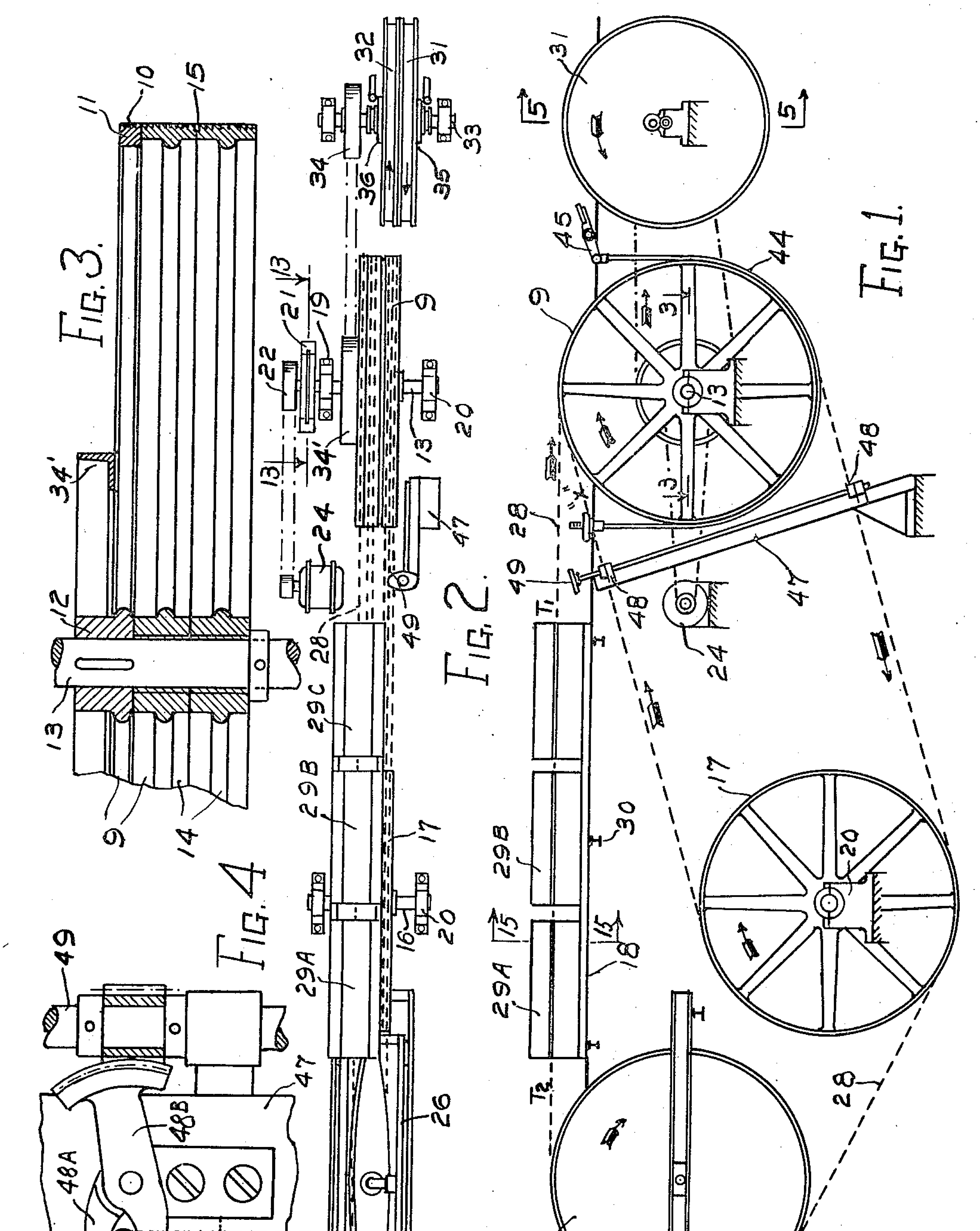
March 7, 1944. L. ILLMER ET AL 2,343,460

GRINDER MACHINE REELING SYSTEM

Filed Feb. 26, 1942 4 Sheets-Sheet 1



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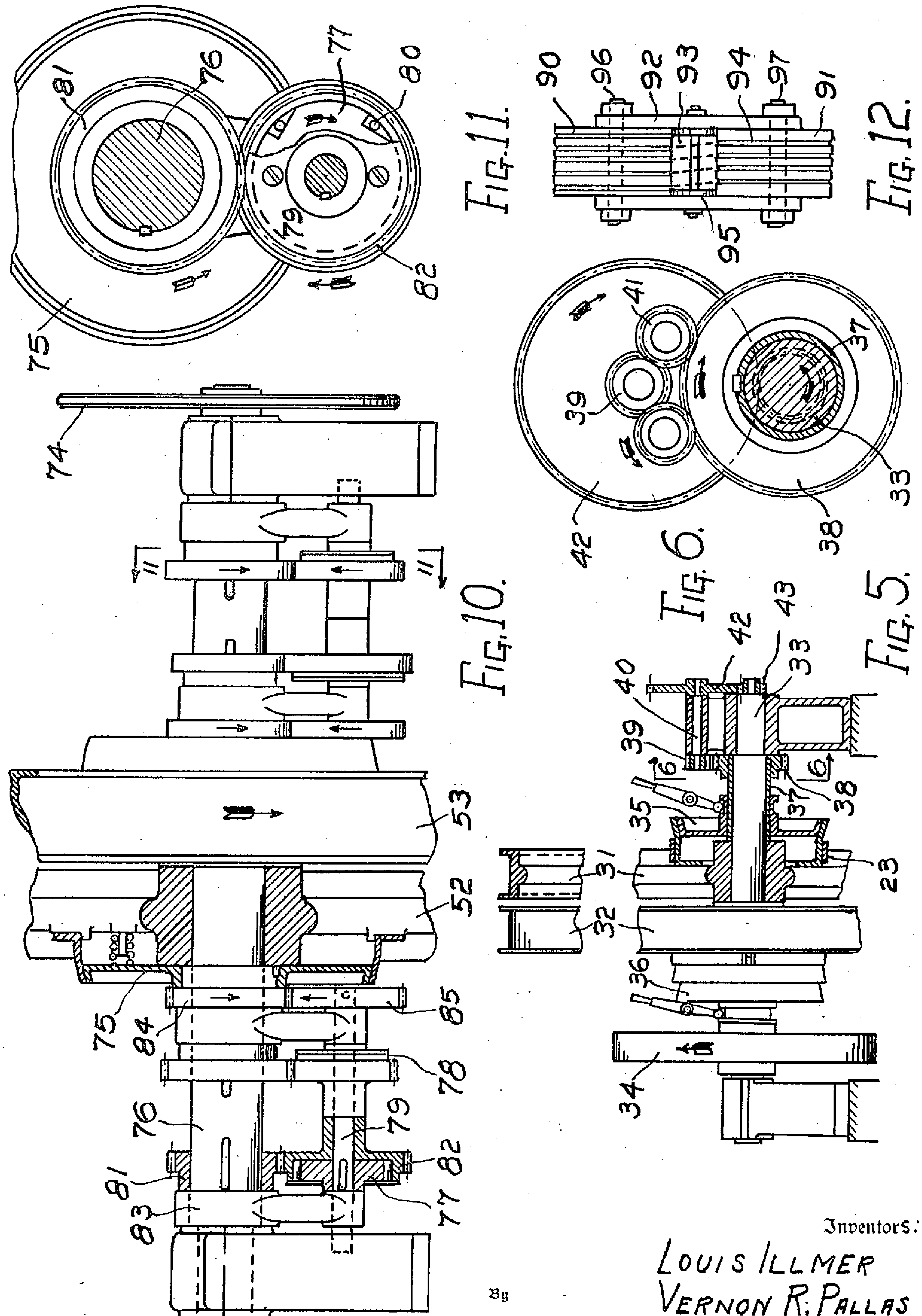
GRINDER MACHINE REELING SYSTEM

