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Schindler

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[54] **APPARATUS FOR DETERMINING THE GAUGE OF WIRE SCREEN OR MESH**

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[52] **U.S. Cl.** **140/112,** 74/142, 226/74, 226/141

[51] **Int. Cl.** **B21f 23/00,** B21f 27/10

[58] **Field of Search**.....140/3, 92.8, 107, 140/112; 226/54, 74, 75, 137, 139, 141; 74/142

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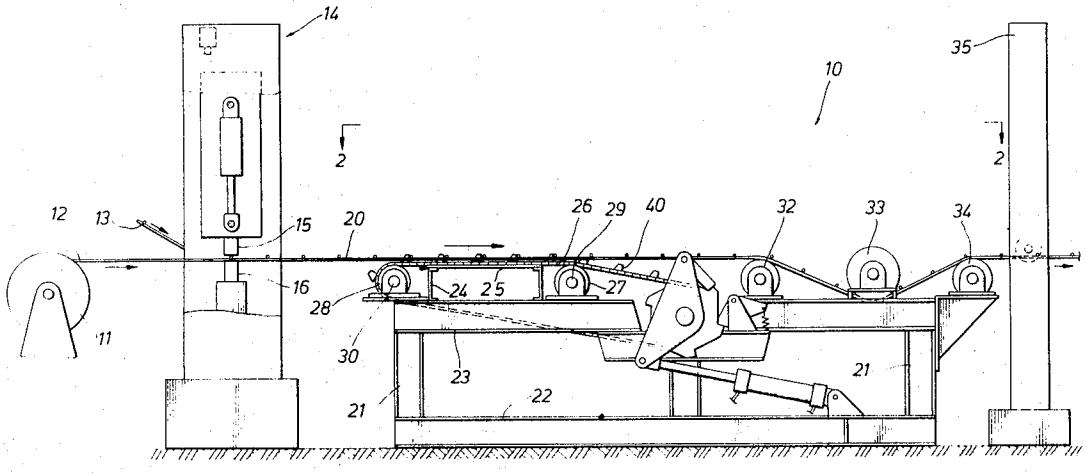
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[57] **ABSTRACT**

An apparatus for use in the manufacture of wire screening or mesh which determines the pitch thereof. The apparatus incorporates a means for drawing the completed wire screen or mesh through a welding apparatus. A plurality of flexible chain drives incorporates upwardly extending dogs which selectively engage the wire mesh and the transverse members thereof. The dogs are movable so as to adjust to a different pitch. The chain drives are advanced by means of a ratchet mechanism, the stroke thereof being variable. The stroke can be varied, for example, from two inches to about six inches.

