Jan. 17, 1950 O. R. NEMETH 2,495,125

WIRE RECORDER TURRET

Filed Aug. 16, 1947 3 Sheets-Sheet 1

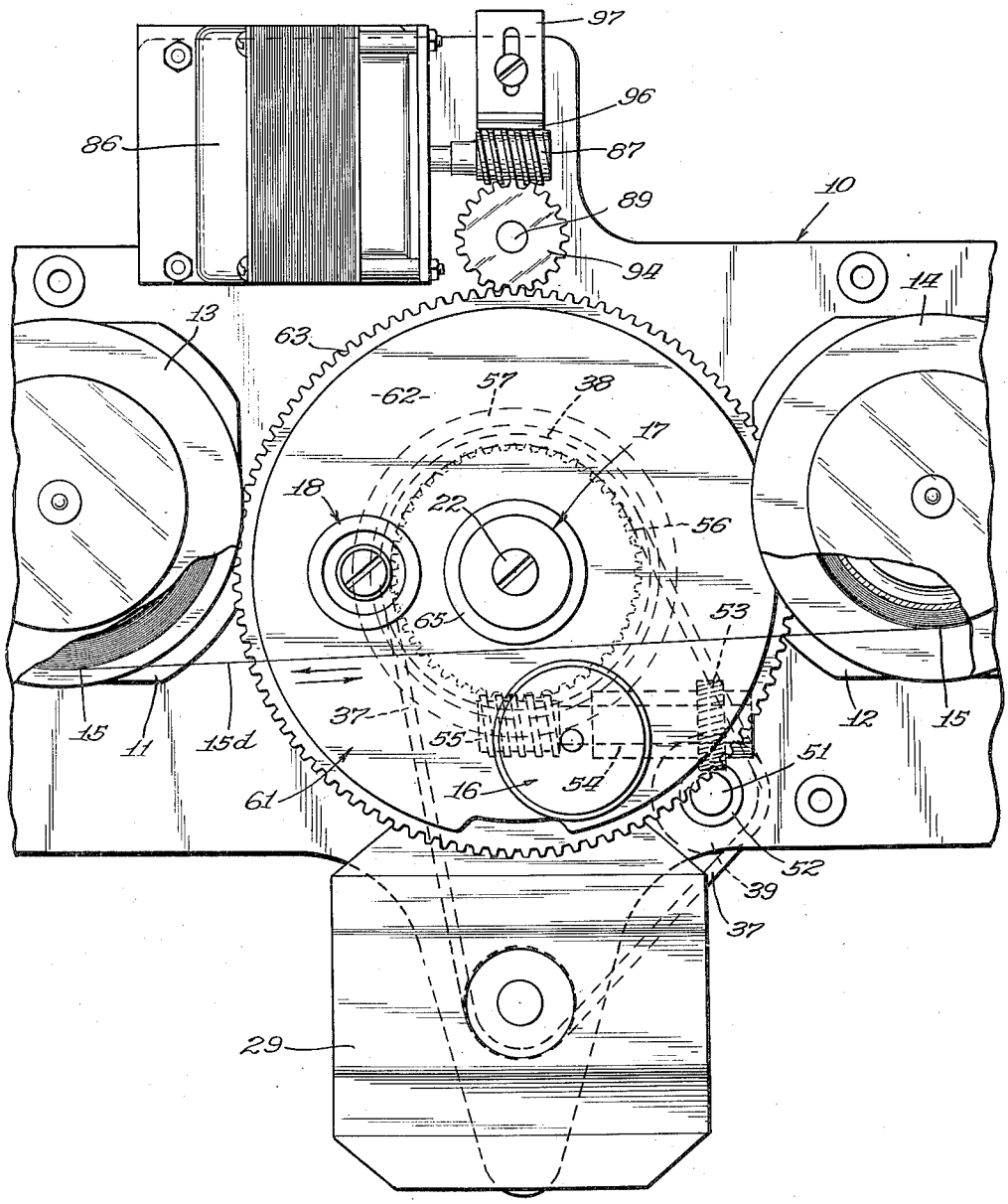


Fig. 1.