Filed Feb. 26, 1942 4 Sheets-Sheet 2



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GRINDER MACHINE REELING SYSTEM

Filed Feb. 26, 1942 4 Sheets-Sheet 3

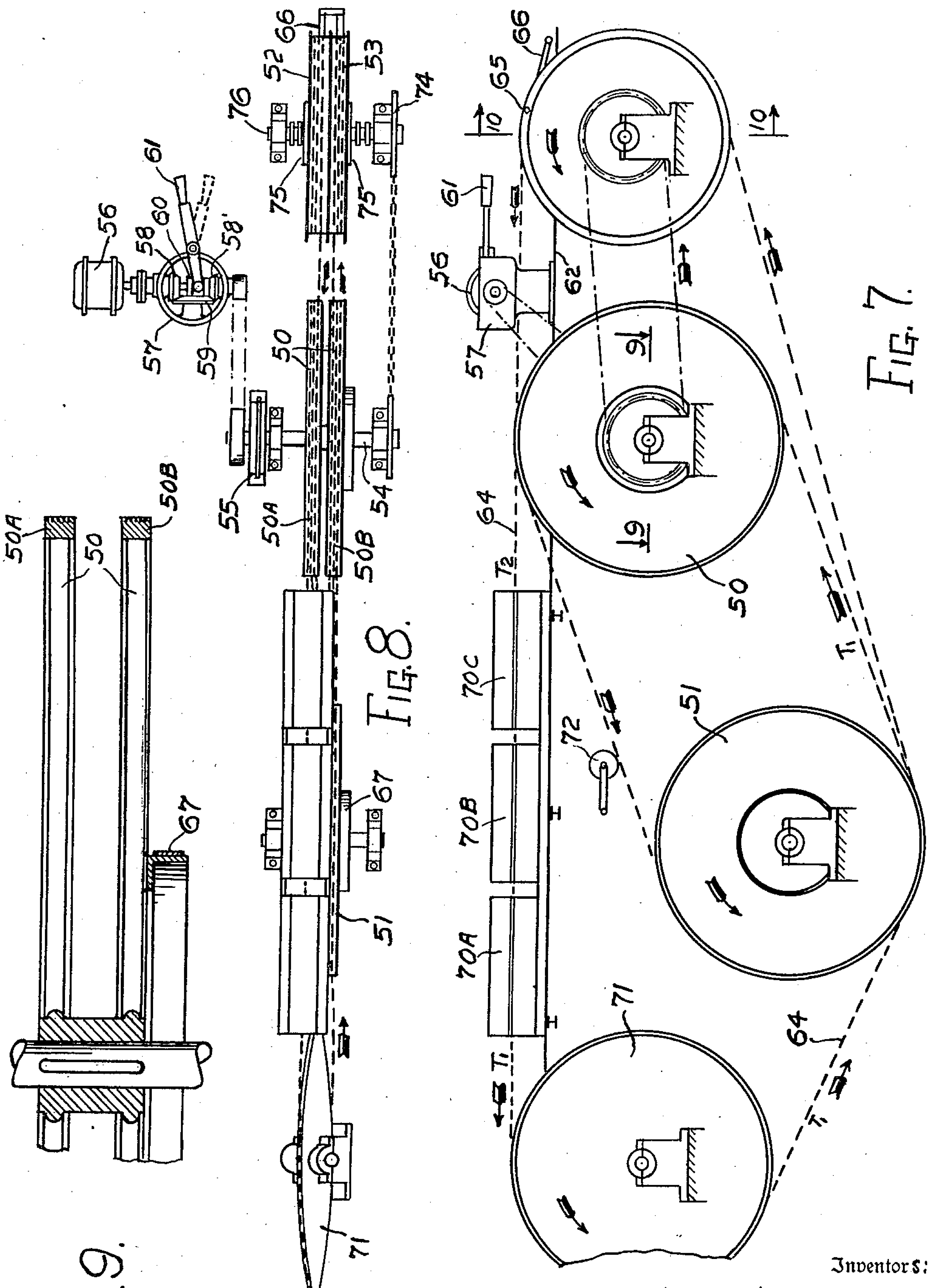

Fig. 7.

Fig. 8.

Fig. 9.

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Filed Feb. 26, 1942 4 Sheets-Sheet 4

FIG. 15.

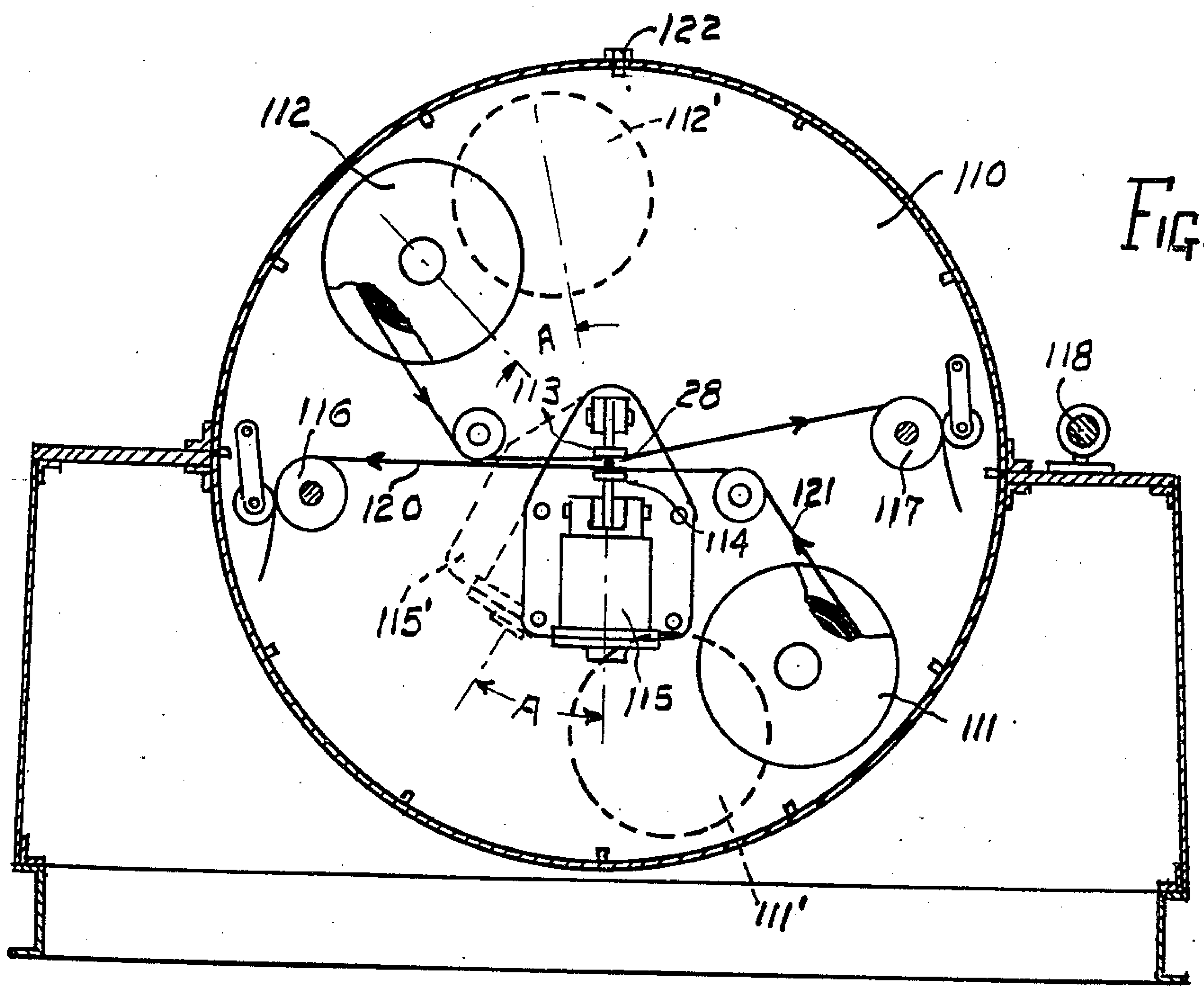


FIG. 14.

