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(54) BELT DRIVEN TAPE TRANSPORT WITH REMOVABLE REEL

(71) We, INTERDYNE COMPANY, a corporation organised and existing under the laws of the State of California, United States of America, of 14761 Califa Street, Van Nuys, California 91411, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates generally to tape transports, and more particularly concerns magnetic tape transports of the type in which an endless belt engages and drives tape rolls on rotary tape reels.

Prior belt driven transports are exemplified by the U.S. Patents 3,907,230 to Merle; 3,692,255 to Von Behren; 2,743,878 to Masterson; and 3,808,902 to Grant. In certain of these the belt is guided over rollers which are fixed in relation to a frame; and in the Merle patent the belt roller is movable relative to the frame but its movement and location in relation to driven tape rolls are subject to tension in the belt. None of such patents is concerned with a belt drive in which the support of the belt and at least one belt driven tape roll is such as to readily accommodate removal and replacement of that tape roll; and none of such patents is concerned with a drive in which tape rolls are driven by a belt urged by separate rollers toward the tape rolls, a spring means other than the belt being employed to accomplish such urging. Further, effective self-feeding of tape between the tape reels is not suggested by such belt drive transport patents.

It is an object of the present invention to obviate or mitigate these disadvantages of the prior art.

The present invention is in a tape transport assembly, the combination comprising

(a) a pair of reels for tape to be transported from a supply roll on one reel to a take-up roll on the other reel,

(b) an endless belt located to engage the tape only at the tape rolls on the respective reels for rotating the rolls and reels to effect said transport in response to lengthwise travel of the belt,

(c) support means for supporting the reels and belt to accommodate bodily displacement of at least one reel relative to the belt into and out of position in which the tape roll on said one reel arcuately deflects and engages a first section of the belt, the reels supported for free rotation,

(d) said support means including a pulley entraining the belt at a position spaced from the tape, and including a drive operatively connected with said pulley to effect said lengthwise travel of the belt which constitutes the only drive for the belt, which in turn constitutes the only drive for the tape,

(e) said support means including a frame, and a fixed guide chute on the frame and extending between the reels to guide the tape therebetween, and

(f) said support means also including belt rollers entraining the belt, a first arm supporting one of said rollers to swing in an arc tending to maintain arcuate engagement of a first belt section with the tape roll on one reel, and a second arm supporting another belt roller to swing in an arc tending to maintain arcuate engagement of a second section of the belt with the tape roll on the other reel, said rollers located to squeeze the belt between said one roller and the tape roll on one reel, and between said other roller and the tape roll on the other reel.

As will be seen in embodiments of the invention, removability and replaceability of one tape roll and associated reel is especially enhanced and accommodated

through initial peripheral "three-point" support; centering of that reel and roll relative to a frame is initially provided by two auxiliary elements engaging the reel periphery, together with one of the two previously mentioned rollers swingable on an arm to yieldably urge the belt to arcuately engage the tape; and subsequent centering of that reel and roll during tape transport is provided by a coaxial axle or mount, for low friction, low wear operation. Accordingly, the reel and roll may be removed from centered position in a direction generally normal to the reel axis of rotation, against resistance imposed by the one arm supported roller acting through the belt, to be replaced by a substitute reel and tape roll, and the reel and roll are coaxially centered with minimum running friction during tape transport, all in the manner as will appear.

Additional advantages of embodiments of the invention include the following:

1) A one-piece replaceable tape unit, i.e. one reel and roll, is enabled to be driven by a belt-drive, avoiding need for a replaceable cartridge employing several rotatable parts such as hubs and rollers.

2) The use of a spring means to urge two arm-supported rollers in arcs tending to maintain the belt in arcuate engagement with the tape rolls reduces the belt and roller design requirements, i.e. inexpensive belts with round cross-section may be used, and the requirements for precisely aligned rollers and shafts are substantially reduced.

3) Large speed differentials may easily be generated, leading to improved tape handling reliability because slack (especially during loading) is taken up more rapidly.

4) Fixed reel centres are employed, which provides better resistance to shock and vibration; also the geometry of the belt drive provides for belt length that remains nearly constant for all tape positions on the two reels, whereby the elastic characteristics of the belt are more nearly uniform with temperature, and from beginning to end of tape transport between the two rolls. Also, the normal forces between the arm supported "floating" rollers and the tape packs or rolls may be independent of the belt elastic characteristics and therefore more precisely controlled. The two "floating" roller design further enables optimum belt wrap angles around the tape packs, improving traction so that higher acceleration deceleration rates may be achieved.