12 Claims, 7 Drawing Figures



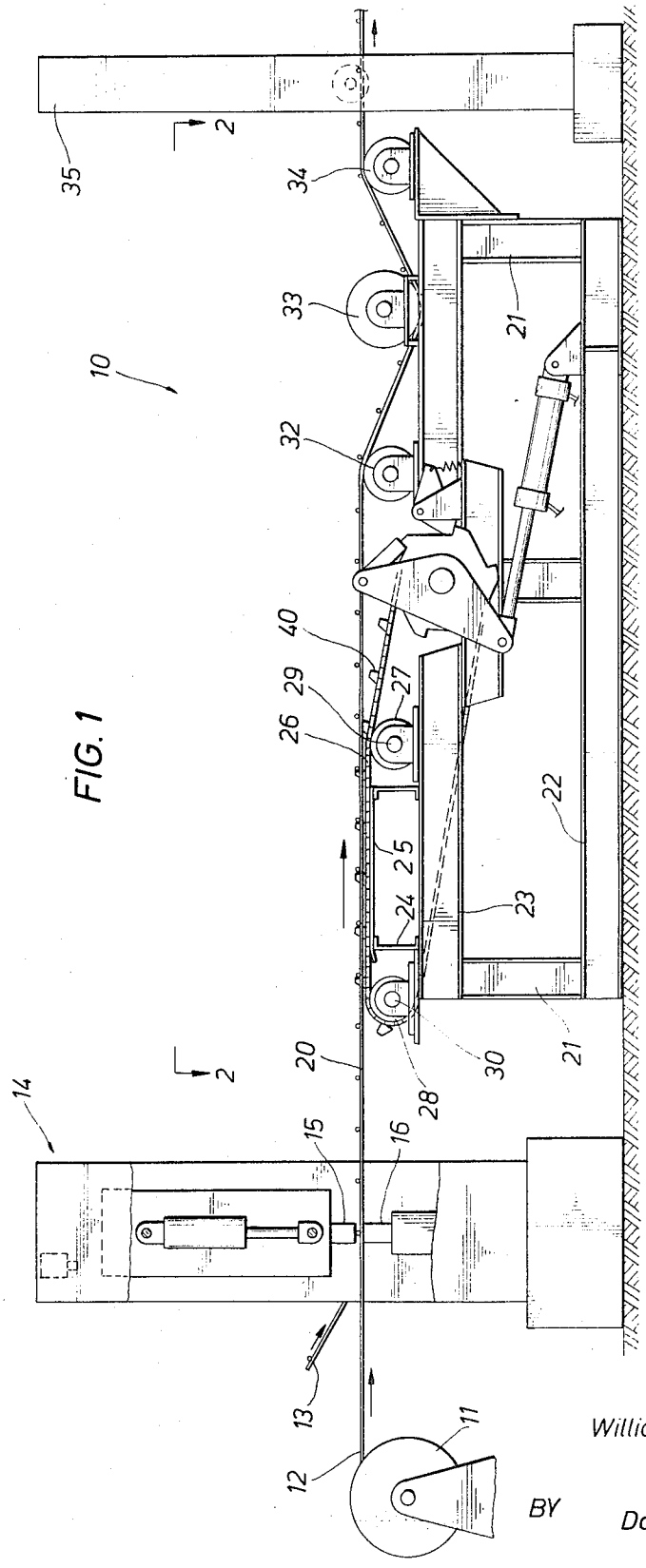


FIG. 1

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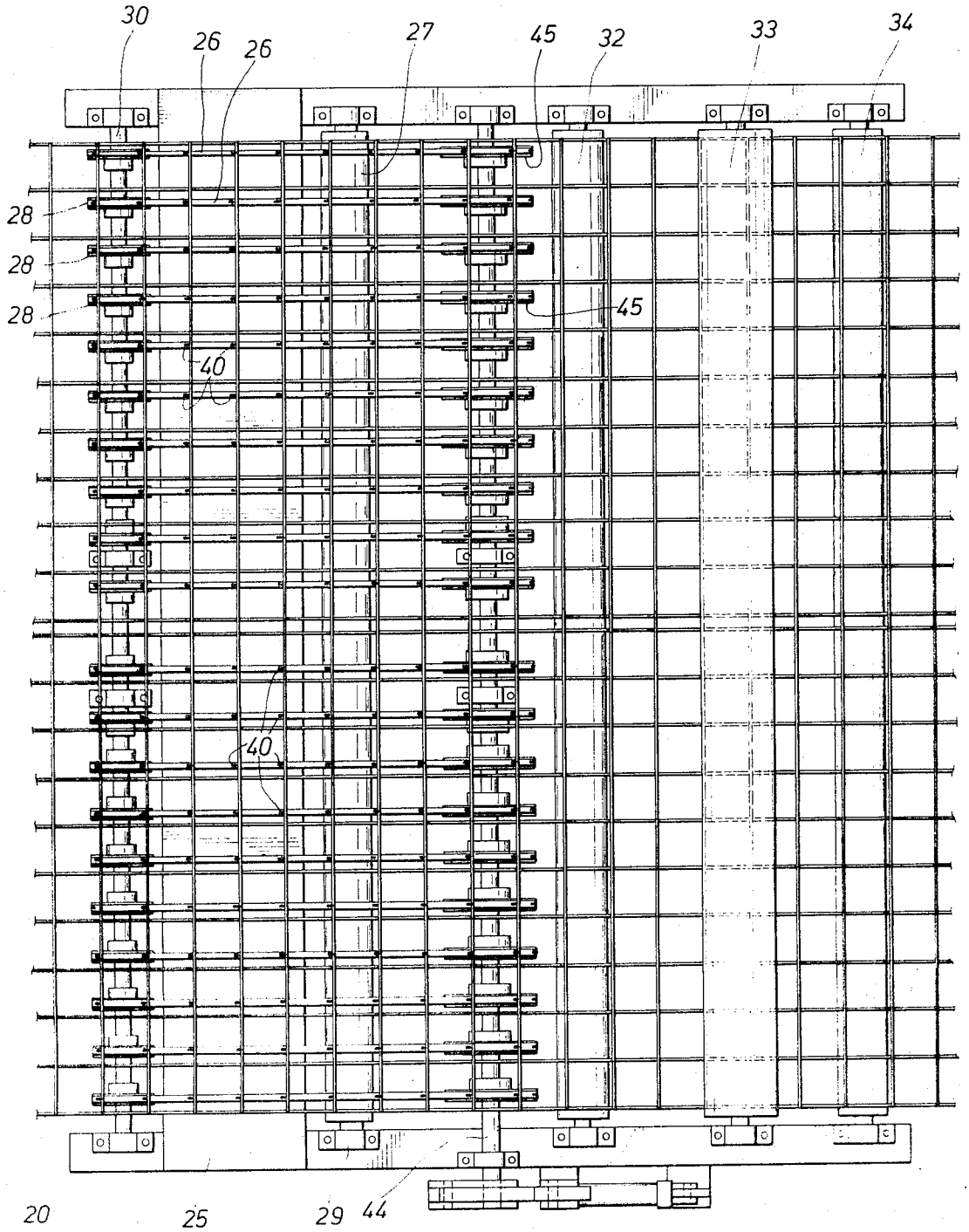