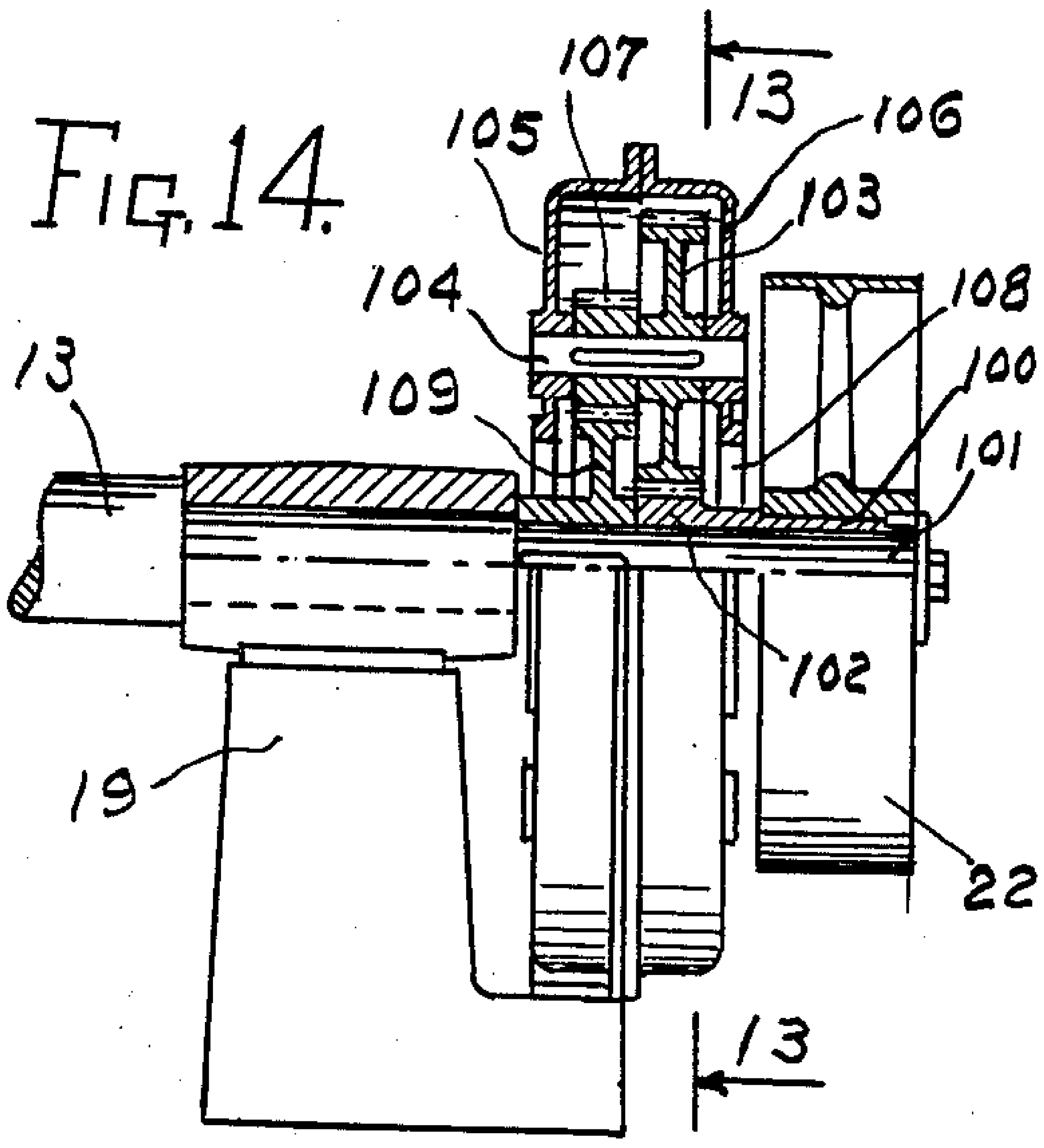
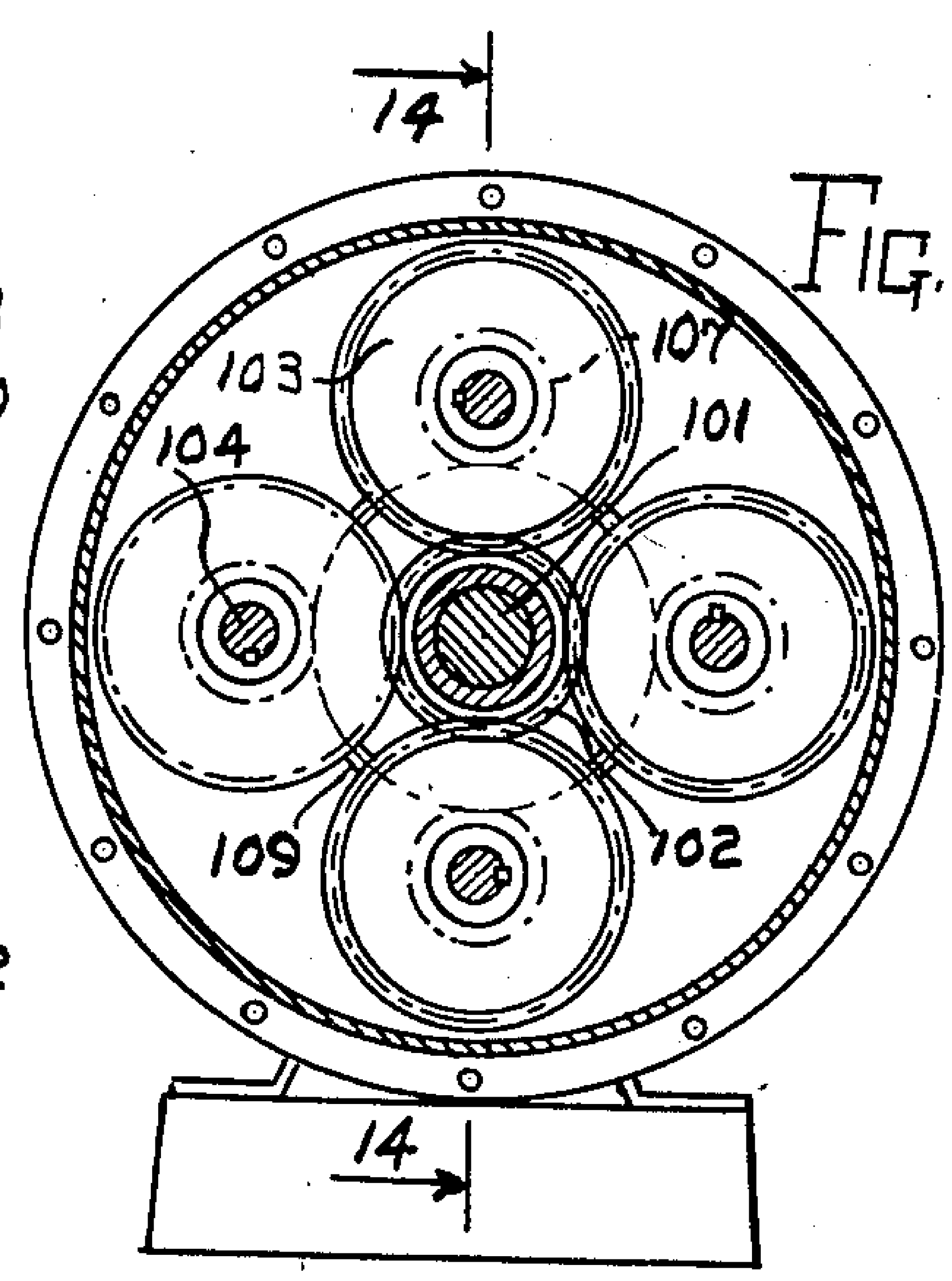


FIG. 13.