5) Simplicity and reliability of tape self threading, in a belt-drive environment, are achieved.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a side elevation showing tape transport apparatus incorporating the invention, but without insertion of a supply reel;

Fig. 2 is a side elevation showing a supply reel;

Fig. 3 is a section taken on lines 3—3 of Fig. 2;

Fig. 4 is a view like Fig. 1 showing the apparatus in operation with the supply reel inserted;

Fig. 5 is a horizontal section on lines 5—5 of Fig. 4;

Fig. 6 is an enlarged fragmentary section on lines 6—6 of Fig. 4;

Fig. 7 is an enlarged fragmentary section on lines 7—7 of Fig. 4, showing winding of leader on the take-up reel;

Fig. 8 is a view like Fig. 7 showing the take-up reel after winding of tape on the take-up reel;

Fig. 9 is an enlarged fragmentary section on lines 9—9 of Fig. 4;

Fig. 10 is a view like Fig. 9, but showing tape wound on the take-up reel;

Fig. 11 is a perspective showing of the self-sealing supply reel seen in Fig. 4, the reel rotating in tape unwinding direction;

Fig. 11*a* is a fragmentary section showing stripping of tape off the supply reel;

Fig. 11*b* is fragmentary section in side elevation showing stripping of tape off the supply reel;

Fig. 11*c* is a fragmentary showing of a leader tail;

Fig. 12 is a view like Fig. 11, but showing the reel rotating in tape re-winding direction;

Fig. 13 is a section on lines 13—13 of Fig. 4;

Fig. 14 is a section on lines 14—14 of Fig. 4;

Fig.15 is a vertical section on lines 15—15 of Fig. 4;

Fig. 16 is a perspective view of apparatus embodying the invention;

Figs. 17 and 18 are sections showing other belt cross sections;

Fig. 19 is a view like Fig. 1, showing a modification;

Fig. 20 is a section taken on lines 20—20 of Fig. 19;

Fig. 21 is a section taken on lines 21—21 of Fig. 19;

Fig. 22 is a schematic showing of reel repositioning;

Fig. 23 is an enlarged section on lines 23—23 of Fig. 22;

Fig. 24 is a view like Fig. 20, showing a further modification; and

Fig. 25 is a top view showing still another modification.

Referring to Figs. 2—6, 11 and 16, the

tape storage or supply unit comprises a self-sealing supply reel 10 having an axis 11, spaced flanges 12 and 12¹ extending in planes normal to the axis, and a hub 13, about which stored magnetic tape 14 is wound in a spiral pack 14*a* between the flanges. Note that the tape width is less than the width of the space between the flange inner walls 12*a*, there being slight clearance therebetween.

The numeral 15 indicates a thin leader strip connected with the end of the tape, the strip for example consisting of plastic such as MYLAR. ("Mylar" is a Registered Trade Mark). While being lengthwise flexible, the leader is resiliently flexible widthwise so as to tend toward a flat planar configuration as indicated in solid lines in Fig. 11*c*. Further, the width of the leader is typically greater than the tape width, as well as the width of the gap between flange inner faces 12*a*. In stored condition, as seen in Fig. 6, the opposite edges 15*a* of the leader are flexed to frictionally grip the inner walls of the flanges as seen in Fig. 6, and extend annularly about the hub in radially outwardly spaced relation thereto; accordingly, when the length of the stored leader is at least about equal to the circumference of the wound tape pack, the tape 14 is protectively confined inwardly of the leader and between the flanges.

Fig. 6 illustrates the manner in which the leader strip may be forcibly displaced into stored position. For this purpose, the flanges 12 and 12¹ may have annularly opposite faces 12*b* which taper radially inwardly to guide the leader opposite edges toward the flange inner walls 12*a*. In addition, a leader engaging rotor 18 has a land portion 18*a* which projects between the flanges 12 and 12¹ so as to be in local contact with the leader to bow it widthwise and toward the reel axis for forcibly urging or "snapping" the leader opposite edges 15*a* against inner walls 12*a*. Fig. 6 shows this stored and temporary resiliently bowed or locally flexed condition of the leader.

Fig. 6 also illustrates the engagement of the annular peripheries 19*a* of rotor flanges 18*b* with the peripheries 12*c* of the reel flanges 12 and 12¹. Such inter-engagement locates the land portion 18*a* generally between the flanges 12 and 12¹ so as to forcibly bow the leader, enabling camming of the leader opposite edges 15*a* over the edges 20 between surfaces 12*b* and inner walls 12*a*. Edges 20 may be rounded, if desired.

Referring now to Figs. 1 and 4, the tape transport assembly basically comprises a pair of reels for tape 14 to be transported from a supply roll or pack 14*a* on one reel such as reel 10 to a take-up roll or pack 14*b* on the other reel, as for example at 290; also, an endless belt, as at 22, is located to arcuately engage the tape rolls on the respective reels for rotating the tape rolls on the reels to effect tape transport between the rolls in response to lengthwise travel of the belt. Finally, support means is provided to support the reels and belt to accommodate bodily displacement of at least one of the reels (as for example reel 10) relative to the belt and into and out of transport position (as seen in Fig. 4) in which the tape roll 14*a* on reel 10 arcuately deflects and engages a first section 22*a* of the belt. Fig. 1 shows the belt first section 22*a* in undeflected condition prior to loading of the reel 10 and tape roll 14*a* into transport position.