FIG. 2

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FIG. 3

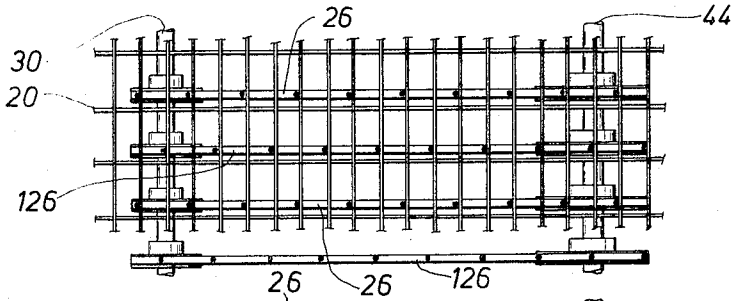


FIG. 4

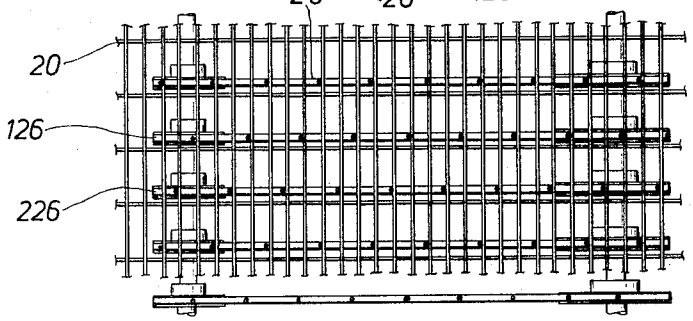
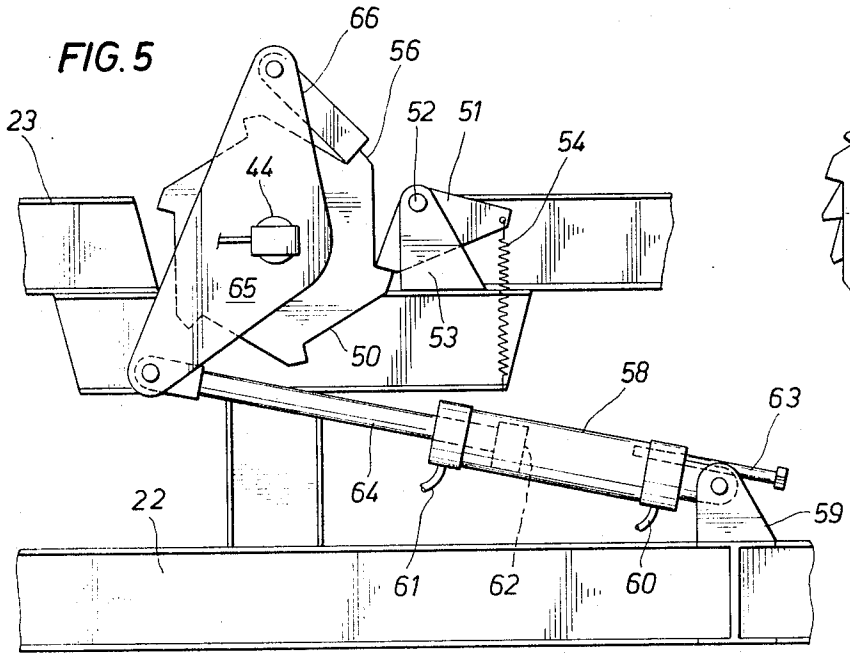


