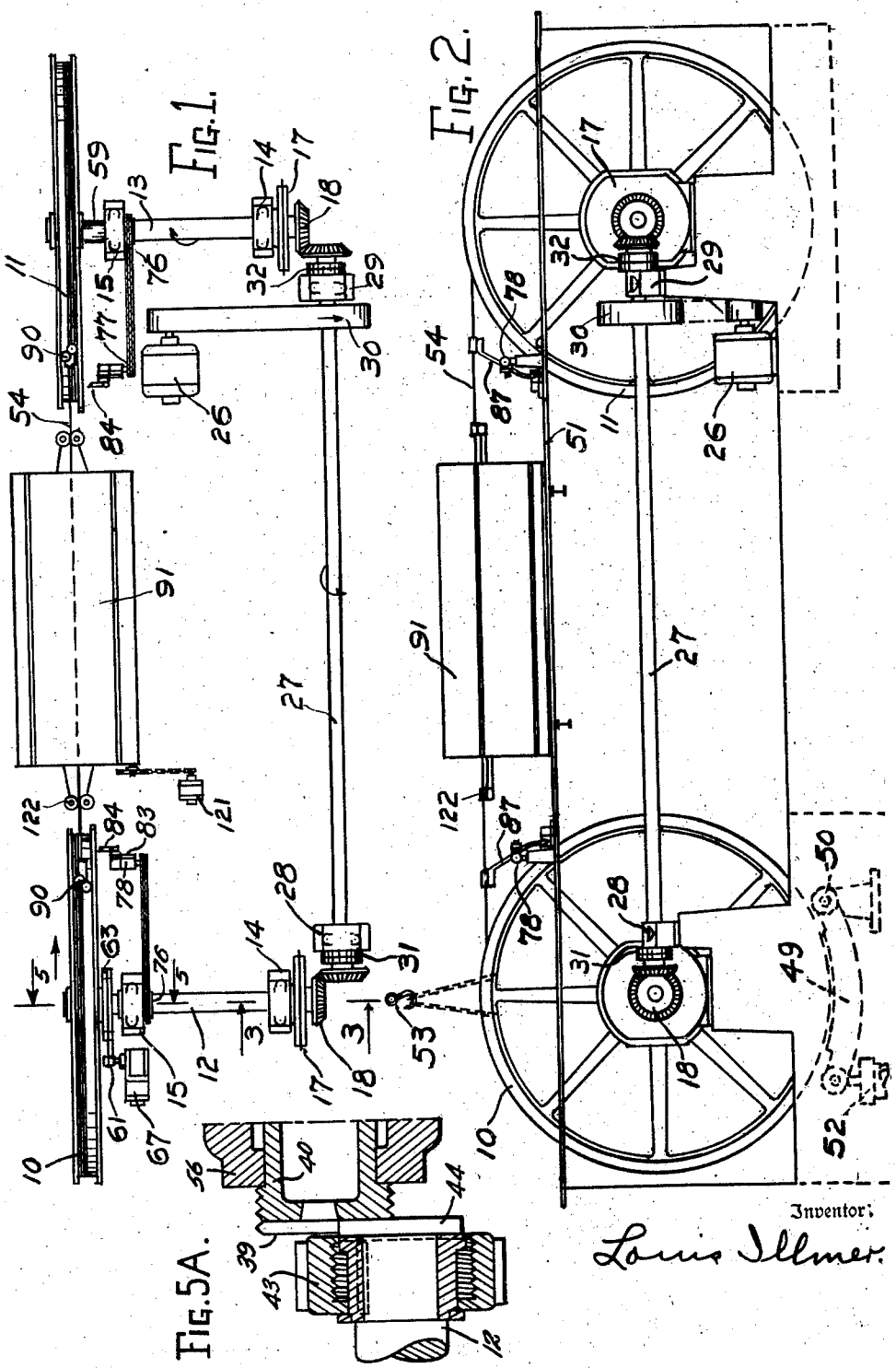
July 22, 1947. L. ILLMER 2,424,465

REEL DRIVE CONTROL FOR GRINDER MACHINES

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REEL DRIVE CONTROL FOR GRINDER MACHINES

