

Jan. 15, 1963

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3,073,497

WEB FEED MEANS

Filed June 6, 1960

3 Sheets-Sheet 2

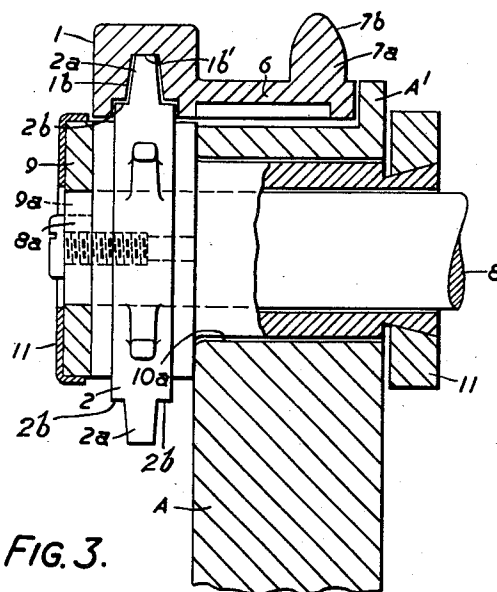


FIG. 3.

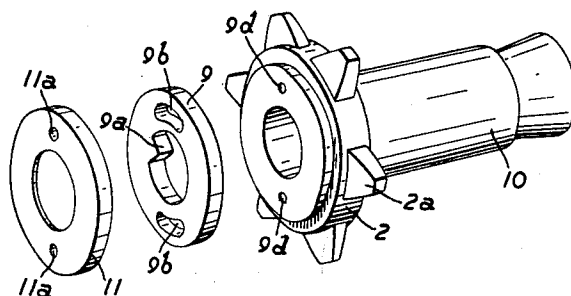


FIG. 8.

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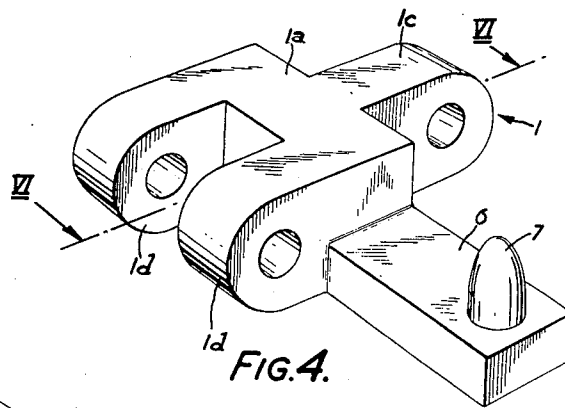
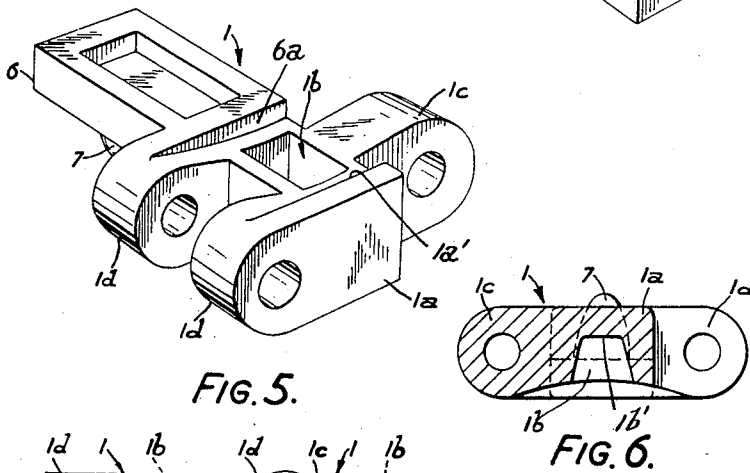
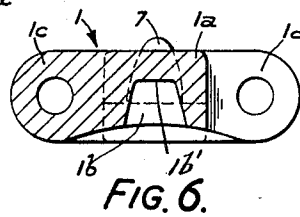
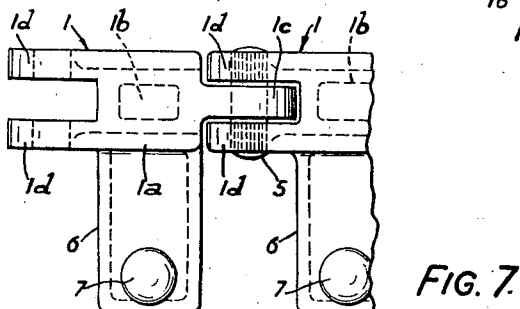
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1

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WEB FEED MEANS

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10 Claims. (Cl. 226-74)

This invention relates to feed means suitable for feeding continuous webs, for example stationery assemblies comprising two or more superposed webs with or without interposed carbons in recording machines and more particularly to an improved tractor unit incorporating an endless chain especially well suited for feeding such webs.