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Patented Mar. 7, 1944 2,343,460

UNITED STATES PATENT OFFICE

2,343,460

GRINDER MACHINE REELING SYSTEM

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Application February 26, 1942, Serial No. 432,406

16 Claims. (Cl. 51—150)

This invention relates to simplified surface finishing machinery in which a succession of abrasive tapes or the like cutting agency are effectively utilized, and more particularly pertains to improved drag equipment by which round or flat strip stock, butt welded metallic rods or wires and the like reelable work pieces may in long length be dragged longitudinally at a relatively high velocity to impart an intensified cutting rate to the treated product when brought into engagement with a plurality of slowly fed tapes as carried by either stationary or rotary abrasive heads.

The present heavy duty apparatus is especially designed to efficiently rough grind or superficially polish hardened piano, stainless steel and other high tensile stock at low labor and other operating costs without requiring any fast moving parts except for the treated stock itself and a solitary winch reeling mechanism.

To this end, a series of laterally spaced bulkheads or stationary housing partition plates, each having mounted thereon angularly staggered abrasive tapes and feed mechanism therefor, may respectively be arranged to treat narrow strip or round stock. Each such abrasive tape component may be fed onward toward their common work piece at an exceedingly slow rate in order that the respective tapes become substantially spent in a single pass through the cutting zone thereof. The present improvements are primarily directed to the use of a single pair of sheaves between which an extensive batch run of reelable strand stock in a diametral size ranging from about $\frac{1}{16}''$ to $\frac{1}{4}''$ may be rapidly dragged in successive unidirectional or reversed passes by one and the same motorized tractor sheave. A preferred peripheral sheave travel rate of more than two thousand feet per minute affords a corresponding fast processing service for a given collective width of active tapes and results in proportionately low total productive costs. Our predetermined high speed longitudinal drag velocity at the same time permits the use of a comparatively low tape backing thrust and an increased cutting performance as measured in tape expenditure per cubic inch of metal removal.

Such intensified processing produces a drag of considerable magnitude. In order to secure the necessary tractional grip upon our dragged wire, we provide for a pair of grooved primary sheaves having a diametral drum size sufficiently large that a prestraightened reelable strand may not become harmfully strained beyond its elastic limit or otherwise set to the drum curvature. That is to say, each such sheave diameter is kept commensurate with that of the handled strand and for large wire sizes, the required sheaves may assume massive proportions to obviate wire rupture by inordinate bending stress.

A supply reel and a mated offtake reel may be associated with our sheaves to allow of slowly prereeling straightened heavy wire thereon without having to hold up active machine production and to facilitate prompt reloading of the primary sheaves with a renewed batch of strand stock.

The object of our invention is to devise an improved strand drag system of the indicated character capable of rapidly advancing a long strand of stock to radially staggered grinder means to complete its abrasive treatment at a fast productive rate in comparatively few passes and which system requires a correspondingly short intervening shut-down period for installing a next succeeding strand batch. Embodied herein are other accessories and structural aspects designed to promote the end in view.

Reference is had to accompanying four sheets of drawings which are illustrative of alternate exemplifications, and in which drawings:

Fig. 1 represents an elevational side view of one style of sheave assembly arranged to drag an endless wire loop through a cooperating grinder housing, and Fig. 2 is a top view thereof.

Fig. 3 is a cross-sectional detail of a driver sheave as taken along 3—3 of Fig 1, and Fig. 4 details our wire grip devices.

Fig. 5 is taken along 5—5 of Fig. 1 to clarify certain reel controls, and Fig. 6 shows a view along 6—6 of Fig. 5.

Figs. 7 and 8 correspond to Figs. 1 and 2 but reveal a modified style of sheave assembly arranged to work with a treated strand of finite length.

Fig. 9 is taken along 9—9 of Fig. 7 and illustrates certain sheave details.

Fig. 10 is cross-sectionally taken along 10—10 of Fig. 7 to depict the gear controls for its associated reel drum, and Fig. 11 details in enlarged scale, the gear lay out as seen along 11—11 of Fig. 10.

Fig. 12 outlines a substitute sheave lay out for storing a wire batch in the Fig. 1 reeling system.

Fig. 13 details our double reduction gear train as seen along 13—13 of Fig. 2, and Fig. 14 shows in fragmental section, an elevational view taken along 14—14 of Fig. 13.

Fig. 15 represents a face view of one circumferentially shiftable grinder disc as seen along 15—15 of Fig. 1.

Referring more specifically to the Figs. 1–6, this sectionalized or dual style of strand carrier collectively designated as 9, may comprise a power actuated driver or tractor sheave component 11 of considerable diametral size having a plurality of circumferential endless grooves 10 accurately turned to a like depth in the rim thereof. As indicated in Fig. 3, the relatively narrow traction rim of such mover sheave 11 may be provided with separate arms and a hub 12 fixedly keyed to the main wheel axle 13. The remainder of said carrier may be made up from one or more similar idler or storage sheave sections such as 14 which may have a brake receiving gap 15 therebetween. The respective floating hubs of these storage sections may be integrally formed and mounted to run freely upon said axle. All the rim grooves of any one sheave are preferably kept to identical diametral size in order to obviate strand slip.

A cooperating follower or driven sheave 17 may be kept substantially identical in structure with the axially spaced driver sheave or carrier 9, except that the follower member 17 does not constitute a strand driver. Their corresponding narrow rim sections such as 11 may be disposed in planiform alignment and each provided with some six or more grooves over which an endless wire or the like pliant strand 28 is helically looped in the open winch fashion schematically indicated by dotted lines, that is to say all next adjacent strand loops are confined to a single layer without overlapping entanglement in order to facilitate guided batch reloading by groove lead. The main axle 13 and the secondary axle 16 of the primary sheave 9 and its follower sheave 17 may be parallelly installed in a pit beneath the level of the protective floor 18 between similar bearing pedestals such as 19 and 20. Both hubs of the follower sheave 17 may or may not be keyed to the axle thereof. One extended end of the slowly rotating main axle 13 may be equipped with a compactly encased transmission gear train 21 of which the tubular drive pinion is loosely centralized around said axle end and its sleeve overhangingly carries the pulley 22. Said pulley may be belt driven from a unidirectional motor or other high speed prime mover 24 of adequate power to impart the stipulated rate of peripheral travel to the dragged product.

As detailed in Figs. 13 and 14, such compactly encased transmission unit 21 preferably comprises the driven sleeve 100 that is coaxially and loosely disposed about the axle extension 101 projecting beyond its adjacent pedestal 19. The inner sleeve end has a sleeve pinion 102 concentrically affixed thereto. Meshing with said pinion are multiple epicycloidal gears such as 103 respectively secured to a separate compound spindle 104. Each spindle may bridge the opposed end walls 105 and 106 of the split stationary casing and which walls are alignedly apertured at 108 to freely project the axle extension therethrough. Conjointly mounted on each such spindle is an epicycloidal pinion 107 that interlockingly rotates in unison with its mated gear 103. These multiple pinions 107 in turn mesh with a keyed axle drive gear 109 to afford an ample gear reduction ratio between the high speed motor 24 and the slowly driven main axle 13, the pulley 22 being disposed exteriorly of the casing confines and affixed to the outer sleeve end as shown.