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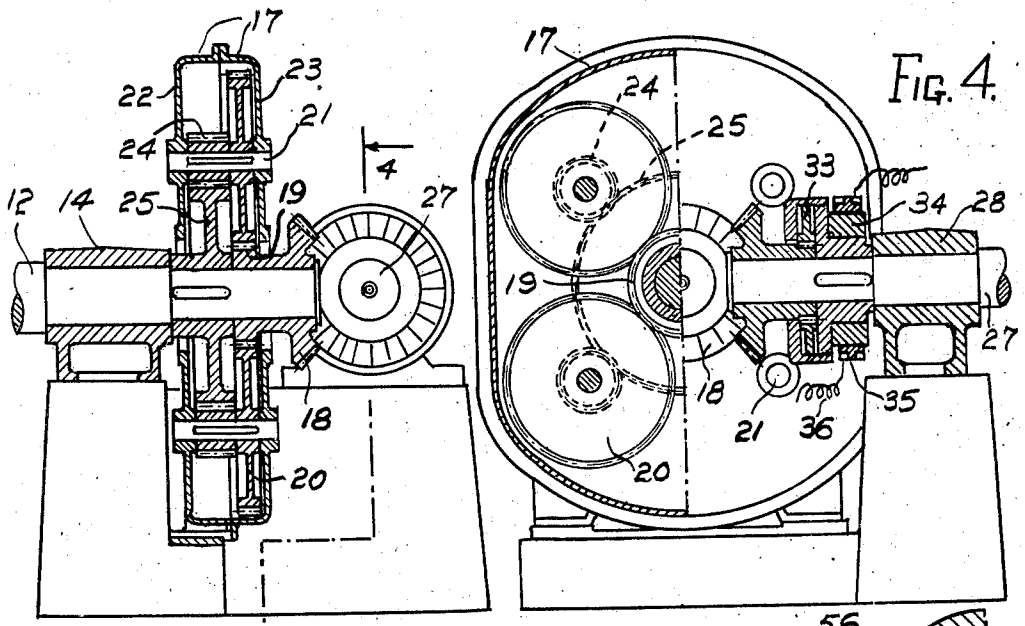


FIG. 3.

FIG. 4.

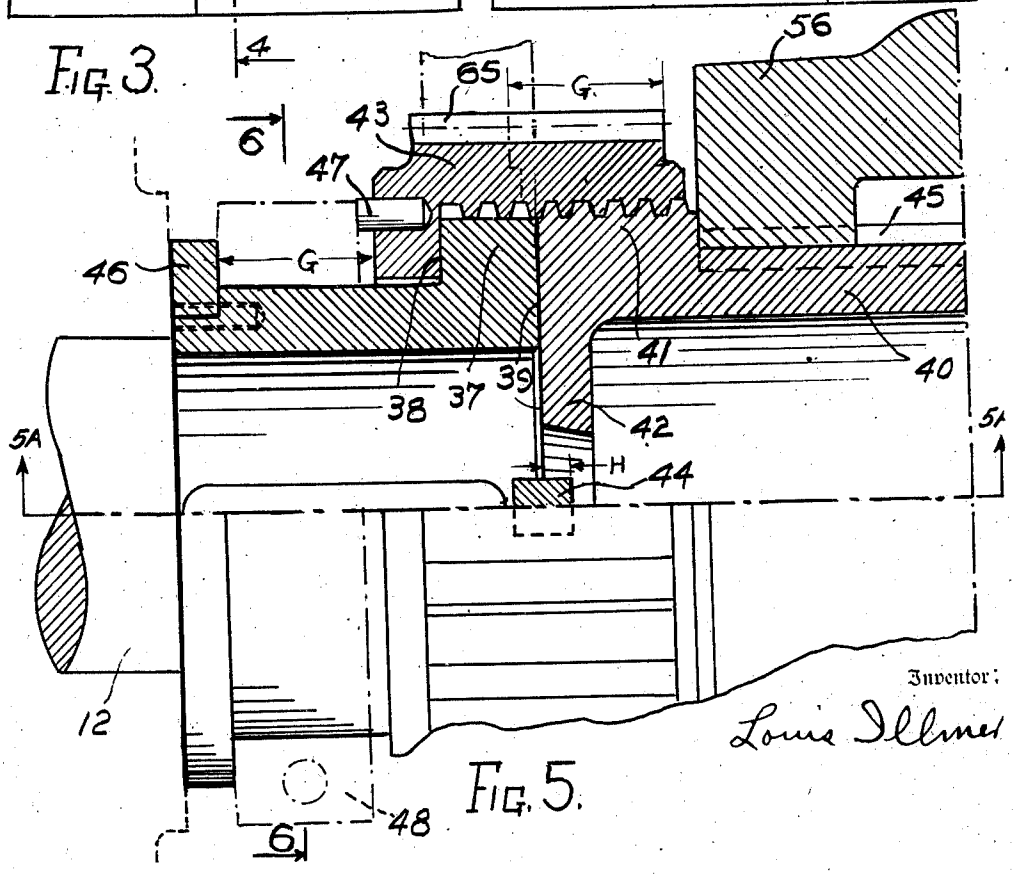


FIG. 5.