The webs to be fed are provided with one or more rows of longitudinally spaced feed holes engageable by feed pins on an endless chain. Such stationery assemblies are fed by the endless chain to apparatus for operating on the webs, for example typing or imprinting data thereon and it is important that superposed webs be maintained in proper alignment as they are fed, as otherwise the areas of the webs to receive data may not be correctly positioned with the typing or imprinting mechanism.

While feed means incorporating endless chains for feeding stationery webs, as shown and described, for example, in British Patent No. 468,284 and U.S. Patent No. 2,790,529, have long been known, I have now found that not only can the manufacture of the feed means be greatly simplified and the cost thereof significantly reduced but also the efficiency and accuracy of the feeding action may be markedly improved.

An important feature of the present invention resides in the formation of the feed means and the endless chains incorporated therein in such manner that the feed pins on each endless chain which engage in the web feed holes are so aligned with the teeth of the drive sprocket when the chain is engaged thereby as to substantially reduce and minimize undesired displacement of the feed pins relative to the desired feed path and at the same time there is provided a substantially more accurate web feeding action than is obtainable with hitherto known feed arrangements.

Another further important feature of this invention resides in the formation of each link of the endless chains as a unitary, one piece member having integrally formed therein both the feed pin for engaging in a web feed hole and a recess for making positive engagement with a tooth on the drive sprocket.

According to a preferred embodiment of the present invention, an endless chain unit for feeding continuous webs each having a longitudinal row of feed apertures engageable by feed pins of an endless chain, comprises a base member having a drive sprocket rotatably mounted therein and guide means spaced from the drive sprocket, an endless chain being supported by said drive sprocket and guide means and including a plurality of inter-pivoting links each including a body portion formed with a recess for receiving the teeth of the drive sprocket such that when the latter is rotated a tooth will make driving engagement with an inner wall of the recess, each or some of the links also being provided with a feed pin for engaging a feed aperture in the webs to be fed, each pin being aligned with the recess of its respective link. The recess in the links may have closed inner ends and be located at the central axis of the link body such that the tips of the teeth of the drive sprocket engage the closed inner end of the recesses which constitutes a point on the effective pitch line of the chain.

Further features and advantages as well as objects of the present invention will be apparent from the follow-

2

ing description of a preferred embodiment and the accompanying drawing in which:

FIGURE 1 is a side view partly in section of a tractor assembly according to a preferred embodiment of the invention;

FIGURE 2 is a fragmentary side view of the tractor on an enlarged scale;

FIGURE 3 is a section on line III-III of FIGURE 2;

FIGURE 4 is a perspective view of one of the links;

FIGURE 5 is a perspective view of the link shown in FIGURE 4 but with the link inverted;

FIGURE 6 is a sectional view of one of the links on the line VI-VI of FIGURE 4.

FIGURE 7 is a plan view illustrating the connection of the two adjacent links of the endless chain; and

FIGURE 8 is an exploded view showing the drive sprocket, coupling disc and cover.

As shown in the accompanying drawings an endless chain unit comprises a base member A of unitary, one piece construction which may be made of synthetic plastic, for example nylon, and supports an endless chain formed by a series of links 1 wrapped round a toothed drive sprocket 2 rotatably mounted at one side of the base member adjacent one end. At its other end the base member is formed with an arcuately curved guide surface 3 round which the links slide. The surface 3 and sprocket 2 have the same effective diameter.

As more particularly illustrated in FIGURES 4 and 5, each link 1 comprises a unitary, one piece moulding, for example of synthetic plastic material and includes a body portion 1a having a central recess 1b closed at its inner end. As shown, the side walls of the recess 1b are of involute profile and each is adapted to be engaged by and form the driving connection for the teeth of the sprocket depending on the direction of the drive motion. Projecting from one end on the longitudinal center line of the body 1a there is provided a lug 1c and at the other end there are two lugs 1d spaced apart a distance slightly greater than the transverse width of the lug 1c.

To form an endless chain, the links are connected (FIGURE 7) by positioning the lug 1c of one link between the lugs 1d of an adjacent link and inserting a pivot pin 5 having knurled ends through aligned transverse bores formed in the lugs 1c and 1d, the knurled ends of the pivot pin keying in the bores in the lugs 1d of one link and the central, unknurled portion of the pin leaving the lug 1c of the other link free to pivot about the pin. It will be noted that no separate connecting spacer links are required. A sufficient number of links are thus joined together to engirdle the base member A in engagement with the sprocket 2 and guide surface 3.