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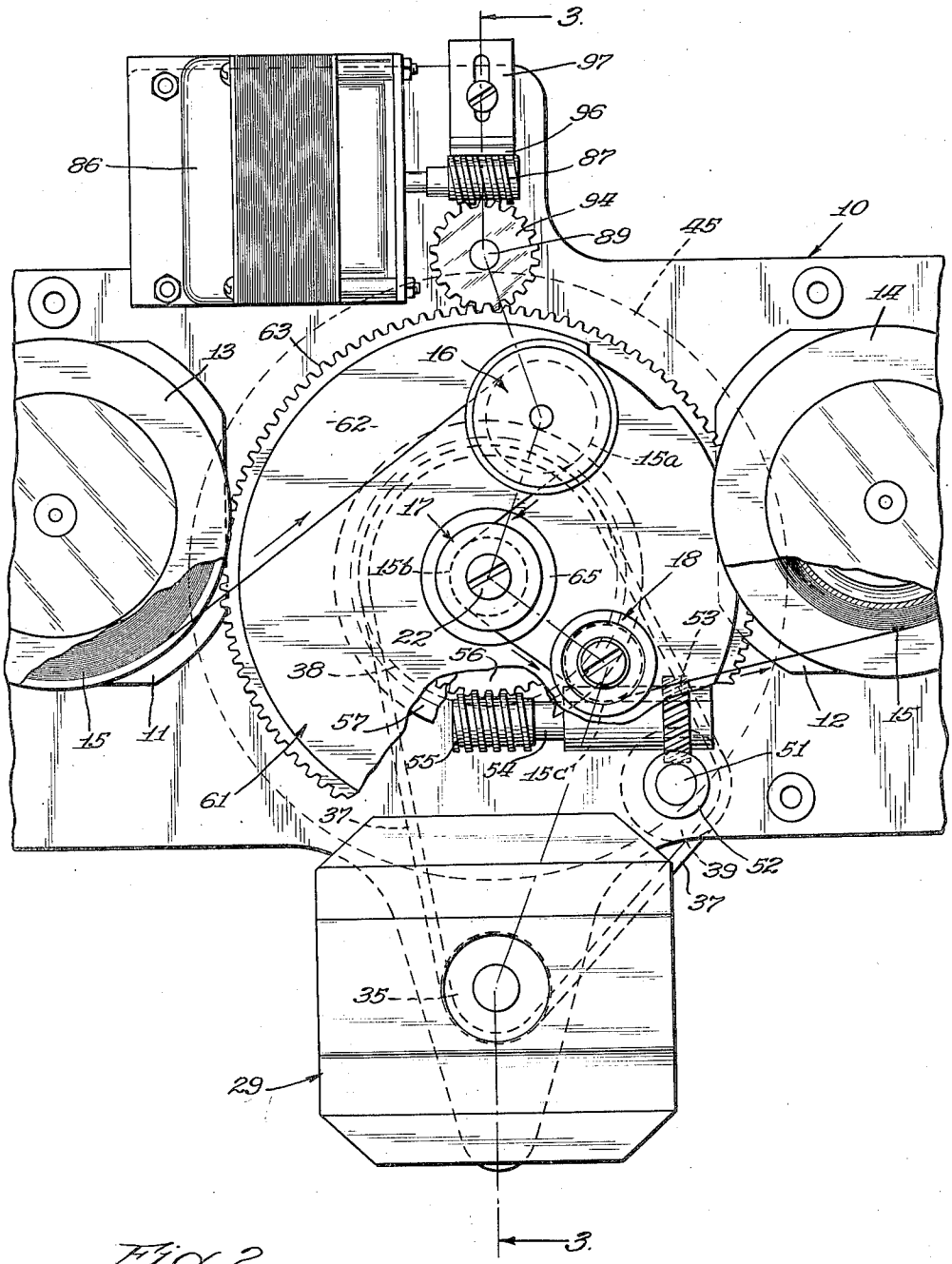


Fig. 2.