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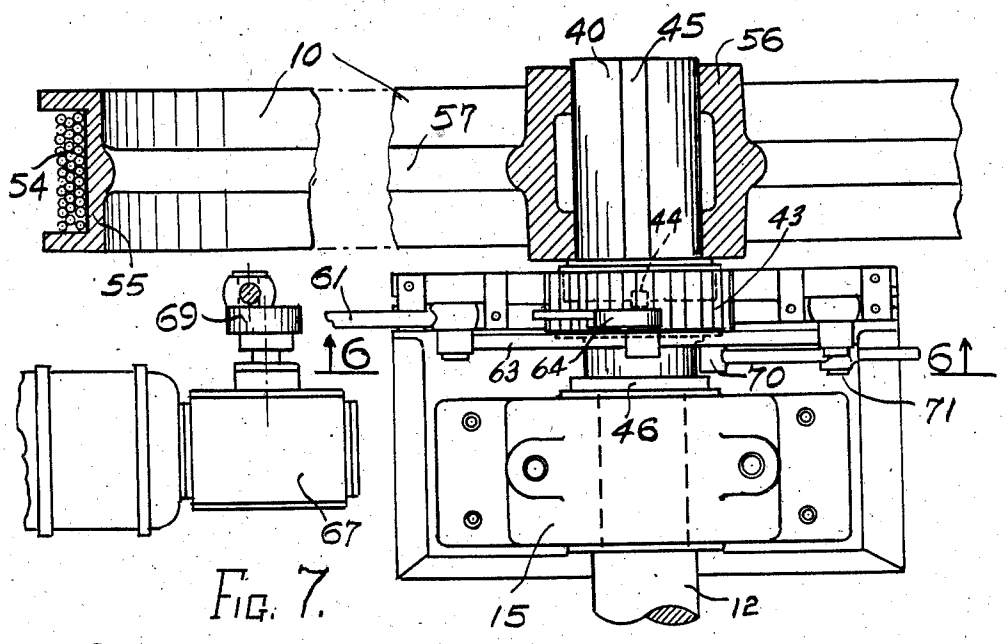


FIG. 7.

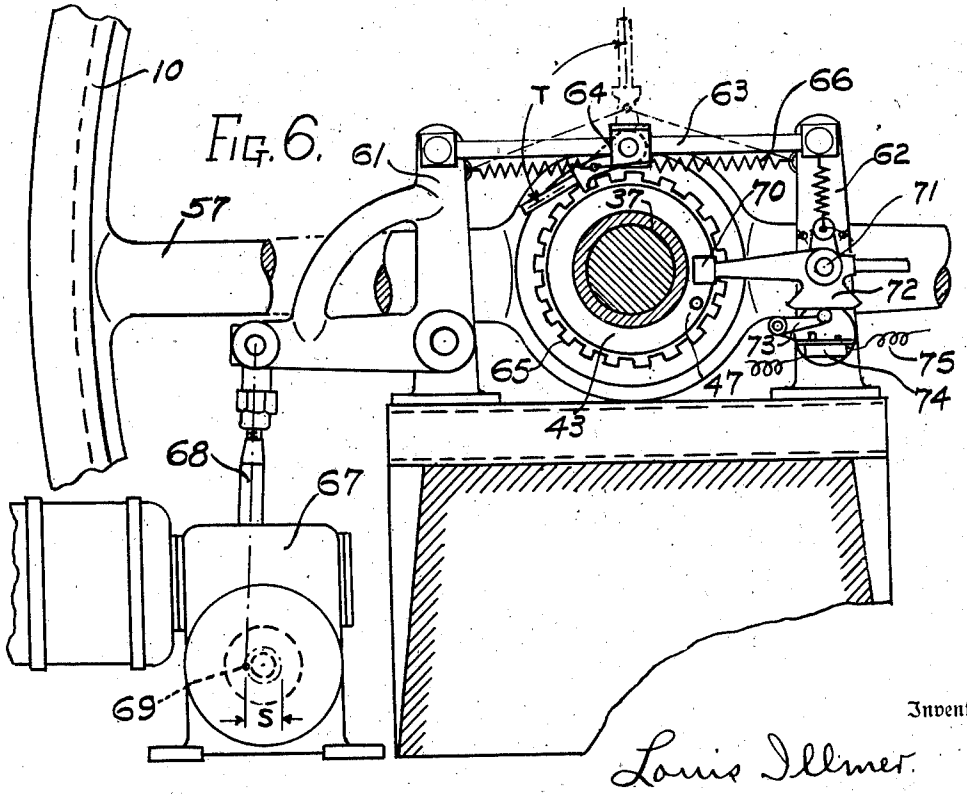


FIG. 6.