Each link 1 is also provided with a laterally projecting plate-like portion 6 on which is provided a feed pin 7, the central axis of which is aligned with the central axis of the recess 1b. Each feed pin 7 includes a lower portion 7a (FIGURE 3) which is substantially cylindrical in cross section and extends from the plate 6, to a height coincident with the inner end wall 1b' of the recess 1b. The portion 7b of the feed pin which extends above the level of the wall 1b' has an involute profile. The profile is generated from the imaginary pitch circle constituted by the path taken by the inner end wall 1b' of the recess 1b when the link forms part of an endless chain and is being operated. Normally, as viewed in FIGURE 2 the paper is fed to the left of this imaginary line.

The effective pitch line of the endless chain is constituted by an imaginary line Y joining the inner end walls 1b' of the recesses 1b. This pitch line Y is to the right (as viewed in FIGURE 2) of where would be located the conventional pitch line of endless chains which has usually been taken to be constituted by an imaginary line joining the link pivot pins. The effect of thus shifting the

pitch line is to counteract the lifting of the rear end of a leading link and the consequent lifting of the forward end of the succeeding link, as the links are successively engaged and disengaged by the teeth of the sprocket.

As indicated in FIGURE 2, the teeth 2a of the drive sprocket enter the recesses 1b of the links 1, the tip of each tooth abutting the inner end wall 1b' which is on the effective pitch line of the endless chain and it will be noted that the involute profiled upper portion of each of the feed pins 7 extends upwardly of this pitch line. This effective pitch line constitutes the imaginary circle from which the involute profile of the feed pin portions 7b and the side walls of recesses 1b are generated.

As shown, the drive sprocket 2 is also formed of synthetic plastic and has an integral hollow hub 10 (FIGURE 8) which is rotatable in a bore 10a in the base member A. A drive shaft 8 extends through the hub 10 and is formed with a V-shaped keyway 8a. The sprocket 2 is coupled to the drive shaft 8 by coupling disc 9 having a V-shaped projection 9a extending inwardly of a central aperture and shaped for engagement in the keyway 8a.

The coupling disc 9 is positioned over the end of the drive shaft 8 which projects beyond the face of the drive sprocket 2, the projection 9a engaging in the keyway 8a and a cap 11 is assembled over the disc.

The cap 11 and disc 9 are secured to the drive sprocket 2 by screws 9c inserted through apertures 11a formed in the cap and slots 9b formed in the disc, the screws screwing into tapped holes 9d formed in the sprocket.

It will be noted that the slots 9b are of arcuate shape, the arcs being struck from a center offset from the rotational axis of the drive shaft and accordingly a limited amount of relative movement between the disc and sprocket in a circumferential and radial direction is permitted.

Accordingly by a small rotational movement of the disc relative to the sprocket, it is possible to insure that the V-shaped projection 9a is adjusted radially so as to bed down properly into the V-shaped keyway 8a so as to reduce or eliminate backlash. Further the permitted circumferential movement between the sprocket and disc enables small adjustments to be made correctly to align the feed pins 7 with the feed apertures in the webs to be fed.

When the sprocket 2 is rotated, the endless chain is driven and the feed pins 7 will engage in a row of feed holes in the stationery assembly to feed the latter. The line X (FIGURE 2) represents the paper feed line and it will be noted that this line is to the left of the effective pitch line Y representing the path followed by the inner end walls 1b' of the recesses 1b.

Because each feed pin 7 is in line with each recess 1b engaged by the teeth of the drive sprocket, any displacement of the links as they pass round the drive sprocket will not produce any substantial displacement of the feed pins. Further as the sprocket teeth and feed pins follow the effective pitch line Y, as defined above, the pins effect a more accurate feed of the webs than is the case in the known endless tractors wherein the sprocket teeth make driving engagement with the pivot pins connecting adjacent links.

The stationery assembly is held in engagement with the feed pins in known manner by a gate assembly 20 (FIGURE 1) comprising a guide member 21 pivotally connected by pin 25 to a support member 22 which is in turn connected to the base member A. The gate guide member 21 is urged by a flat spring 23 to overlie the portion of the run of the endless chain located between the drive sprocket 2 and arcuate guide surface 3 so as to press the stationery to engage the feed pins carried by the chain, the guide member being formed with an elongated slot 24 for receiving the upper ends of the feed pins. When it is desired to thread the webs X the guide members 21 are swung out of their operating position to the

position shown in broken line in FIGURE 1 where it is held locked by the spring 23.