FIG. 5



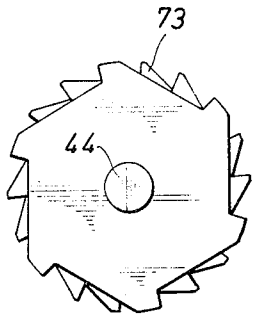


FIG. 7

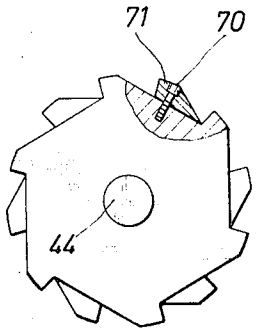


FIG. 6

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APPARATUS FOR DETERMINING THE GAUGE OF WIRE SCREEN OR MESH

SUMMARY OF PROBLEM AND SOLUTION

In the manufacture of wire fencing or mesh, it is sometimes necessary to change the gauge or spacing of the constituent members. The fencing material will be defined as including tranverse members and members which extend the full length. A typical size might be 6 feet in width with perhaps seven lengthwise members. The lengthwise members will be defined hereinafter as the long wires. For a size of 6 feet, the transverse members will be 6 feet long. They extend from edge to edge typically and are spaced at a distance which determines the gauge or mesh of the openings in the fencing material. For example, gauge or mesh openings of perhaps six inch widths are not uncommon.

With the foregoing in view, the apparatus of the present invention assists in the manufacture of fencing or mesh by altering the spacing of the transverse members. The members may be altered to fabricate fencing perhaps intended to specified agricultural purposes in which case the spacing of the transverse members is related to the size of the animal to be confined within the fence. If swine are to be fenced, the spacing might be fairly wide. Smaller animals or domesticated fowl require fairly close spacing. The same is also true for mesh to be placed in poured concrete structures as a reinforcing device. A foundation structure may be specified wherein the mesh is perhaps very close, or in other circumstances, the mesh may be relatively wide. The present invention contemplates an apparatus whereby the fencing or mesh material can be manufactured with a variable pitch or spacing in the completed product.

Accordingly, the present invention is summarized as an apparatus cooperative with a transverse welding device useful in the manufacture of fencing or mesh as including a generally rectangular frame having a top surface. A plurality of flexible chain drives extends over the top surface. The drives are all located parallel to one another. Each drive carries a plurality of upwardly extending dogs which engage the transverse wires of the fence or mesh. The dogs can be arranged parallel to one another to form a fencing of wide spacing. However, the flexible chain drive can be readjusted and the dogs repositioned to fall at more narrow intervals. The apparatus draws the fencing material through a cooperative transverse welding device which welds the transverse members to the long members dependent on the length of the advance of the fencing. The length of advance is correlated to the spacing of the various files of dogs by adjusting a ratchet mechanism. The ratchet mechanism can be adjusted for steps of different sizes. The ratchet mechanism is operatively connected to the plurality of flexible chain drives to serve as a means advancing them.

Many objects and advantages of the present invention will become more readily apparent from a consideration of the following written specification and drawings, which are:

FIG. 1 is a side view of the apparatus of the present invention in conjunction with a supply of wire for the fencing and a cooperative welding device;

FIG. 2 is a top plan view of the apparatus taken along the line 2 — 2 of FIG. 1 illustrating the fencing material

engaged by a plurality of dogs for advancing the fencing material through the apparatus;

FIGS. 3 and 4 together are views similar to FIG. 2, but smaller in scale, illustrating different facings on the dogs to obtain different spacings on the transverse members of the fencing material;

FIG. 5 is a side view of a ratchet mechanism for advancing the flexible chain drive and associated dogs of the previous figures through the apparatus; and,

FIGS. 6 and 7 are alternative embodiments of the ratchet mechanism of FIG. 5 showing means whereby the stroke of the ratchet mechanism is altered in accordance with the teachings of the present invention.