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2,424,465

REEL DRIVE CONTROL FOR GRINDER MACHINES

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Application July 23, 1943, Serial No. 495,948

10 Claims. (Cl. 242—54)

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This invention relates to surface grinder machinery in which abrasive tape or an equivalent cutting agency may be effectively utilized, and more particularly pertains to improved interchangeable reel drive equipment of the reversible type by which a long batch of round or flat reelable stock may be dragged longitudinally at high velocity in successively reversed passes into operative engagement with a plurality of slowly fed abrasive elements carried by either stationary or rotating head means.

The present high duty apparatus may be installed at moderate first cost and is especially adapted to rapidly and economically rough grind a reloadable batch of larger gauged hard alloy steel or the like high tensile stock on a low labor servicing basis, preferably without requiring any fast moving working parts except for the treated stock itself.

The instant grinder improvements are primarily directed to the use of a pair of conjointly driven reels of relatively large diametral size of which one such may be demountably coupled to a sectionalized drive axle whereby to expedite batch replacement and maintain a high productive machine output as measured over a protracted operating period. Each such reel is further equipped with controlled dual drive clutch means, preferably of the electromagnetic type, which are alternately rendered inactive to successively reverse the travel direction of a treated batch. Also associated with said reels are long-range motorized cross-shaft means and other structural refinements serving to promote the end in view.

The object of my invention is to devise an efficient and compact work piece drag system of the indicated reversible reel type capable of effectively processing a long batch of stock when successively passed longitudinally through grinder head means to complete its abrasive treatment at a relatively fast productive rate and which system requires a comparatively short shut down period between batch runs in which to operatively install a next succeeding batch of stock for similar treatment.

Reference is had to the accompanying three sheets of drawings which are illustrative of a preferred exemplification, and in which drawings:

Fig. 1 represents in approximate scale, a plan layout of my controlled reel assembly, and Fig. 2 is an elevational side view thereof.

Fig. 3 shows a gear driven fore-end region of a reel axle taken along 3—3 of Fig. 1, and Fig. 4

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a detail of such gear transmission taken along the broken line 4—4 of Fig. 3.

Figure 5 details a split aft axle end region together with an interposed nut coupling for my demountable reel.

Fig. 5A is a sectional detail taken along 5A—5A of Fig. 5 to show abutting axle parting faces that may be relatively shifted in a definite transverse direction without material face separation.

Fig. 6 is cross-sectionally taken along 6—6 of Fig. 5 to reveal a preferred ratchet mechanism for a rapid loosening or securement of the coupling nut, and Fig. 7 depicts a top view thereof.

As arranged in Fig. 1 for the treatment of wire stock, my system may comprise a pair of flanged reels 10 and 11 that are respectively mounted upon the mated driven parallel axles 12 and 13. These axles may each be suspended between a fore main bearing pedestal 14 and an aft bearing 15. The respective overhanging fore bearing axle ends may each be separately driven by a compactly encased transmission unit 17 (see Figs. 3 and 4). Each such unit may be provided with a bevel gear or the like skew means 18 of which its sleevelike hub may be coaxially and rotatably disposed about its axle as shown. The aft end of such gear hub may have a sleeve pinion 19 affixed thereto. Meshing with this single pinion are multiple gears such as 20 respectively carried upon a separate compound spindle 21. Each spindle may bridge the opposed end walls 22 and 23 of the split stationary casing utilized in unit 17 and which walls are alignedly apertured to allow of freely projecting the fore axle end therethrough. Conjointly mounted upon each such spindle is a pinion 24 that interlockingly rotates in unison with its mated gear 20. These multiple pinions mesh with a common keyed axle drive gear 25 and collectively provide for an ample combined reduction ratio between the high speed unidirectional main motor 26 and either of the slowly rotated reel axles 12 and 13. Each such speed reducer is purposely designed to unstallingly operate in reverse.

In accordance with the Fig. 1 assembly, the respective bevel gears 18 of these axles may be selectively coupled to the main drive motor 26 through the cross-shaft 27 mounted between the auxiliary bearings 28 and 29. The overall length of such cross-shaft is herein kept shorter than the interspacing between the axles 12 and 13 and lies in parallelism with the suspended work piece length that tangentially interconnects my reels 10 and 11. A shaft drive pulley 30 located between said bearings may be belted to the

unidirectional main motor 26 to rotate said shaft at a considerably faster speed than the axles 12 or 13.