Further cooperating with said mated sheaves, is a singly grooved skew sheave 25 of which the axle may be cradle mounted in a slidable carriage 26. One carriage end may be counterweighted at 27 and released by a manipulative hoist 27A accessibly located above the floor line level. One or more stationary grinder units such as 29A, 29B, 29C may be alignedly erected across pit rails 30 that lie on a level with the floor line 18, as shown. Each unit may be of any suitable construction comprising a row of rotary or non-rotary abrasive heads respectively equipped with either abrasive tapes or wheels to constitute a series of cutting zones. The plural component tapes of any one housing may be adjustably backed by pneumatically controlled shoes and means provided by which all such tapes may be simultaneously unloaded and thrown out of commission at will.

One such housing unit usually suffices to treat fast-grinding low-tensile stock when served with coarse grit tape. For slower grinding high-tensile stock, it is preferred to simultaneously employ twin housings since the tape drag per housing then becomes materially reduced without overloading the common motor drive 24. The third or alternative housing 29C may be held in reserve and stocked with finer grit tape to finish a long strand when the coarse grinding tape housings have been thrown out of service.

The Fig. 1 installation is intended to operate with a long endless strand or looped work piece 28. After such batch of wire has been threaded about the primary sheaves as shown, it may be completely finished in place without removal. Each of our housings may employ a plurality of tapes that are uniformly staggered angularly about the wire axis and thus afford a large collective tape width that promotes intensive cutting performance. Where large sized wires are to be extensively treated to thoroughly eliminate surface defects, a comparatively small number of successive wire passes may be resorted to until the desired degree of stock reduction has been achieved by stepwise removal.

Referring in detail to Fig. 15, the bore of our longitudinally split tubular housing such as 29A may be spacedly partitioned by a series of stationary grinder discs of which one such is designated 110. Each disc side face may be provided with dual tape supply spools 111 and 112, also with a pair of opposed backing jaws 113 and 114 of which one may be retracted by a remotely controlled cylinder 115. The corresponding tape feed rollers 116 and 117 are intended to be positively actuated at slow speed in an appropriate manner by the driven lay shaft 118. As indicated in dotted outline, the opposed face of the disc 110 may be similarly equipped but with its spools 111′ and 112′ and primed accessories bodily shifted through a lead angle marked A.

The free end of each tape roll such as 120 or 121 may be threaded over suitable guide rollers to feed in their arrowed directions while interposed between the tape backing jaws and thereby constitute diametrically opposed abrasive zones for the treated strand 28. Any one of our discs may be angularly shifted with respect to a contiguous disc and thereupon set in fixed position by the disc keyway latch 122, the intended successive jaw distribution being arranged to bring about a substantially uniform abrasion about the entire strand perimeter in a single pass.

The present improvements are chiefly concerned with the economical handling of reelable wire in larger diametral sizes for which the ratio of surface to embraced content is relatively small and therefore requires the minimum of abrasive expenditure. Subsequent to such advantageous processing, the resulting brightly surfaced wire may be drawn down through successive dies to reduce its original diametral size without defacing the initial polish thereof.

It will further be noted that in both the Fig. 1 and 7 layouts, the corresponding large sheaves comprised in our winch device are all kept to an approximately equal diameter and that the respective axes thereof are disposed in parallelism to define the vertices of a triangle. The obtuse angular divergence between the sheaves **9** and **25** or **50** and **71** is herein subtended by a rectilinear strand course along which our grinder zones are incorporated. Such course tangentially and undeviatingly spans the mated perimeters of the enumerated sheave pairs to provide therebetween for a comparatively long cleared space falling within the overall confines of such compactly installed three sheave winch system.

Because of the short time period that elapses between repeated passes at the stipulated high travel velocity, it is expedient to work with a long endless loop of product, preferably several thousand feet in length whereby to reduce labor costs and to obviate the need for frequent batch renewal. When subjected to intensive abrasive tape treatment, smaller sized wires in particular are likely to undergo considerable rise in superficial temperature. Our ample sheave storage capacity further affords adequate time for cooling off the treated wire prior to its reentry into a grinder housing.

For best results, it is not merely a matter of increasing the tractor rim grooves sufficiently to accommodate the entire storage of our long wire loop **28**. As taught by the rope transmission art, the degree of traction or slipless groove grip on part of the driver sheave **11** is dependent upon the materials in frictional contact. For a particular endless rim groove, the off-going slack side of such half lap of rope is thereby delivered at a materially reduced tension relative to that prevailing in the tight on-coming rope side. Such slackened tension continues to drop between next adjacent grooves in a geometric ratio. For a firm stable wire grip working without abnormal span sag or slip, the ultimately reduced tension T_2 indicated in Fig. 1 should not be allowed to fall below certain limits with respect to the maximum tension T_1. In case of a non-driver, i. e. follower sheave such as **17**, the on-coming and off-going strand tensions are not similarly reduced but remain substantially equalized. Our traction rim section **11** of the driven sheave **9** primarily serves as the sole grip or hauling agency for the dragged wire. Upon reaching a desirable lowered tension value, said wire may be transferred on to a loose storage rim section such as **14**, whereupon the threaded endless strand **28** maintains a substantially constant T_2 tension until it enters the first housing **29A**.

The single grooved skew sheave **25** inclinedly guides or shifts the treated strand from an outer idler groove into running alignment with an opposed outer groove of the tractor rim **11**. In passing through one or more housings, the accumulative drag of their loaded tapes augments the tension of the emerging wire. By properly proportioning the grooves in the mated traction rim sections and by use of an adjustable counterweight **27**, said endless wire may be successively dragged through active grinder housings in repeated passes by the motor **24** until a required quota of stock has been removed. The intensive tape drag set up in the respective housings automatically raises the inferior wire tension T_2 to T_1 and thus permits the use of a comparatively light counterweight **27** without material slippage on part of the driven tractor rim **11**. It will also be observed that our sheave layout is such that only a single strand is purposely offset and carried through the several grinder housings in parallelism with the floor line **18** and that the remainder of the strands are compactly disposed therebeneath. As a safeguard against rupture by defective welds, such depressed strands may be shielded beneath a protective cover such as floor **18**. It is also pointed out that by motor reversal, our work piece **28** may be dragged in either direction by the use of a single pair of sheaves **9** and **17**, although in the Fig. 1 layout, it is preferred to operate in the one way arrowed direction.

Immediately upon leaving the last housing unit, our highly tensioned strand is purposely carried directly toward and about the perimeter of the primary sheave **9**. Such disposition promptly reduces the extreme tension T_1 and obviates subjecting the skew sheave **25** thereto. It is also pointed out that the recurrent winding of a large sized wire about a winch of reasonable diameter, may involve considerable power loss by unrecoverable internal strand bending stress. It will be obvious that the use of but a single double-acting winch minimizes such wastage.

After grinder completion, another batch of wire stock is mutually threaded around the companion primary sheaves **9** and **17**. In such connection, it is preferred to work with a supply reel **31** and a complementary offtake reel **32** that are preferably mounted upon a common supplementary axle **33** disposed in parallelism with the main axle **13**. Either of said reels may be independently clutched and intermittently belt driven in unison with the keyed traction sheave **11** by the pulleys **34** and **34'**, whereby to maintain exact synchronism with the tractor sheave **9** without overtravel when delivering a completed wire batch onto the offtake drum. Such synchronized restrained rate of peripheral transfer obviates undue slackening on part of the oncoming strand and prevents leaving its guide groove, particularly while starting or stopping a batch transfer period.