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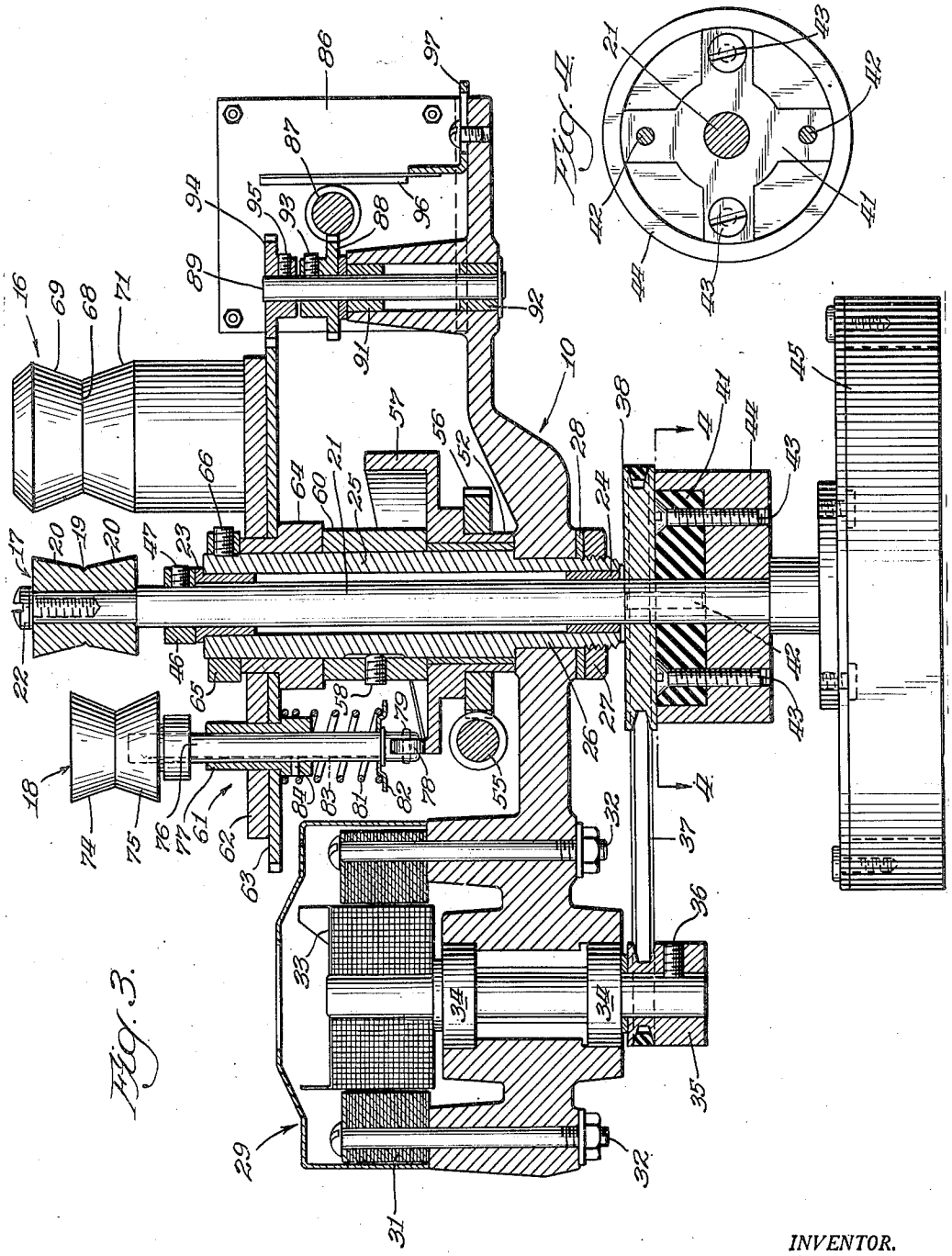


Fig. 3.

Fig. 4.