In the drawings, attention is first directed to FIG. 1 where a supply reel of wire is indicated by the numeral **11.** Several reels are located in parallel, each supplying wire to serve as one of the long members of the completed fencing material. The long members are indicated by the numeral **12.** The transversely extending wires or rods are indicated at **13.** They are hand placed in a transverse posture to be welded to the long rods **12** by means of the welding apparatus generally at **14.** The welding apparatus **14** cooperates with a fixed lower electrode **16** and a slidable reciprocating upper electrode **15** which pinches the transverse rod **13** and the long wires **12** between the two electrodes. Electric current is passed from electrode to electrode to complete the weld. The welding apparatus **14** is not a portion of the invention per se, but does constitute supporting structure or apparatus which is described sufficiently herein to enable one skilled in the art to appropriately install the welding apparatus for cooperation with the present invention. It is significant to note that the present invention cooperaties with a welding apparatus in some form or fashion. The apparatus moves the fencing or mesh material after the transverse members have been joined to the long wires **12.**

The completed fencing is indicated at **20.** The completed fencing merges from the welding apparatus **14.** It should be appreciated that the welding apparatus cannot form the necessary welds unless the fencing material **20** is kept under tension, and further, the transverse members are welded at a pitch or distance determined by the present invention.

The present invention is indicated by the numeral **10.** It incorporates a rectangular frame comprised of a number of upstanding vertical legs **21,** lower rails **22** which extend from leg to leg and which rests on the floor, and a pair of elongate structural members **23** extending along each side. The members **21, 22** and **23** can be formed of I-beam stock as desired. The transverse members **23** support a pair of transversely extending structural members **24.** The members **24** support a metal plate **25** which serves as an upper working surface. The plate **25** extends across the width of the equipment and its width is equal to or greater than the width of the fencing material. The metal plate **25** provides a supportive surface for a number of flexible chain drives **26** which pass over its top. They are returned to the equipment elsewhere as will be described. The flexible chain drives are engaged by a pair of sprockets **27** and **28.** The sprockets are supported on suitable axles **29** and **30,** respectively. The axles are parallel to one another and are preferably parallel to the frame member **24.** The axles actually carry a plurality of individual but similar sprockets. The shaft **30** sup-

ports a number of identical sprockets. More will be noted concerning this hereinafter.

The completed fencing material is advanced past the sprockets **28** and then **27.** It passes over a roller **32** and then beneath a second roller **33.** It then passes over an additional roller **34** and past additional equipment **35** to be spooled, cut, wrapped, and otherwise prepared for delivery. The rollers **32, 33** and **34** are all supported on the framework of the apparatus and generally serve to align the fencing material at desired levels while keeping it taut as it moves through the apparatus. The roller **32** is placed at a level sufficient to keep the fencing material **20** essengially parallel to the top working surface **25** and to the flexible drive members **26** which are carried thereon. The rollers **32, 33** and **34** are not driven, but are furnished with suitable pillow blocks having the necessary bearing mechanisms and associated equipment therein. The rollers may be formed of metal or resilient material on the exterior.

Considering the invention further, attention is next directed to FIG. **2** where the numeral **20** identifies the fencing material which extends thereacross. FIG. **2** further includes the roller **33** which is located above the fencing material as shown in the plan view. The view of FIG. **2** further includes the rollers **32** and **34.**

