine, which pawl is adapted to be disengaged from the ratchet wheel by the action of the iron core.

4. A jump feed apparatus for a machine for making sliding clasp fastener chains substantially as described with reference to the accompanying drawings.

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