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WIRE RECORDER TURRET

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7 Claims. (Cl. 274—4)

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The present invention relates to magnetic recording and reproducing devices, and is specifically directed to the provision of an improved turret designed for use in such a machine. The principles of this teaching are equally applicable to wire recorders and to machines designed to employ a flat paramagnetic tape, but since the specific embodiment of the invention here disclosed is intended for use in a machine utilizing wire as the recording medium, it will be described with particular reference to wire recorders.

The primary purpose of a turret mechanism as disclosed in this application is to provide a means whereby a magnetic translating device may be self-threading, so that the wire, tape, or other recording medium need not be led over the translating head, through the driving devices, across idler wheels or around wire guides by hand, but instead may be automatically caused to engage these various instrumentalities. This type of mechanism is particularly desirable in magazine type machines, not only because it eliminates the inconvenience of hand threading, but also since it means that the individual magazines need contain only storage facilities for the record, and that the translating head, erasing means, level winding devices, wire guides, etc., need not be incorporated as a part of the magazine, but may be mounted on the machine to engage the record in any of several magazines when the magazine is put in position. Thus when a magazine is placed on the machine, the span of wire extending between the spools in the magazine is automatically engaged and threaded over the erasing and recording gaps of the head and across the driving and level winding devices, so that the machine is ready to operate. The usefulness of the turret is not limited to magazine machines, however, since even in a free spool type machine it is a considerable convenience if the individual spools need only be placed on the machine without the necessity of hand threading. The present invention will accordingly be described in conjunction with a record consisting of a fine steel wire wound on and extending between a pair of spools, which need not necessarily be enclosed in a magazine housing, but which may form a part of a magazine if desired.

As heretofore stated, the primary object of a turret type recorder is the provision of automatic threading. However, to obtain high fidelity reproduction, it is also essential to achieve perfectly smooth vibrationless operation of the mechanism by which the record is moved across the translating head, so that the rate of movement of the record across the flux gap will be absolutely uniform and free from any mechanical vibration of fluctuations in linear velocity. Satisfactory accomplishment of this important aim has never heretofore been achieved, since it has been assumed that any practical type of

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threading mechanism including a constant speed driving capstan required that the driving capstan be on a shiftable mounting on the frame of the machine in order to move into or out of engagement with the wire, and it appears to be mechanically impossible to achieve the necessary freedom from vibration and uniformity in operating speed on any sort of a shiftable device.

It is therefore the principal aim of the present invention to provide a record threading device for a magnetic recording and reproducing machine comprising a turret having its individual parts so constructed and arranged that the unit is capable of unusually uniform motion, together with smooth and vibrationless operation so that the linear rate of movement of the wire across the translating head approaches absolute uniformity more closely than heretofore possible in a machine of the self-threading type.

Another important object of the invention resides in the provision of a turret for a magnetic recorder including a record driving capstan on an axially stationary spindle rotatable in bearings rigidly fixed in the main frame of the machine, so that a relatively large flywheel may be carried directly on the spindle to aid in attaining uniform motion; together with wire guide means adapted to swing in an arcuate direction around the capstan, to engage the wire and place it in the groove of the capstan.

A further object of the invention is the provision of a magnetic recorder turret having the characteristics above indicated, yet of sturdy, rugged, and compact design so that it is capable of trouble-free operation over a long period of time and is unlikely to be damaged by ordinary abuse or neglect.

Still another object of the invention resides in the provision of a turret for a magnetic recorder including a wire guide adapted to reciprocate in a direction generally perpendicular to the movement of the wire to effect level winding of the wire on the reels, together with an improved and simplified method of actuating the wire guide.