Separate electromagnetic clutches 31 and 32 may respectively be interposed between each such auxiliary bearing and its contiguous loose bevel gear in the Fig. 4 manner to independently command the driving of its associated axle. Each such clutch may comprise a faced annular slip disc or releasable grip elements 33 that encircle the cross-shaft 27, also a switch controlled field coil 34 that may be energized from any suitable current source through the commutator rings 35 and lead wires such as 36. As indicated by arrows, the Fig. 1 installation is such that the reel axles may be selectively motor driven in opposed directions whenever one or the other of said clutches is made operative. The field coil current flow may be so controlled that only one magnetic clutch is allowed to become active at any given time and purposely leave the other clutch idle. Both reels will then run in a like direction because of being interconnected by the work piece and the released slip disc 33 of such uncoupled clutch will then be freely rotated by its associated reducing gear 17.

As detailed in Fig. 5, a transversely split axle 12 may comprise a fore or master section of which the aft end region is encircled by an outstanding endless flange 37, the flange hub being affixed in place to provide for an annular thrust face 38 and separable axle parting faces 39 that when uncoupled, are rendered relatively shiftable in a transverse direction, that is to say lengthwise of the radially disposed key 44 without requiring a substantial separation of the faces 39 (see Fig. 5A). A substitutional tandem aft axle section may be equipped with a perimetrically threaded flange 41 that overhangingly abuts said flat parting face 39 to constitute an aligned sectionalized axle. Said flange threads cooperate with a demountable screw coupling agency 43 that renders interchangeable my reel 10. Said aft axle section may further include a tubular shank component 40 that is preferably tightly telescoped as a plug and keyed at 45 within a standardized bore of the reel hub 56 to project rearwardly beyond the parting face 39 and confines of the axle support bearing 15. An axle web component 42 may span the flange 41 as shown. It will be obvious that as a demountable reel upholding agency, such substitutional aft axle section may also be incorporated integrally with the reel hub.

The interiorly shouldered nut 43 when screwed up into operative position, brings the nut shoulder into tight clamping engagement with the thrust face 38. A straight-edged, radially disposed supplementary key 44 having a length shorter than the thread bore of the nut 43, may be interlockingly interposed between the abutting parting faces 39 to prevent relative rotation therebetween while said key remain slidably entered within the web 42 by the semidepth range designated H. Such unitary coupling means may be speedily connected by screwing up a single axially centralized nut or the like face clamping agency. The released nut 43 may be retracted to the extent marked G, whereupon the demountable reel 10 may be unobstructedly lifted directly upward when the key 44 stands vertically without requiring a material separation between the mated substantially planiform parting faces 39. A spaced stop collar 46 may be applied to the forward hub end of the axle flange 37 and the contiguous face of the nut 43 may be provided with a stop pin 47. As defined by dotted and dashed outline in Fig. 5, a split collar 48 may be entered between said stop pin and the collar 47 to block the assembled nut from inadvertently backing off in either direction of reel rotation.

In Fig. 2 there is schematically indicated a retractably mounted arcuate saddle 49 disposed beneath the perimeter of the demountable reel 10 and serving as a cradle that facilitates the hub centering of a substitute spare reel when likewise coupled in the Fig. 5 manner. One end of such saddle may be pivotally mounted at 50 and the other end actuated by ram means 52 whereby to bodily raise or lower such interchangeable reel into place. In addition, the hook of a traveling chain hoist 53 may be employed to remove a completed batch together with its detachable reel, or to transfer into place a substitute reel initially having an unground strand batch prereeled therearound.

The smoothly turned rim component 55 of each reel is preferably kept to a common large diametral size to obviate undue bending stress when laying a relatively heavy gauged work piece 54 thereon. Said rim may be integrally interconnected to its hub 56 by plural reel arms 57. All my demountable reels may be permanently fitted upon a standardized hub plug component 40. The several batch layers may herein be held to a continuous length of about one ton or more in weight and thereby afford an adequate time period between next successive reel reversals.

Because of the relatively large reel diameters required for treated work pieces of larger gauge, it is preferred to locate their horizontally parallel axles 12 and 13 in a servicing pit below the level of a beam supported floor 51 and have both companion reels 10 and 11 extend upwardly through said floor in the Fig. 2 manner and tangentially suspend the work piece horizontally between the top regions of both reels as shown. It will be observed that the non-demountable solid reel axle 13 may be kept devoid of any coupling means, its aft end in this instance may merely project beyond its bearing 15 and be enlarged to a standardized hub bore size by a cylindrical bushing 59 (see Fig. 1). As regards the coupled reel 10, it is the intent to provide for interchangeable spare units and to utilize such substitute reels for prereeling an unground batch of wire thereon by extraneous means for subsequent coupled installation onto the master section of the axle 12. When completely processed, the finished batch may be restored upon its original reel 10 prior to its batch removal.