Of significant interest to FIG. **2** is the shaft **30** as shown at the left hand edge. The shaft **30** supports a number of sprockets **28** as previously noted. The shaft **30** supports a number of sprockets **28** which are all attached to the shaft by means of appropriate set screws. The sprockets **28** are parallel to one another and all carry teeth preferably on the same pitch as a matter of convenience and not of necessity. The sprockets **28** each engage the flexible chains **26.** The chains **26** are thus found at many locations spaced across the width of the apparatus. Each chain **26** passes over the roller **27** which deflects the chains downwardly. Each chain **26** carries a number of upstanding dogs **40.** In FIG. **2,** it will be noted that each chain carries a dog at the same spacing as the dogs on the other chains so that they move in unison and form a transversely extending line. The several dogs are thus carried by the flexible chains **26** as they move around the sprockets **28** and engage the transverse wire of the fencing material. The chains position the dogs on the left hand side of the transverse wire which is welded to the long wires, and this imparts a lateral force to the fence material **20** tending to draw it through the equipment. The several dogs line up behind the transverse wire and move it from left to right in FIG. **2.** It will be noted that several transverse members are engaged by a plurality of dogs across the full width of the fencing material. This continues until the chains **26** pass over the roller **27.** At that juncture, the chains **26** are routed somewhat downwardly and divergently away from the fencing material as is better shown in FIG. **1.** The individual dogs **40** are gradually withdrawn from the fencing material as the chains **26** advance downwardly.

An additional shaft **44** is arranged parallel to the shafts **29** and **30.** The shaft **44** supports a number of sprockets **45** which engage the drive chain **26.** It will be recognized that the flexible chains **26** extend about the sprockets **28** and **45.** The roller **27** is placed at a mid point to change the direction of the chain drive movement. However, a significant feature is the use of the chain drive as an endless loop about the sprockets **28** and **45.**

The endless loop arrangement returns the chain drives beneath the equipment to the bottom side of the sprocket **28** at which point they turn in a customary manner for chain drives and re-engage the sprockets **28** and thereafter engage the fencing material with the dogs **40.**

In FIG. **2,** the dogs will be observed to be in one file or line behind each transverse wire. Each chain drive engages each transverse wire with one dog. This arrangement can be altered to vary the spacing. Attention is next directed to FIG. **3** where the fencing **30** is shown positioned over the apparatus. In FIG. **3,** the shaft **30** is again shown parallel to the shaft **44.** A first flexible chain drive **26** and a second flexible chain drive **126** are noted. Two additional chain drives are shown in FIG. **3** and are indicated by the same numbers. The chain drives **26** remain fixed in the relative posture shown in FIG. **2** of the drawings. However, the flexible chains **126,** while remaining identical in structure, have been advanced to a different position with respect to the fencing materials **20.** The projecting lugs are repositioned at a point mid way between lugs on adjacent chains. If the lugs on the chain **26** are located 6 inches apart, the projecting lugs on the adjacent chain **126** are located at a mid point. The chain **126** carries the same number of lugs as The chain **26,** and the two chains are out of step with one another. This out of step arrangement is beneficial inasmuch as it permits the lugs to be positioned to engage a different transverse wire in the fence material **20.** As shown in FIG. **3,** assume that the lugs on the individual chain are located 6 inches apart. Through the use of the shifted lugs on the adjacent chain, a fencing material **20** with a spacing of three inches on each transverse member is drawn by the apparatus. This means that each transverse member is engaged by only half as many lugs across its full width. There are twice as many transverse members, and hence, the pulling force imparted to the fence material **20** by the apparatus **10** remains the same. The spacing is varied by shifting every other chain.

In FIG. **4,** the fence material **20** is drawn through the apparatus again. A first chain is indicated at **26,** and a second chain is indicated at **126.** A third chain is indicated at **226.** Additionally, the sequence is repeated across the width of the equipment. The lugs or dogs carried on each chain are spaced the same distance apart for that particular chain. The lugs on adjacent chains are spaced differently. The lugs on each chain maintain their own spacing with respect to their chain, but are laterally rearranged. The rearrangement results in a mechanism which is able to draw the fencing material through by engaging different transverse members of the fencing material. Presuming again a 6 inch spacing between the lugs on a particular chain, the adjacent chain is offset by one-third of this distance and the last chain **226** is offset by two-thirds of this distance. The arrangement of the lugs in FIG. **4** enables the apparatus to draw the fencing material through with transverse wires spaced every two inches. Again, each transverse wire is engaged only by one-third as many lugs as might be the case in FIG. **2.** However, there are three times as many transverse members, and so the same amount of pull is imparted to the fencing material. The 2 inch spacing provides a means whereby each transverse member is readily engaged by the lugs.