As shown in Fig. 5, the reel hubs may be rotatably carried by the supplementary axle and respectively coupled thereto by the independently manipulative clutches **35** and **36**. The clutch of the supply reel **31** may be equipped with a train of reduction gears as indicated by Fig. 6. The associated clutch **35** is slidably feathered upon one end of an axle sleeve **37** and the other sleeve end fixedly carries a spur gear **38**. A pinion **39** mounted upon an auxiliary shaft **40** may mesh with said spur gear through one or more intermediary idlers such as **41**. The opposite end of the shaft **40** may be provided with a relatively large driven change gear **42** that in turn meshes directly with the driver change pinion **43** fixedly mounted on one end of the axle **33**. The offtake reel **32** when clutched, is intended to rotate in the same direction as its axle but the idler 41 preferably drives the clutched supply reel 31 in a reverse direction. The manipulative brake straps 23 may selectively apply a frictional drag to either reel.

While an endless wire loop 28 is being abrasively treated as described, the relatively large supply reel 31 when not otherwise in use, may be belt driven by the pulley 34 for prereeling a renewal batch of wire thereon originally comprising numerous bundles of wire adjoined end to end by welding or the like. Wire in larger diametral sizes, usually needs to be run through a conventional straightener machine (not shown) at a comparatively slow feed rate. By the use of substitute change gears respectively having a tooth ratio different than the gears 42 and 43, the prereeling rate may be accommodated to straightener requirements for a wire of given feed characteristics without having to bodily demount the prereeling drum. Such preparatory step is intended to be carried out simultaneously with the processing of a preceding wire batch.

After batch completion, a shut down of the motor 24 brings the sheave system to rest. A brake band 44 may be dependingly suspended in the rim gap 15 and the treadle 45 applied to decelerate the fast moving wheel members (see Fig. 1). A rigidly mounted brace or tool prop 47 schematically indicated in Fig. 1, facilitates batch renewal when the motor is brought to rest. Such brace may be affixed alongside the outer edge of the storage sheave 14 and equipped with complementary plierlike wire gripping tools 48 of the kind detailed in Fig. 4. One retained jaw 48A of each tool may be fixedly attached to the prop while the other movable plier jaw 48B may be gear actuated in unison by a rod extended to a central control point 49 located above the floor level.

Assuming the tape backing jaws to be unloaded and the lifted counterweight 27 to have relieved strand tension, then after bridgingly gripping corresponding legs of said loop with the tools 48 as shown, a U-shaped sheave embracing loop portion of the previously treated wire 28 may be severed in the region marked "X" (see Fig. 1). The freed rim embracing end of such loop may without unwanted slackening of the entire wire batch, be swung over onto the offtake reel 32 for securement thereto. In addition, the loose outer end of a new batch of prereeled wire carried by the supply reel 31, may be spliced to the plier gripped end of the severed wire. By releasing the tools 48 and throwing in the offtake clutch 36, a careful starting of the motor transfers the completed wire batch onto the offtake reel and simultaneously reloads the sheave system with a fresh wire batch. Such preparatory prereeling on a relatively large spool diameter permits wire transfer to the primary sheaves at a high travel rate without protracted time loss. It now remains to splice the ends of the reloaded wire batch into an endless loop and to restore the counterweight into operative position. After being wound upon the offtake spool, the completed batch of wire may be independently bundled or otherwise removed prior to the completion of a next succeeding wire batch.

In as much as each wire batch needs to be reloaded frequently, it is expedient to bring the fast running sheave rims to rest quickly. Our succession of wire gripping shoes when not retracted, collectively provide for a sufficient drag to meet such need without resort to supplementary decelerating means. When utilized for such retarding purposes, our remotely controlled tape backing shoes may be operatively retained during each sheave shut down period and simultaneously retracted to free the wire grip prior to restarting the sheaves from rest.

In Fig. 12 there is schematically shown a plan view of a modified pair of primary sheaves 90 and 91 which may be substituted for the corresponding elements 11 and 14 of Figs. 1 and 2. In this alternative layout, the respective sheave axles have been brought into closer parallelism and complementary struts such as 92 are inserted between corresponding axle ends 96 and 97. Such struts serve to directly counteract the combined heavy thrust set up by the numerous rim spanning strands such as 93 which are operatively threaded across laterally stepped rim grooves such as 94. As an equivalent, supplementary compression rollers such as 95 may respectively be interposed between adjacent rims for a like purpose.

Referring now to Figs. 7 to 9, this double-acting reeling system works with a treated strand 64 of finite length of which opposed end regions may respectively be wound upon reversely actuated drums driven by a controlled motive mechanism serving to alternately drag the strand in opposed directions. Such reeling drums collectively afford large storage capacity and permit abrading a batch of continuous wire weighing up to a ton per run. In this instance, a medial wire region is snugly gripped for traction by means of the axially spaced driver sheave 50 and a coacting idler sheave 51. These dual tractor sheaves are substantially identical in purpose to the corresponding rim sections 11 of Fig. 3, the hub of the driver sheave 50 being keyed to its main axle 54 and the idler sheave 51 may be floatingly disposed on a mated non-driven axle. In Fig. 8, a pair of dual rim components 50A and 50B may be comprised in each such primary sheave and laterally spread apart to respectively register with the channeled reel drums 52 and 53, it being the intent to evenly feed the wire upon said drums in layers by conventional level winder means (not shown).

The keyed drive sheave 50 is slowly but positively rotated through the encased reduction gear train 55 of the Fig. 14 type which may in turn be belt driven from the high-speed unidirectional motor 56. A reversing gear unit 57 may comprise opposed bevel pinions 58 and 58' that mesh with an intermediary bevel gear 59. The splined jaw clutch block 60 is shiftable by the manipulative lever 61 and serves to selectively run the main axle in either direction to reverse wire travel. If desired, such reversing unit may also be compactly incorporated into the gear train casing 55. Said motor 56 together with its starting controls and lever 61 are purposely located above the level of the floor line 62 within easy reach of the attendant.

To promote rapid product handling, said drums 52 and 53 are preferably mounted alongside each other in tandem upon a common reel axle 76 in the Fig. 10 manner. Opposed ends of the wire or other work piece 64 may be respectively wound around different drums in reversed directions and said ends crimped into a rim flange hole such as 65 (see Fig. 1). A follow up or tell-tale vane 66 riding upon the wire layers, may be utilized to electrically indicate when either bottom reel layer has become substantially unwound. Obviously such instrumentality may also serve to automatically trip the motor circuit breaker.

A long lead wire may be attached to each terminal of the treated work piece 64 and constitute an initial bottom layer component of each cylindrical reel spool. Such provision insures that the interposed treated batch of wire shall throughout its length be uniformly abraded, irrespective of the variable longitudinal cutting action occuring during the period of pass reversal. Each primary sheave may also be equipped with actuated brake bands such as 67 whereby to decelerate and promptly bring the moving system to rest prior to strand reversal.