Each initial layer of such prereeled batch may include a repeatedly used lead end section welded to a terminal of the treated batch proper and having a free lead end affixed to its reel perimeter. Such refinement insures that the entire interposed batch may be uniformly ground at high velocity irrespective of slowing down during reversing periods. When operatively coupled in place, the outer prereeled batch terminal of the reel 10 is intended to be spliced to the free lead end section of the companion reel 11 so that when one of the magnetic clutches such as 32 is thrown into commission, the other idling clutch 31 will allow its axle 13 to be dragged in a corresponding direction by a suspended portion of the reel interconnecting strand 54.

Referring in detail to Figs. 6 and 7, these disclose a preferred rapid mode for securely tightening up the unitary coupling nut 43 by the use

of auxiliary motorized means rather than by manually operated wrench means. A pair of upstanding rocker arms 61 and 62 may be pivoted about each side of the reel axle 12 with their swinging ends interconnected by the tie rod 63. This rod and its associated parts are laterally offset out of registry with the key 44 to clear the hub of the reel 10 when raised vertically. A medial portion of said rod is shown provided with a pivoted nut pawl 64 adapted to releasably engage an endless series of ratchet teeth 65 that circumscribe the nut axis. Said pawl may be resiliently retained by balanced springs such as 66 and the pawl selectively urged into operative engagement with said teeth as indicated in full outline. This shiftable pawl may also be snapped through the angle T into a dotted neutral position and manually thrown onward into its reversed position. For normal reel running conditions, said pawl is placed in such cleared position. A geared motor 67 may have its slow speed outlet shaft equipped with a crank 69 which by the adjustable feed rod 68 serves to propel the bell crank ratchet 61 in toggle fashion whereby to forcibly actuate the coupling nut 43 in either direction. As an equivalent, a reversible motor may be directly geared to impart a slow continuous movement rather than intermittent ratchet movements to said nut.

Furthermore in lieu of the cited Fig. 5 split collar 48, Fig. 6 resorts to an automatic safety or emergency tell-tale device comprising an abutment lug 70 which may be floatingly interposed between the stop collar 46 and the opposed pin 47 to normally clear the latter while the reel 10 is kept in rotation. Said lug may be shiftably carried by the stationary pivot 71 and provided with a depending twin profile cam 72 that is spring urged into a centralized position with respect to the roller switch arm 73. A double push button snap switch 74 may thereby be automatically thrown into its cut off position should the nut 43 accidentally start to back off in either direction of reel rotation and allow the stop pin 47 to collide with the lug 70. The switch lead wires such as 75 may be series connected to command current flow through one of the electromagnetic clutches to bring the reeling system to rest should the reel nut become loosened while in service.

Figs. 1 and 2 schematically show a level winder mechanism especially suited to present large reel needs as applied to wire treatment. The axles 12 and 13 may respectively be provided with an affixed sprocket 76 that chain drives its sprocket pinion 77. Each such driven pinion may be separately carried upon the high speed input shaft of a single worm gear reduction box 78 erected above the floor level 51, as shown. The box output shaft may be provided with a change gear that meshes with a mated gear parallelly mounted upon an auxiliary stub shaft The last named shaft may also coaxially mount a crank pin disc 83 that reciprocatively actuates the roller link 84 to rock the level winder arm 87. Said disc and its change gear may be interlocked to rotate in unison, the installation being such that the selective use of substitute change gear pairs readily permits of modifying the rate of crank pin rotation with respect to its axle sprocket 76.

As regards my preferred grinder apparatus, this may comprise a tubular, axially split housing 91 adapted to abrasively treat the suspended work piece 54 when centrally passed therethrough. In order to provide for the compact grinder assembly shown in Fig 2, such suspended work piece length is purposely arranged in parallelism with the cross-shaft 27.

Such single housing may be provided with multiple tapes of sufficient collective width to combinedly grip the perimeter of a treated work piece having a circular profile up to its safe drag load capacity. Each such tape may be independently impressed into engagement with said work piece by suitable backing jaw means, preferably of a releasable type.