The gate assembly 20 is so arranged as to enable it to be fitted to either a left or right hand tractor. The gate assembly may have provision for adjustment to accommodate the use of the tractor with stationery assemblies comprising varying numbers of superposed webs.

In some instances the stationery webs may have feed holes so spaced that a feed pin 7 is not required on each succeeding link. In that event, one or more links without a feed pin is mounted between the links carrying feed pins so that the feed pins register with the feed holes in the web.

The base member A is formed with an integral flange A' in closely spaced relation to the adjacent sides of the links 1 of the chain such that the flange serves to prevent lateral displacement of the links of the chain when it is being driven. The stationery being fed overlies the flange A' at one side edge and accordingly the portion of the flange adjacent to the drive sprocket 2 also serves to insure stripping of the stationery from the feed pins on reaching the end of the linear portion of the course of the endless chain. It may be noted that substantially at the cross-over between the pitch line Y and the normal web feed line X, the web leaves the cylindrical portion 7a of the feed pins so that the web feed holes comes into alignment with the involute portions 7b.

An additional flange may be provided on the side of the arcuate guide surface 3 remote from the flange A' so that the links are guided between two opposed flanges in moving round the surface 3.

As shown more particularly in FIGURE 3, the drive sprocket is formed with an annular shoulder 2b at each side of the teeth, the links 1 each being formed to accommodate the shoulders. The wall 6a of the plate-like portion 6 and the opposed wall 1a' of the body portion 1a (FIGURE 5) serve to limit lateral movement of the links.

The tractor feed units of the present invention may be conveniently mounted in a recording machine as brought out in said U.S. Patent No. 2,790,529 in connection with the web feed members there described in connection with FIGURE 5 of that patent. For this purpose, a clamp member 13, as shown in FIGURE 1, in the form of a cylindrical rod is provided having an arcuate recess 13a formed in the surface thereof presented to transverse bore 14 extending through the base member A. The clamp member 13 extends through a bore formed in base member A transversely to and intersecting the bore 14. The ends of clamp member 13 rest in holes formed in the opposite ends of a generally C-shaped member 16 which extends partially about hub-like portion A'' of the base member A. The radius of curvature of recess 13a is somewhat greater than the radius of bore 14 and that of rod 12 (the latter corresponding to rod 102 or rod 105 of said U.S. patent). At one end, clamp member 13 is provided with a screw which is threaded into a head 15. Tightening up of head 15 moves the clamp member 13 relative to bore 14 and into clamping engagement with the rod 12. When it is desired to adjust the position of any one of the tractor feed units on its rod 12, the head 15 is rotated sufficiently so that the clamp member 13 may be shifted to center the recess 14 about the rod 12.

The base member A and flange A' may be formed as a one piece moulding of nylon or other suitable synthetic plastic. This facilitates forming base member A with a somewhat enlarged width intermediate the sprocket 2 and the guide surface 3, as is drawn in FIGURES 1 and 2, and thereby provide supporting surfaces along which the links of the chain may slide intermediate the sprocket and the guide surface. The drive sprocket may also be moulded from similar material, the annular shoulder 2b being formed in the moulding operation.

While the endless chain has been described as wrapping round a drive sprocket and a stationary arcuate

guide surface, it will be understood that the latter may be replaced by an idler sprocket.

Heretofore, the links forming an endless chain have comprised a multiplicity of different parts made of metal and each of which has had to be separately manufactured and the parts then assembled together to form the complete link. The necessity of manufacturing the separate parts and their assembly has resulted in the links, and thereby the complete chain, being relatively costly to produce.

These drawbacks are obviated in the present invention by forming the links as a one piece moulding of synthetic plastic material including a body portion having integral means at each end for pivoting the link to other links, and a portion extending laterally of one side and carrying a web feeding pin.

Examples of synthetic plastic, from which the links may be moulded are nylon, polyvinyl chloride and copolymers of vinyl chloride and vinyl acetate, polyethylene—especially the high density types, polystyrene and polymers or copolymers of acrylonitrile, butadiene and styrene. It will be understood that the synthetic resin selected should be hard wearing and not readily distortable particularly under humid conditions. One example of preferred material is nylon marketed by Imperial Chemical Industries Ltd. under B.100.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, guide means and a rotatable drive sprocket mounted on the base member, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and guide means, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess for engagement with the teeth on the drive sprocket and a feed pin for engaging a feed aperture in the continuous stationery and connected to said body portion in alignment with said recess.

2. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, guide means and a rotatable drive sprocket mounted on the base member, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and guide means, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the opposite end wall of said recess, and a feed pin for engaging a feed aperture in the continuous stationery and connected to said body portion in alignment with said recess.

3. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, guide means and a rotatable drive sprocket mounted on the base member, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and guide means, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, and a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess.

4. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, guide means and a rotatable drive sprocket mounted on the base member, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and guide means, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, and a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket.

5. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, guide means and a rotatable drive sprocket mounted on the base member, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and guide means, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket, and each of said pins having a cylindrical base portion adjacent to the associated plate and an end portion of involute profile remote from said plate, the portion of involute profile of the feed pin adjacent to where it merges with the cylindrical base portion thereof being aligned with said recess end wall.

6. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, a rotatable drive sprocket mounted on one side of said base member, said base member having an arcuate surface on the other side thereof, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and arcuate surface, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket, each of said pins having a cylindrical base portion adjacent to the associated plate and an end portion of involute profile remote from said plate, the portion of involute profile of the feed pin adjacent to where it merges with the cylindrical base portion thereof being aligned with said recess end wall.

7. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, a rotatable drive sprocket mounted on one side of said base member adjacent to one end thereof, said base member having an arcuate guide surface adjacent the other end thereof and a pair of flanges on the opposite sides of said arcuate surface forming a guide way therewith, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and by said arcuate surface between said flanges, each of said links consisting of

7

a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket, and each of said pins having a cylindrical base portion adjacent to the associated plate and an end portion of involute profile remote from said plate, the portion of involute profile of the feed pin adjacent to where it merges with the cylindrical base portion thereof being aligned with said recess end wall.

8. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member, a rotatable drive sprocket mounted on one side of said base member adjacent to one end thereof, said sprocket having a pair of shoulders extending annularly thereabout on opposite sides of its teeth, said base member having an arcuate guide surface adjacent the other end thereof and a pair of flanges on the opposite sides of said arcuate surface forming a guide way therewith, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and by said arcuate surface between said flanges, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, the walls of said body portion adjacent the mouth of said recess being further recessed to receive the portion of said shoulders on opposite sides of the tooth in said recess, a feed pin for engaging a feed aperture in the continuous stationery, a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket, and each of said pins having a cylindrical base portion adjacent to the associated plate and an end portion of involute profile remote from said plate, the portion of involute profile of the feed pin adjacent to where it merges with the cylindrical base portion thereof being aligned with said recess end wall.

9. An endless chain unit for feeding continuous stationery webs each having a longitudinal row of marginal feed apertures, comprising a base member having adjacent

8

to one end thereof a pair of flanges one on each side of an arcuate guide surface, a drive shaft having a V-shaped recess formed therein rotatably mounted on said base member adjacent to the other end thereof, a rotatable drive sprocket mounted on said drive shaft, a coupling disk having a V-shaped projection seated in said V-shaped recess, threaded means connecting said coupling disk to said sprocket, a plurality of links pivotally connected to form an endless chain supported by said drive sprocket and said arcuate guide surface, each of said links consisting of a one piece integral moulding formed with a body portion having fixed walls defining a recess open only at one end thereof for receiving a tooth on said drive sprocket with the tip of the tooth engaging the end wall of said recess opposite the open end thereof, a feed pin for engaging a feed aperture in the continuous stationery, and a plate laterally projecting from said body portion and supporting said feed pin in alignment with said recess, the end walls of said recesses successively tracing the effective pitch line of said endless chain as said links pass about said sprocket, each of said pins having a cylindrical base portion adjacent to the associated plate and an end portion of involute profile remote from said plate, the portion of involute profile of the feed pin adjacent to where it merges with the cylindrical base portion thereof being aligned with said recess end wall.

10. An endless band tractor link for pivotal connection to other similar links to form an endless chain comprising a one piece moulding of synthetic resin material having a body portion with a recess formed therein about a center line and opening solely on one side thereof, means at each end of and integrally formed with said body portion for pivotally connecting the link to other links, a plate portion integral with and extending laterally from said body portion substantially in alignment with said one side, a web feed pin formed integrally with and extending from one side of said plate portion spaced from said body portion to a point beyond the opposite side of said body portion, said web feeding pin having a cylindrical base part extending from said plate portion in line with said recess and having an end part of involute profile merging with said cylindrical base part and extending beyond said recess, the longitudinal axis of said pin being in line with the center line of said recess.

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