The manner in which the foregoing objects are accomplished by the teachings of this disclosure are best described by reference to the drawings attached to and forming a part of the present specification, and illustrating one form of the invention. It will be noted that the structure shown not only represents a construction remote from any of the published art, but also is a direct departure from previous machines devised by the present inventor, in that while prior devices of the applicant (Serial No. 673,363, filed May 31, 1946, now abandoned) have provided a moveable turret to support a capstan, translating head, and wire guide, the present invention provides a driving capstan that does not change its axial position. Instead, it is rotatable on a

fixed axis so that it may be mounted in stationary bearings adequately supported on the main frame of the machine. The turret is supported by the capstan bearings instead of supporting them. It follows that, while the structure of the turret is concentric with the capstan and rotates around it, yet only the translating head and the wire guide are actually supported by the turret structure and the mass of the capstan and flywheel are supported directly on the main frame. The parts are arranged, however, so that in one portion of the turret the wire (or other recording medium) of the machine, extending in a straight span across the turret, will be clear of all of the turret parts, so that the wire spools or magazine may be placed on the machine or removed therefrom without danger of entangling the wire in the turret mechanism. However, when the turret is energized, it rotates about the axis of the driving capstan so that the wire guiding means advance across the wire span, engage the wire, place it in the groove of the driving capstan, and draw it into a loop around the recording head.

Referring now more particularly to the drawings attached to and forming a part of this specification,

Figure 1 is a fragmental plan view of a magnetic recorder having a turret as contemplated in the present invention, the turret being shown in inoperative position, with the wire record of the device extending in a straight span between the feed reel and the take up reel and clear of the driving capstan, translating head, and level wind guide.

Figure 2 is a fragmental plan view similar to Figure 1 showing the operating position of the turret, with the wire looped around the translating head and engaging the driving capstan and level winding guide.

Figure 3 is a transverse sectional view taken substantially on the plane of the line 3—3 of Figure 2, and

Figure 4 is a detail plan sectional view taken substantially on the plane of the line 4—4 of Figure 3.

The recorder includes a main frame 10 upon which a pair of motors 11 and 12 are mounted with reels 13 and 14 consisting of spools carried on the armature shafts of the motors 11 and 12, respectively. The spools serve as points of storage for an elongated record 15, which, for the exact type of machine illustrated, is a fine steel wire. The wire is coiled on both spools so that it may traverse between the spools 13 and 14 in either direction. When the machine is recording or reproducing, the wire 15 will extend in a loop 15*a* partially around a translating head 16, around a driving capstan 17 at 15*b* and across a level wind guide 18 at 15*c* (Figure 2). When the wire is being rewound, advanced without recording, or when the spools are to be put in position or removed, the wire may extend in a straight span 15*d* between the spools (Figure 1).

The driving capstan 17 is shown with a V groove 19 to engage the wire record, and with a pair of oppositely tapered surfaces 20 to guide the wire into the groove. The capstan 17 is secured to the upper end of a driving spindle 21 by a machine screw 22, and the spindle is rotatably mounted in a pair of bearings 23 and 24 at the upper and lower ends respectively of a bearing sleeve 25. The bearing sleeve 25 includes a reduced portion 26 at its lower end fitted into a bore in the main frame 10 of the machine and locked in position by a threaded nut 27 and lock washer 28 so that the sleeve is rigidly mounted in and forms a part of the main frame. The capstan 17 is positively driven at a uniform speed of rotation by a motor 29 having its field laminations 31 bolted directly to the frame 10 of the machine by screws 32 and having an armature 33 mounted in bearings 34. A driving pulley 35 is locked to the shaft by a set screw 36 so that the pulley serves to drive a flexible belt 37 extending from the motor to a spindle driving pulley 38 and a cam driving pulley 39. The spindle driving pulley 38 is loosely mounted on the lower end of the capstan spindle 21 and is connected to the spindle through a rubber torque member 41. The connection is made by a pair of pins 42 which engage two of the arms of the rubber piece, and a pair of screws 43 extending through the opposite arms and into a hollow housing 44. A flywheel 45 is mounted on the lower end of the capstan spindle 21 and a locking collar 46 is positioned immediately above the upper bearing 23 and secured to the spindle by the set screw 47.