Considering the import of FIGS. **2, 3,** and **4** together, it will be observed that the present invention provides

a means whereby the spacing of the lugs in the aggregate accommodates variations in the spacing of the transverse wires in the fence material. The fence material is therefore still forcefully drawn through the equipment.

To this juncture little has been noted concerning the motive means of the apparatus. The chains themselves provide motion to the fence material tending to draw it through the welding apparatus shown in FIG. 1 and the other associated equipment required for manufacturing and shipping the fencing material. The present invention incorporates the motive means. The motive means is best illustrated by reference to FIG. 5 of the drawings.

In FIG. 5, the shaft 44 carries at one end a toothed gear 50. The toothed gear 50 rotates in a clockwise fashion as viewed in FIG. 5. A triangular lock member 51 is supported on a shaft 52. The shaft 52 is supported by an upstanding bracket 53. The triangular lock member 51 is spring urged by a resilient member 54 to present one edge to the gear 50. The gear 50 is provided with teeth 56. The lock member 51 rides over each tooth 56 against the resilient member 54 and falls into the valley adjacent each tooth to lock the gear 50 against counterclockwise rotation. The lock member 51 serves as a ratchet mechanism. As discussed to this juncture, the gear 50 is able to advance in clockwise steps until locked by the locking device 51. This permits clockwise rotation in discrete steps or in multiples of discrete steps.

The numeral 58 identifies a double acting hydraulic cylinder which is pivotally supported by an upstanding bracket 59 which is pinned to the lower end of the hydraulic cylinder 58. The hydraulic cylinder 58 is made double acting by introducing fluid at both ends to the lines 60 and 61. It incorporates an internal piston shown in dotted line at 62. The piston 62 has a range of travel determined by the size of the cylinder 58. The range of travel can be reduced by inserting a threaded pin 63 at the lower end. The pin 63 is advanced to a precise or calculated position to limit the range of travel of the piston 62. The piston 62 is connected to a piston rod 64. The rod 64 extends to a bell crank mechanism 65 which is mounted on the axis or shaft 44. The bell crank 65 is rotated by the piston rod 64 when it is extended. The bell crank reciprocates about the shaft 44.

The upper end of the bell crank 65 carries a push rod 66. The push rod 66 is locked against a tooth 56 of the gear 50. The push rod 66 falls into the valley between teeth as the gear 50 rotates. The push rod 66 advances the gear in a clockwise fashion. This is accomplished when the piston rod 64 is extended. When the piston rod 64 is withdrawn, or shortened, the push rod 66 is rotated in a counterclockwise direction along with the bell crank 65 and falls over the next tooth. This then enables the advancing mechanism to set the next step. The next step of the equipment is achieved when hydraulic power is applied to the hydraulic cylinder 58 to advance the piston rod 64 and rotate the gear 50 in a clockwise direction.

From the foregoing, it will be understood how the gear 50 is advanced one step at a time. The length of the stroke determines the length of the step. While it is possible that the bell crank could be rotated by a larger distance, only one step is preferred wherein the push rod 64 rides over only one tooth. Rotation in the clockwise direction advances the gear. The gear is prevented from slipping backwards by the locking mechanism, including the lock member 51.

It will be seen how the gear is advanced by a distance equal to the spacing from one tooth to another. The teeth 56 on the gear are spaced at a predetermined distance, such as 6 inches in the preferred embodiment. The step can be varied so as to accommodate the spacing of lugs shown in FIGS. 3 and 4 to vary the mesh or pitch of the fencing or mesh material by altering the shape of the gear 50. This can be done in a number of ways. Rather than simply remove the gear, an alternative form of the gear is shown in FIG. 6 for modifying the gear. The gear is provided with suitably tapped openings on each face between teeth to permit a bolt 70 to be threaded therein to fix in position an intermediate tooth 71. The tooth 71 has a general contour like that of the tooth 56 on the gear 50. However, with the tooth 71 installed, the spacing from tooth to tooth is changed. The spacing is altered to one-half the normal spacing or three inches in the preferred embodiment. This can be repeated fully about the perimeter to convert the gear 50 to a device which advances the fencing material only one-half the distance, or 3 inches, thereby permitting the arrangement of the dogs or lugs as shown in FIG. 3. This then permits the equipment to work with mesh or fencing having one-half the spacing on the transverse members.