Referring in further detail to Figs. 7 and 8 and assuming the motor to be dragging the strand at high rate of travel in the arrowed direction, it will be noted that the off-coming wire leaving the supply reeling drum 52 is directed into the inner perimetric groove of the rim component 50A. After repeatedly embracing the mated idler sheave 51, this wire emerges from the outer groove of the rim component 50A in a centrally aligned relation to the tandem grinder housings such as 70A, 70B, etc. The abraded wire under a relatively high drag tension T_1, is thence carried about the skew sheave 71 and wrapped into gripped engagement with the outer groove of the rim component 50B. After being repeatedly threading over the drive and idler sheaves, the work piece emerges from the inner groove of the rim component 50B at a materially reduced tension for reception by the take-up reeling drum 53. The installation is such that during successive pass reversals, the rim components 50A and 50B alternately act as the wire hauling or grip agency. Whenever a lead wire of the treated strand approaches one of its terminals, the lever 61 may be manually or automatically shifted to time each pass reversal. A weighted belt type of tightener 72 may be employed to take up undue slackness of the strung wires.

To obviate winding superimposed layers too tightly upon the reversable supply and offtake reels, the Fig. 10 refinements may be resorted to. The interchangeable reeling drums 52 and 53 are symmetrically disposed about the mid region of the wheel shaft 76 and may be driven in unison with the main axle 54 by the chain sprocket 74. When it is desired to run wire onto one such spool as a take-up reel, its associated clutch disc is made to overtravel and thereby maintain the supplied wire under moderate tension without marring the laid wire. When serving as a supply reel, the slip clutch draggingly retards wire delivery. In order to automatically keep such slip behavior in step with the shift position of the lever 61, pairs of rotatable ratchets 77 and 78 respectively including reversely mounted clutch rollers 80, may be carried by a common lay shaft 79. Such rotating shaft may be supported between the spaced stationary bracket arms such as 83. Said ratchets may be driven off the wheel shaft 76 by gears 81 and 82 of unlike diameters to obtain a differential speed for said lay shaft that is in turn transmitted to its adjacent clutch disc through the mated spur gears 84 and 85.

Our reel arrangement serves to keep the treated strand taut while alternately serving either as a supply spool or a take-up spool. When the wire has become sufficiently processed by repeated passes, a new batch of straightened wire may first be prereeled upon a drum device of the kind described in connection with Fig. 5, which is thereupon transferred to one of the reeling drums 52 or 53. Such prereeled wire may then be incorporated into the Fig. 7 system by splicing such wire to the trailing end of a processed batch that is withdrawn by winding same upon the mated reeling drum.

The foregoing disclosure will, it is believed, make evident to those skilled in this art, the outstanding commercial advantages afforded by our reeling system particularly in reducing the number of required heavy winch sheaves to a minimum. It will be observed that certain structural aspects of the disclosed improvements may readily be modified to produce a like result, all without departing from the spirit and scope of our invention heretofore described and more particularly defined in the appended claims.

We claim:

1. In a surface abrading machine comprising grinder means adapted to treat a common laterally pliant work piece, a plurality of abrasive elements respectively brought into successive cutting zone engagement with said work piece, to uniformly abrade around the entire perimeter thereof in a single pass, sectionalized winch sheave means including perimetrically grooved components concentrically mounted in tandem upon a common axle and having the work piece snugly wrapped into plural grooves of each such component, motive means rotating said axle, one of said components being affixed to the axle and serving as the sole traction agency for longitudinally dragging the treated work piece through the aforesaid zones, the work piece portion wrapped in successive grooves of said affixed sheave component being subjected to a gradually reduced tension and the work piece portion wrapped about the other sheave component being substantially maintained at the lower differential tension reached in the fixed sheave grooves.

2. In a system for expediting the successive reloading of a grinder machine adapted to treat an original batch of strand grippingly looped about power-driven winch means to provide for a strand region brought into operative engagement with an abrasive agency and which batch prior to its renewal affords a disjoined strand terminal, supplementary prereeling means adapted to be loaded with a substitute batch of finite length of which a free strand end is coupled to said terminal and which substitute batch is transferred lengthwise to displacedly duplicate the operative position of said original batch and thereby replenish the last named batch throughout the length thereof, and controlled drive means maintaining the peripheral velocity of the prereeling means in unison with the winch means during the strand transfer period.

3. In a system for expediting the successive reloading of a grinder machine adapted to treat an original batch of strand looped about power-driven winch means to provide for a strand region brought into operative engagement with an abrasive agency and which batch prior to its renewal affords a disjoined strand terminal, supplementary prereeling means adapted to be loaded with a substitute batch of finite length of which a free strand end is coupled to said terminal and which substitute batch is transferred lengthwise to displacedly duplicate the active position of said original batch and thereby replenish the last named batch throughout the length thereof, unloaded take-up means cooper-

atively arranged with said prereeling means to receive a displaced portion of the original batch thereon, and controlled drive means maintaining the peripheral velocity of the take-up means in unison with the winch means during the strand transfer period.

4. In a system for expediting the successive reloading of a grinder machine adapted to treat an original batch of endless strand looped about axially spaced winch sheave means to provide for a strand region brought into operative engagement with an abrasive agency to complete the grinding of such batch throughout the length thereof and which endless strand is subsequently severed into opposed terminals, preparatory prereeling drum means carrying a substitute reloading batch of finite length adapted to be united into an endless strand loop of which an initially free end is coupled to one such terminal whereby to draggingly transfer the reloading batch lengthwise to replenish the entire length of said original batch, take-up drum means coupled to the other terminal and arranged to receive a displaced portion of the original batch thereon, the prereeling drum means and said take-up drum means being cooperatively disposed in the vicinity of a common end region of the spaced sheave means, and controlled drive means maintaining the peripheral velocity of the take-up drum means in unison with the sheave means during the strand transfer period.

5. In a system for expediting the successive reloading of a grinder machine adapted to treat an original batch of elongated stock comprising an endless strand that is helically looped about axially spaced winch sheave means to provide for a strand region brought into operative engagement with an abrasive agency throughout the length thereof to complete the grinding of such batch and the endless strand of which batch is thereupon severed into opposed terminals, driven supplementary prereeling means adapted to carry an additional strand supply to constitute a substitute reloading batch of finite length adapted to be united into an endless loop of which an initially free end is coupled to one such terminal, said sheave means serving to drag said reloading batch lengthwise to wholly displace and thereby replenish the entire length of the original batch, rotatable take-up means coupled to the other terminal and arranged to receive a displaced portion of the original batch thereon, and drive means for simultaneously rotating the take-up means and said winch sheave means while the original batch is being displaced.

6. In a system for expediting the successive reloading of a grinder machine adapted to treat an original batch of strand looped about a pair of axially spaced winch means to provide for a strand region brought into operative engagement with an abrasive agency and which batch prior to its renewal affords a disjoined strand terminal, rotatable prereeling drum means adapted to carry a substitute reloading batch of finite length of which a free end is coupled to said terminal whereby to transfer the reloading batch lengthwise to wholly displace and duplicate the operative position occupied by the original batch, complementary take-up drum means arranged to receive a displaced portion of the original batch thereon, the prereeling drum means and said take-up drum means being provided with control means for intermittently reversing the rotative direction of one such drum, and controlled drive means maintaining the peripheral velocity of the take-up drum means in unison with the winch means while the original batch is being displaced.

7. In a system for expediting the successive reloading of a grinder machine adapted to abrasively treat an original batch of strand that is embracingly looped about a pair of axially spaced tractor sheave means and which batch prior to its renewal affords a disjoined strand terminal, drive means for rotating said sheaves to impart a predetermined longitudinal velocity to said treated original batch, driven preparatory drum means rotatably arranged to prereel thereon a straightened substitute reloading batch of strand at a travel rate slower than said predetermined velocity, said reloading batch being of finite length of which a free strand end is coupled to said terminal subsequent to the completion of the original batch whereby to draggingly transfer said reloading batch about the sheave means, adjustable means for selectively altering the rotative rate of said supplementary drum with respect to that of the sheave means, and means maintaining the peripheral velocity of the drum means in unison with the sheave means during the strand transfer period.