The cam driving pulley 39 is mounted on a vertical spindle 51 extending through a bearing in the frame 10 and having a worm 52 at its upper end in mesh with a worm gear 53 on a horizontal spindle 54. The spindle 54 is also mounted in a suitable bearing on the main frame. The spindle 54 carries a worm 55 at the end opposite the worm gear 53, and the worm 55 meshes with a worm gear 56 mounted on the hub of a circular cam 57. The hub of the cam is fitted over the outer surface of the bearing sleeve 25 so that the cam 57 and gear 56 are both rotatable on an axis concentric with the spindle 21 and may be driven by the motor 29 through the belt 37 and the worm gears. A collar 60 is secured to the sleeve 25 by a set screw 58 to prevent upward movement of the cam and gear assembly.

The turret of the machine, generally designated at 61, includes a surface plate 62 and a gear 63 both mounted on a central bearing 64 fitted to the outer surface of the bearing sleeve 25 and held in position by collar 65 and set screw 66. The translating head 16 is mounted on the surface plate 62 and, as shown, includes a wire groove 68 through which the wire record 15 is drawn during recording and reproducing. The head is preferably provided with oppositely inclined surfaces 69 and 71 to guide the wire into the groove 68, so that the head housing performs a double function, serving not only to house the magnetic recording and reproducing instrumentalities, but also acting as one of the guide means for engaging the wire and moving it into position across the capstan.

The turret also supports the wire guide 18 which, as shown, includes oppositely inclined surfaces 74 and 75 to engage the wire so that as the idler is moved upwardly and downwardly it will act as a level winding device and guide the wire into single layer winding on the reel 14. The wire guide roller 18 is rotatably mounted at the upper end of a spindle 76 mounted for vertical sliding movement in a bearing 77 extending through and fixed in the surface plate 62 of the turret. The spindle 76 includes a cam roller 78 mounted on a cross pin 79 near its lower end. The mounting bearing 77 of the spindle is the same distance from the center of the spindle 21 as the radius of the cam 57 so that as the cam is rotated by the worm gear 55 the spindle 76 is raised and lowered in a vertical reciprocating movement against a coil spring 81 extending between the lower surface of the gear 63 and the upper surface of a washer 82 positioned on the spindle immediately above the roller 78. The

spindle is provided with a key way 83 and the bearing 77 includes a key 84 so that rotation of the spindle in the bearing is prevented and the axis of the roller 78 is maintained on the radius of the cam 57.

The turret is rotatable between the idle position illustrated in Figure 1 and the recording or reproducing position illustrated in Figure 2. To this end a motor 86 is mounted on the frame 10 so that a worm gear 87 on its armature shaft may mesh with a worm gear 88 carried on a vertical stub shaft 89 mounted for rotation in bearings 91 and 92. The worm gear 88 is secured to the shaft by a set screw 93 and a pinion gear 94 in mesh with the gear 63 of the turret is secured by a set screw 95. The motor 86 may be operated in either forward or reverse direction to move the turret to the desired position, and circuit breakers (not shown) are arranged to stop the turret at the proper points of rotation. An oiling pad 96 may be mounted on a bracket 97 to lubricate the worm gear 87 if desired.

In the operation of the mechanism, the reels 13 and 14 on which the wire 15 is wound are placed in position on the armature shafts of the motors 11 and 12, respectively, so that the wire extends in a straight span between the reels (Figure 1). As this is done the turret is in inoperative position and the parts are so positioned that the translating head 16 of the device is positioned near, but to one side of the wire span 15*d*, while the driving capstan 17 is on the opposite side of the span but also sufficiently spaced from it that the spools and wires may be easily lifted off or positioned on the motor shafts without interference between the wire and these parts. The wire guide 18 is also clear of the span 15*d*. When the machine is to be operated for recording or reproducing, the motor 86 is energized to rotate the turret from the position shown in Figure 1 through about 210 degrees of movement to the position shown in Figure 2. As this occurs, it will be seen that the translating head 16 advances in an arcuate path around the capstan 17, so that it crosses the straight span 15*d* of the wire and draws the wire into a loop 15*a* around the recording head and into an arc 15*b* in the groove of the capstan. Thus, although the capstan is entirely stationary on its axis, the motion of the head, which serves as one of the wire guiding means, causes the wire to engage the capstan and be drawn into the V groove 19 thereof, so that the wire will be driven by the movement of the capstan. The level winding wire guide 18 also moves in an arcuate path from the position shown in Figure 1 across the right hand side of the wire span 15*d*, so that the surfaces 74 and 75 of the guide engage the wire at 15*c*. This is at a point on the wire after it has passed over the driving capstan and before it reaches the reel 14, so that the vertical motion of the guide acts as an effective level wind, to lay the wire on the reel 14 in smooth layers. The capstan 17, being provided with a relatively large flywheel 45 and coupled to the motor 29 through a resilient torque connection 41 will revolve at a very smooth and constant speed, and will consequently drive the wire at a uniform and unvarying linear rate. The rotation of the level winding cam 57 will cause a regular reciprocating movement of the level winding guide 18, so that it will rise and fall in direct proportion to the length of wire fed to the reel 14 and will wind the wire evenly in multiple layers on the reel.