FIG. 7 shows another form wherein the same tapped opening is used and a bolt, somewhat shorter, is utilized to attach an additional insert 73. The insert 73 carries two teeth. This converts the pitch of the teeth on the gear 50 to one-third of that shown in FIG. 5. The 6 inch spacing is thus converted to 2 inch spacing through cooperation with the spacing of the lugs as shown in FIG. 4. This advances the fence material 2 inches as opposed to 6 inches in the unmodified form.

In FIGS. 6 and 7, the spacing of the teeth is altered. The hydraulic cylinder 58 shown in FIG. 5 is likewise modified for this purpose. The hydraulic cylinder is modified by moving the pin 63 to change the length of stroke. This prevents the push rod 66 from riding over two or more teeth on each step. It is desirable that it ride over only one tooth in the ordinary use of the equipment. The pin 63 is repositioned to reduce the length of stroke of hydraulic equipment, and the extent of rotation of the gear 50 at the urging of the bell crank 65 and its associated paraphernalia.

As described to this juncture, the apparatus of the present invention is particularly useful for fabricating fencing material having a different pitch. The spacing shown at all junctures is even, although it can be varied. While it is possible, no extended discussion will be incorporated regarding irregular spacing of the transverse members in the fencing material. The equipment can be modified for this purpose, but this is believed not necessary to detail the operation of the equipment.

The foregoing description describes the preferred embodiment. Numerous alterations and variations can be incorporated. For instance, as a matter of convenience, the sprockets 28 can be loosely placed on the shaft 30 while the sprockets 45 are pinned to the shaft 44. Through the use of drilled holes in the shaft, the set screw can be readily moved and threaded into the different drilled holes through the attached collar on the sprockets 45 to thereby index the various sprockets. Numerous other alterations and variations can be like-

wise included. The scale or dimensions of the device can be widely varied to manufacture fencing or mesh of any size or shape.

The scope of the present invention is determined by the claims which are appended hereto.

I claim:

1. A fence or wire mesh handling apparatus which comprises:

a supportive framework;

an upper surface on said framework;

a plurality of flexible drive members arranged in parallel fashion adjacent to said surface;

a plurality of lugs carried on said flexible drive members and adapted to engage a fencing material;

a motive means for advancing in unison said plurality of flexible drive members to draw such a fencing material on engagement with said lugs; and,

means for adjusting the spacing of said lugs on said drive members.

2. The invention of claim **1** wherein said motive means includes a unidirectional ratchet mechanism wherein the length of step of said ratchet mechanism is altered dependent on the pitch of the fencing material.

3. The invention of claim **2** wherein said motive means incorporates a gear having teeth therein; lock means for engaging the teeth of said gear to limit its rotation to a single direction; advancing means engaged with said gear for advancing said gear periodically, said advancing means having a predetermined length of advance.

4. The invention of claim **3** wherein said advancing means incorporates a bell crank mounted on a common axis with said gear and driven by an extensible member, said bell crank including a push rod which is connected therefrom to said gear for engaging the teeth thereof and forcing said gear to advance by a length of stroke determined by said advancing means.

5. The invention of claim **4** wherein said gear has teeth of a predetermined spacing and further including means for altering the spacing thereof.

6. The invention of claim **3** wherein said gear incorporates teeth having a fixed spacing, and further including a means for attaching additional teeth to said gear at a spacing which is less than the original spacing.

7. The invention of claim **1** wherein said flexible drive members are endless loop members and extend above said surface and loop therebelow.

8. The invention of claim **1** wherein said drive members carry said lugs with regular spacing along the length thereof and lugs on adjacent drive members are evenly arranged with respect to one another.

9. The invention of claim **1** including first, second and third shaft members parallel to one another and wherein said flexible drive members are endless loops about said shafts, and one of said shafts is rotated by said motive means.

10. The invention of claim **9** wherein said first and second shafts engage and position said drive members to extend across said surface.

11. The invention of claim **10** wherein said third shaft is below the level of said surface at a location such that said flexible drive members engage said lugs with the fencing material between said first and second shafts and said lugs are withdrawn from engagement with the fencing material between said second and third shafts.

12. The invention of claim **11** wherein said third shaft is rotated by said motive means.

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