8. In a system for expediting the successive reloading of a grinder machine adapted to abrasively treat an original batch of strand that is cooperatively looped about a pair of axially spaced winch sheave means and which batch prior to its renewal affords a disjoined strand terminal, drive means rotating said sheaves to impart a predetermined longitudinal velocity to said treated original batch, intermittently driven drum means floatingly mounted upon a supplementary axle to prereel thereon a substitute reloading batch of strand of finite length of which a free end is coupled to said terminal whereby to draggingly transfer said reloading batch about the sheave means, sleeve means slippingly embracing said axle, manipulative clutch means disposed between said sleeve means and the drum means, and a train of reduction gears operatively interposed between the sleeve means and said supplementary axle.

9. In a system for expediting the successive reloading of a grinder machine adapted to abrasively treat an original batch of strand looped about a pair of axially spaced sheave means to include a certain severable loop portion, motorized drive means for rotating said sheave means to intermittently advance said batch longitudinally, releasable gripping means adapted to fixedly grip and retain a severed terminal region of said certain loop portion while the sheave means remains at rest, supplementary prereeling means adapted to be loaded with a substitute reloading batch of finite length that is coupled to one such severed terminal region, said gripping means when released allowing the energized drive means to draggingly transfer the reloading batch onto the sheave means, take-up drum means arranged to receive the displaced original strand thereon, and means maintaining the peripheral velocity of the take-up drum means in unison with the sheave means during such transfer period.

10. In a system for expediting the successive reloading of a grinder machine adapted to abrasively process an original strand batch of finite length that is medially looped about a tractor sheave and which strand has an elongated lead appended to each end thereof, motorized drive means serving to intermittently reverse the ro-

tational direction of said tractor sheave, mated reels which respectively engage an opposed terminal region of said appended leads, means for reversing said reels in unison with the tractor sheave, a pair of independently rotatable drums of which one such is arranged to receive the completed original batch thereon, clutchable drive means for actuating the other of such drums to prereel thereon a next successive renewal batch while the original batch is being processed, said last named batch being thereupon transferred and interposed between the inner lead ends, and means for maintaining the peripheral velocity of said one drum in unison with the tractor sheave during the strand transfer period.

11. In a system for expediting the successive reloading of grinder means adapted to abrasively treat a batch of strand, a single tractor sheave and a counterweighted skew sheave having the strand mutually looped about said sheaves to run in unison, releasable drive means arranged to intermittently rotate the tractor sheave to impart a predetermined longitudinal velocity to said strand, a plurality of abrasive elements operatively applied in succession along a strand loop portion that spans said sheaves and when active serving to collectively impose a substantial combined drag grip upon said strand, said drag upon release of the drive means acting to quicken the deceleration of said tractor sheave, cooperating take-up drum means arranged to have said batch transferred thereon by instituting a restarting of the tractor sheave subsequent to bringing said batch to rest, and controlled drive means for said drum means serving to maintain the peripheral drum velocity in a synchronous relation to the restarted tractor sheave and thereby hold the oncoming transferred strand in a substantially taut condition.

12. In a surface grinding machine comprising grinder head means adapted to treat a laterally pliant strand when dragged lengthwise therethrough, a pair of dual sheaves each provided with a cylindrical rim having a series of grooves coaxially mounted on a common main axle, follower sheave means provided with a groove series disposed in substantial registry with those of the respective dual sheaves and mounted about a secondary axle lying in substantial parallelism with said main axle, the aforesaid sheave grooves being arranged to have a continuous strand length looped helically therearound in open winch fashion to successively lead into gripping embrace with the entire group of grooves, and power driven means applied to positively rotate one of said dual sheaves and which when rotated in either direction constitutes the sole hauling agency for correspondingly dragging the treated strand through the aforesaid grinder head means.

13. In a surface abrading machine adapted to treat an endless loop of strand when dragged lengthwise, a supported floor structure having said loop movable threaded therethrough with a minor rectilinear portion disposed above the floor level and which floor serves to protectively safeguard the major loop portion in the event of loop rupture, head means including a plurality of abrasive elements brought into operative engagement with said rectilinear strand portion, a pair of dual sheaves coaxially mounted upon a common main axle located wholly beneath the floor level and having one such sheave affixed thereto, follower sheave means mounted about a secondary axle lying in substantial parallelism with said main axles, the aforesaid sheaves being arranged to have a major loop portion helically threaded therearound in winch fashion, and power driven means applied to rotate said one sheave and which serves as the sole strand hauling agency irrespective of the direction of rotation.

14. In a grinder machine adapted to superficially treat a laterally pliant strand when dragged longitudinally, an abrasive element brought into operative engagement with said strand, a main axle upheld between a pair of spaced bearings and mounting a traction rotor that is perimetrically gripped by wrapping the strand therearound, said axle being provided with an extension that overhangs one of its bearings, a hollow casing comprising opposed end walls having the shaft extension freely entered therethrough, an axle drive gear affixed to said extension adjacent to said one bearing, multiple spindles respectively bridging said walls and each provided with an epicycloidal pinion that respectively mesh with the axle drive gear, an epicycloidal gear mounted upon each such spindle and coaxially interlocked with the pinion thereof, a sleeve member coaxially mounted outwardly beyond said drive gear to rotate about the shaft extension, a sleeve pinion affixed to the inner sleeve end and disposed to mesh with the several epicycloidal gears, and motorized sleeve drive means disposed beyond the casing confines and carried at the outer sleeve end region, said means serving to actuate the rotor through a unitary double reduction gear train and thereby drag said strand through the abrasive element.

15. In a grinder machine adapted to superficially abrade a laterally pliant strand, a pair of dual sheaves coaxially mounted upon a common main axle and which sheaves are respectively provided with a series of perimetric grooves, follower sheave means provided with a groove series disposed in substantial registry with those of the respective dual sheaves and mounted about a secondary axle lying in substantial parallelism with said main axle, the aforesaid sheave grooves being arranged to have a continuous strand length wound helically about both axles and alternately entered into the sheave grooves thereof in single layer formation, a skew sheave mounted to rotate on a third axle slightly inclined with respect to said parallel axles and the respective profiles of which three axles define the vertices of a triangle including a major angle, a single divergent strand portion being tangentially extended from one of said dual sheaves into engagement with said skew sheave to provide for a rectilinear strand course that subtends said major angle, and an abrasive zone located within the extent of said course and which zone treats the entire strand perimeter in one single pass.

16. In a surface grinding machine adapted to treat a laterally pliant strand, said machine comprising a series of abrasive zones operatively located in succession in a hereinafter stipulated strand position and by intensive abrasion setting up a differential strand drag between the opposed end regions of said zones, unitary reversible tractor sheave means of the grooved type together with a multigrooved follower sheave and a skew sheave of which any two of their respective axes are parallelly disposed to each other so that their respective axial profiles define vertices of a triangle, a length portion of said strand being helically wrapped in a single

continuous layer into gripping embrace with corresponding grooves of said tractor and follower sheaves, another solitary strand portion being angularly diverted to tangentially span the tractor and skew sheave perimeters in a subtending relation to one angle of such triangle and having said series of abrasive zones interposed therealong, motorized drive means rotating said tractor sheave means without material slippage of its wrapped strand and serving as a sole hauling agency to draggingly advance said diverted strand portion in either travel direction through said series of abrasive zones, and releasably loaded counterbalancing means for the skew sheave and which means when active exert a supplemental additive tension component directed outwardly from the slacker end region of said zone to fortify the strand grip about the perimeter of said hauling agency and thereby render said grip substantially non-slipping with respect to said agency when applied to surmount the aforesaid differential strand drag.

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