In rewinding, it is unnecessary to maintain the uniformity of linear speed, and since it is also undesirable to cause additional wear on the parts by drawing the wire through the groove of the recording head, the turret may be returned to the position of Figure 1, so that the wire is fed directly from the reel 14 to the reel 13. It has been learned that when this is done, it is unnecessary to utilize the level winding device, since the wire unwinding from the even layers of the reel 14 will rise and fall and will thus achieve effective level winding on the reel 13.

From the foregoing it will be apparent that the teachings of this disclosure mark a true advance in the magnetic recording art, since they make possible the utilization of an efficient constant speed driving mechanism in connection with a machine having an automatic threading mechanism. This has not heretofore been accomplished, and though the need for a mechanism utilizing automatic threading yet capable of high fidelity performance has long been recognized, the common assumption in the art that such a device would require a bodily shiftable driving device for the wire and would thus involve gearing and bearing problems introducing backlash and vibration into the unit has resulted in the accepted belief that the problem would continue to defy solution. In the present disclosure, it is solved by a direct departure from prior teachings. The driving capstan itself does not move and is not supported by the turret. Thus it may be provided with adequate bearings, rigid on the main frame, and may carry a flywheel of sufficient mass to function properly. The threading is not accomplished by moving the capstan, but by the wire guiding means of the turret, which move about the axially stationary capstan so as to engage the wire, draw it into a loop around the translating head, and place it in the driving groove of the capstan and guide groove of the level winding device. It follows that the machine is entirely automatic in threading and unthreading, yet is capable of achieving extreme uniformity of wire speed and is thus capable of high fidelity reproduction not heretofore possible in a self-threading device.

The exact form of the invention illustrated in the drawings and described in the specification has been selected as the best embodiment of the inventive concept, and is believed to be well illustrative of the means by which these teachings can best be utilized, but it is recognized that various modifications are possible without sacrifice of all of the advantages of the invention, and it is accordingly pointed out that the scope of the inventive thought extends to any variations of structure coming within the terms of the appended claims.

Having thus described the invention, what I claim as new and desire to protect by United States Letters Patent is:

1. In a magnetic translating device including a main frame, a pair of reels supported by the frame and a coiled wire record wound on the reels and adapted to extend in a straight span between them, the combination of an axially stationary driving spindle, a V grooved capstan at one end of the spindle, together with a flywheel on the spindle at the opposite end from the capstan; a mounting sleeve for said spindle including a pair of bearings spaced apart from each other to support the spindle; and means for fixedly securing the mounting sleeve as a

part of the main frame; together with a rotatable turret carried on the mounting sleeve and coaxial with the axis of the driving spindle; a translating head and a level winding guide each mounted on the turret and spaced away from the capstan, with means for rotating the turret to advance the translating head and level winding guide across the straight span of wire extending between the reels whereby the wire is drawn into a loop at least partially around the translating head and engaged by the level winding guide and driving capstan; and means for reciprocating the level winding guide in a plane perpendicular to the path of the wire; said means including a slide rod parallel with the driving spindle and a single circular cam concentric with the driving spindle and rotatably mounted on bearings on the exterior of the mounting sleeve of the driving spindle, with a common driving means for the driving spindle and the level winding cam.