The functional behavior of my reel drive system is thought obvious from the foregoing description of its elements. As will be understood, the respective lead wires 36 commanding the magnetic clutches 31 and 32 may be separately placed under the positive control of manual or automatic switch means. Assuming that a demountable spare reel 10 with a prereeled unground batch to have been operatively installed in place upon its master axle section and the coupling nut 43 to have been adequately tightened by the Fig. 6 instrumentalities, then by initially energizing the motor driven clutch 32, the Fig. 1 assembly is ready to transfer such prereeled batch through the grinder housing 91 and on to the previously emptied reel 11 at a finally attained uniform pass velocity. Such velocity is preferably held at a predetermined travel rate of several thousand feet per minute between reversal periods.

When the trailing end region of said transferred batch is reached, the clutch 32 is disengaged, which slows up said strand interconnected reels. The considerable abrasive drag imposed upon the treated strand effects a fairly rapid deceleration of the rotating reels. Upon approach to rest, the other clutch 31 may be manually or automatically energized in sequence by switch means to reliably reverse the loaded reels 10 and 11 irrespective of their axle spacing.

If preferred, all of the tape backing jaws may be released during each starting period to promote rapid reel acceleration. The initial lead wire affixed to either batch end is intended to be sufficiently long to afford an appropriate number of rim turns for present needs and thereby assure that the entire active batch may be evenly processed throughout its length. The use of batch lots approximating one ton in weight, materially extends the time period between reel reversals and correspondingly reduces the frequency of clutch switching. Such infrequent reversal practice obviates overheating of the main drive motor and provides adequate time in which to air cool the coiled work piece between successive passes.

The required number of repeat passes depends among other considerations, upon the hardness of the treated material, the collective width of the abrasive tapes, the rate of tape feed and the extent to which an initial work piece size needs to be reduced. Upon having reached a prescribed requirement with the completed batch rewound upon its original reel 10, the main motor 26 may be shut down, whereupon my centralized hub nut 43 may be unscrewed by the auxiliary motor 67 and the batch removed for subsequent bundling or the like. An interchangeable spare reel may then be substituted and the same abrasive procedure continued on such renewed batch. As a consequence of my unitary single axle coupling and to the end that a low cost per pound of processed product may be obtained, such spare reels may be installed with dispatch and the net grinding rate kept to a high level of effective produc-

tive output at the minimum servicing labor and without having to unduly interrupt active performance while reloading the reels of my grinder machine.

While my unidirectional motor 26 remains in operation, it is rendered responsive to a clutch shift without having to wait during each reel reversal for such drive to attain its full rated speed. Furthermore by locating my heavy duty clutches 31 and 32 upon the low torque cross-shaft 27, the clutch size and cost may be materially lowered in comparison to equivalent clutches installed directly into the high torque axles 12 and 13.

The foregoing disclosures will, it is believed, make evident to those skilled in this art, the outstanding commercial advantages afforded by my refined heavy duty reeling system. It will be evident that certain structural aspects of the disclosed reeling and housing improvements may readily be modified to produce a like result, all without departing from the spirit and scope of my invention, heretofore described and more particularly characterized in the appended claims.

1. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of horizontal axles of which one axle is transversely sectionalized intermediate its ends by abutting parting faces of which one such has a straight-edged keyway sunk therein and the other face is provided with a registering projection adapted to seat between said edges to comprise a master section arranged to have one of several substitute sections interchangeably coupled thereto in axial tandem alignment with said master section and which substitute sections respectively uphold thereon the hub of a stock carrying reel to constitute a bodily demountable spare unit, the other of said pair of axles being provided with a driven companion reel serving to transfer thereon the stock carried by any one of such interchangeably installed units and coupling means drawing said parting faces toward each other.

2. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of substantially parallel axles of which one axle comprises separable tandem sections respectively having abutting ends that are rendered relatively shiftable in a definite transverse direction without requiring substantial axial separation of said ends with one such section rotatably supported and its mated section overhangingly disposed in axial alignment therewith, centralized unitary coupling means demountably interlocking the abutting ends of said section against shift in the aforesaid direction, a stock carrying reel upheld by said mated axle section, a companion reel mounted on the other of said pair of axles, and drive means serving to rotate said reels in unison with a stock portion spanning the respective reel perimeters.

3. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat a batch of reelable stock in reversed passes, a pair of axles of which one axle comprises separable tandem sections, means for rotatably supporting one such section and for overhangingly coupling the mated tandem section in axial alignment with said one section, said coupling means including threaded solitary nut means arranged to demountably interlock

contiguous ends of said tandem sections, a stock carrying reel upheld by said coupled mated section, a companion reel cooperatively mounted on the other of said pair of axles and having a stock portion transferably suspended between the respective reel perimeters, and drive means for reversing said reels in unison.

4. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of substantially parallel axles of which one axle comprises separable tandem sections whose contiguous ends are respectively provided with opposed cylindrical flanges having abutting parting faces, one such flange being provided with a perimetrically inset annular thrust face that is laterally spaced from its parting face and the perimeter of the other flange being threaded, a tubular coupling nut sized to cooperate with such flange thread and one end region of which nut has an internally disposed shoulder that engages said thrust face when the coupling nut is drawn up into operative position, supplementary retaining means interlocking the respective parting faces against relative rotation, a stock carrying reel upheld by one such coupled axle section, a companion reel mounted on the other of said pair of axles, and means rotating said reels in unison.

5. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of parallel axles of which one such axle is transversely sectionized between its ends to comprise separable tandem sections respectively having abutting parting faces, means for rotatably supporting one such section and for demountably coupling its mated tandem section thereto in axial alignment, supplementary straight-edged key means diametrically interposed across said parting faces to interlock the coupled faces against relative rotation and which faces when uncoupled are relatively shiftable lengthwise of said key edges, a reel upheld by said coupled mated section, a companion reel mounted upon the other of said pair of axles, and drive means cooperatively rotating said reels in unison through said coupled axle sections.

6. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of parallel axles of which one axle comprises separable tandem sections, means for rotatably supporting one such axle section, coupling means of the threaded nut type which when screwed up into operative position serve to retain the mated tandem section in overhanging axial alignment with said one section, nut locking means arranged to obstruct the nut from retracting out of its operative position, a stock carrying reel upheld by said coupled tandem section, a companion reel mounted upon the other of said pair of axles, and means rotating said reels in unison with a stock portion transferably suspended between the the respective reel perimeters.

7. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of parallel axles of which one axle comprises separable tandem sections, means rotatably supporting one such axle section, threaded coupling means provided with ratchet teeth and which means when brought into operative position serves to tightly affix the mated tandem section in axial alignment with said one sec-

tion, driven retractable pawl means arranged when active to engage said ratchet teeth and thereby draw up the coupling means into said operative position, a stock carrying reel upheld by said coupled tandem section, a companion reel carried by the other of said pair of axles, and means rotating said reels in unison with a stock portion transferably suspended between the respective reel perimeters.

8. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of parallel axles of which one axle comprises separable tandem sections, means for rotatably supporting one such section, threaded solitary nut means serving to demountably couple contiguous ends of said tandem sections in axial alignment, said nut being provided with a series of ratchet teeth that encircle the nut axis, reciprocatively guided pawl means arranged to be selectively shifted into reversed engagement with said teeth, actuating means for forcibly reciprocating the guided pawl means in either travel direction, a companion reel carried by the other of said pair of axles, and drive means rotating said reels in unison with a stock portion transferably suspended between the respective reel perimeters.

9. In a reeling system for expediting the reloading of a grinder machine adapted to abrasively treat successive batches of reelable stock, a pair of parallel axles of which one axle comprises separable tandem sections, means for rotatably supporting one such axle section, threaded coupling means which when tightly screwed into operative position serve to interlockingly affix the mated tandem sections in overhanging axial alignmgent with said one section, a stock carrying reel upheld by said overhanging coupled section, a companion reel mounted upon the other of said pair of axles, means rotating said reels in unison, and an emergency device including tell-tale means arranged while in service to automatically register an accidental recession of said coupling means from operative into a loosened condition.

10. A reeling system adapted to abrasively treat successive batches of reelable stock and comprising mated high-torque axles that are widely spaced apart in substantial horizontal

parallelism and are respectively disposed to bridge a separate pair of axle mounting main bearing pedestals with an end portion of one such axle overhanging the pedestal next adjacent thereto, a stock carrying reel affixed to such overhanging axle end and a companion reel affixed to the other axle adapted to have a reelable stock length alignedly suspended to tangentially span the respective top regions of the reel perimeters, a low-torque cross-shaft of an overall length shorter than the aforesaid long range axle spacing and disposed to lie axially coincident with the plane of said parallel axles with the respective shaft terminal regions directly interconnected to an adjoining axle by skew gear reducing means including a bevel gear carried by each such cross-shaft terminal region and which shaft is rotatably upheld by a pair of auxiliary pedestals respectively located contiguous to one such bevel gear, selectively controllable mated clutch mechanisms each including a pair of opposed definitely shiftable grip elements operatively installed and retained in close proximity upon a shaft terminal region between one such bevel gear and its next adjacent auxiliary pedestal, and motorized unidirectional drive means applied to the cross-shaft intermediate said auxiliary pedestals and serving to rotate the axles in opposite directions when said clutch mechanisms are successively brought into operative engagement.

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