2. In a magnetic translating device including a main frame, a pair of reels supported by the frame and a coiled wire record wound on the reels and adapted to extend in a straight span between them, the combination of an axially stationary driving spindle, a V-grooved capstan at one end of the spindle, together with a fly-wheel on the spindle at the opposite end from the capstan; a mounting sleeve for said spindle including a pair of bearings spaced apart from each other to support the spindle; and means for fixedly securing the mounting sleeve as a part of the main frame; together with a rotatable turret carried on the mounting sleeve and coaxial with the axis of the driving spindle; a translating head and a level winding guide each mounted on the turret and spaced away from the capstan, with means for rotating the turret to advance the translating head and level winding guide across the straight span of wide extending between the reels whereby the wire is drawn into a loop at least partially around the translating head and engaged by the level winding guide and driving capstan; and means for reciprocating the level winding guide in a plane perpendicular to the path of the wire.

3. In a magnetic translating device including a main frame, a pair of reels supported by the frame and a coiled wire record wound on the reels and adapted to extend in a straight span between them, the combination of a mounting sleeve forming a part of the main frame; a rotatable turret carried on the mounting sleeve, a translating head and a level winding guide each mounted on the turret, with means for rotating the turret to advance the translating head and level winding guide across the straight span of wire extending between the reels whereby the drive is drawn into a loop at least partially around the translating head and engaged by the level winding guide; and means for reciprocating the level winding guide in a plane perpendicular to the path of the wire, said means including a slide rod parallel with the mounting sleeve, and means for rotating the cam with respect to the sleeve.

4. In a magnetic translating device including a main frame, a pair of reels supported by the frame and a coiled paramagnetic record wound on the reels and adapted to extend in a straight span between them, the combination of an axially stationary driving spindle with a driving capstan thereon; a mounting sleeve for said spindle including at least one bearing to support the spindle; and means for fixedly securing the mounting sleeve as a part of the main frame; together with a rotatable turret carried on the mounting sleeve and coaxial with the axis of the driving spindle; a translating head mounted on the turret and spaced away from the capstan, with means for rotating the turret to advance the translating head across the straight span of the paramagnetic record extending between the reels whereby the record is drawn into a loop at least partially around the translating head and engaged by the driving capstan.

5. In a magnetic translating device including a main frame, a pair of reels supported by the frame and a coiled paramagnetic record wound on the reels and adapted to extend in a straight span between them, the combination of an axially stationary driving spindle with a driving capstan thereon; mounting means for said spindle including a pair of bearings spaced apart from each other and fixedly supported in the main frame; together with a translating head and a shiftable support therefor, with means to advance the translating head across the straight span of the record extending between the reels whereby the record is drawn into a loop at least partially around the translating head and engaged by the driving capstan.

6. In a magnetic translating device including a main frame, an elongated paramagnetic record, and means supported by the frame to coil the record in either of two points of storage and to suspend a straight span of the record between the points of storage, a threading mechanism for the record comprising, in combination, a driving capstan mounted for rotation on a fixed axis and carried in bearings in a stationary sleeve forming a part of the main frame of the mechanism, a turret rotatably mounted on said sleeve, with a translating head and a guide for the record supported on the turret; the turret adapted to be rotated around the capstan to advance the translating head and guide across the straight span of the record to engage the record, bring it into engagement with the driving capstan, and form a loop in the record extending at least partially around the translating head.

7. In a magnetic translating device including a main frame, an elongated paramagnetic record, and means supported by the frame to coil the record in either of two points of storage and to suspend a span of the record between the points of storage, a threading mechanism for the record comprising, in combination, a driving capstan mounted for rotation on a fixed axis and carried in bearings rigidly secured in the main frame of the mechanism, a turret concentric with the capstan and rotatably mounted on said main frame, and a translating head supported on the turret and adapted to be rotated around the capstan and advanced across the span of the record to engage the record, bring it into engagement with the driving capstan, and form a loop in the record extending at least partially around the translating head.

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