The support means may advantageously include a frame which may, for example, include a support plate 23 and wall 24 and circuit board 25 interconnected by posts 26; also, the support means may be considered to include belt rollers 27 and 28 entraining the belt, and arms 29 and 30 supporting such rollers to swing in arcs. As illustrated one idler roller 27 is carried by arm 29 to swing bodily clockwise in Fig. 4 and in an arc relative to the frame in response to displacement of tape loaded reel 10 into and out of transport position; further, arm 29 supports belt roller 27 to swing counterclockwise in an arc tending to maintain arcuate engagement of the belt first section 22*a* with the tape roll 14*a* on reel 10, during tape transport. Similarly, second arm 30 supports idler roller 28 to swing in a clockwise arc tending to maintain arcuate engagement of a second section 22*b* of the belt with the tape roll 14*b* on reel 20. Figs. 4 and 14 show arms 29 and 30 pivoted at 33 about a common axis, and a torsion spring 34 acting to resiliently urge the arms toward the tape packs. The spring turns are wrapped about pivot post 33 attached to plate 23. Figs. 9 and 10 show positions of arms 30 and roller 28 during tape build-up on reel 20.

The support means may also include a motor driven pulley 31 entering the belt at 22*c* between sections 22*a* and 22*b*, there being a drive such as single motor 32 operatively connected with the pulley to rotate same. The belt itself may consist of an elastomeric material, and may advantageously have circular cross-section; thus, the belt may consist of a rubber O-ring, for example. Consequently, rollers 27 and 28 may comprise pulleys.

The support means may include auxiliary rollers carried by the frame to be engaged by reel 10 in response to bodily displacement of reel 10 into loaded or inserted position, seen in Fig. 4. Such auxiliary rollers may include idler roller 18 previously des-

cribed, and roller 35 having a construction similar to that of roller 18. Accordingly, roller 35 also has flanges corresponding to flanges 18*a* and 18*b*, with the same or similar functions. Fig. 6 shows roller 18 rotatably mounted on a shaft 36 carried by plate 23, and roller 35 may be similarly rotatably mounted, in fixed position relative to plate 23.

Reel 20 is suitably mounted in fixed position, as by anti-friction bearings 37 and axle 38 seen in Fig. 5. Axle 38 is carried by plate 23.

Referring now to Figs. 1, 4, 11, 11*a* and 11*b*, it will be noted that a stripper finger 41 projects between the leader 15 and the tape 14 in the pack on reel 10, and between flanges 12 and 12^1, the finger serving to strip the leader free of the walls 12*a* as the reel rotates in a tape supply direction (see Fig. 11). Finger 41 has opposite faces 42 and 43 tapering toward an apex at 41*a*, face 43 lying generally parallel to and adjacent the surface of the tape pack. Downwardly lengthwise concave face 42 of the finger deflects the stripped leader and tape toward and into wide guide slot 45 for receiving and guiding the unwinding leader and tape. Fig. 11*a* shows that the face 42 preferably has sections 42*a* which taper toward the underside of the leader to bow it outwardly during stripping. Figs. 11*b* and 11*c* show a tab or tail 15*e* on the end of the leader and which diverges outwardly away from the stored leader to provide a gap 200 into which the stripper finger is received to initiate stripping. Slot 45 extends as shown in Fig. 4 toward a read/write head 46, adjacent which the tape is passed.

The tape guide means may also be considered to include structure 47 forming upwardly concave guide surface 44, and acting with structure 48 to form the wide slot 45 to guide the leader during threading. Broken line 15*h* in Fig. 4 indicates the leader path during initial threading. The guide means may also include tape guides such as idler rollers 50 and 51 the peripheries of which are generally tangent with the tensioned tape as it travels lengthwise in the slot 45. Fig. 12 shows the leader 15 being wound on reel 10 as the latter rotates in re-wind mode. Connection of the leader with the tape appears at 201. The length of the leader is typically sufficient to at least once overalp the connection 201.

Figs. 5 and 7—10 show the construction of the second or take-up reel 20 having an axis 53, hub 54, and spaced flanges 55 projecting normal to axis 53 and radially outwardly of the hub. An idler rotor or roller 56 is located to receive the leader 15 delivered from slot 45 toward the periphery of the hub 54 adjacent the periphery of rotor 56. Rotor 56 is pivotally carried by an arm 57 pivoted to post 58 connected to the frame. Torsion spring 59 urges the arm and rotor 56 toward reel 20, the rotor penetrating between flanges 55 and seen in Figs. 4, 7 and 8.

As the reel 20 and rotor 56 rotate in take-up mode, the leader entering therebetween is bowed or flexed so that the leader edge portions 15*a* are forced into grooves 64 sunk in the inner faces of flanges 55 and the leader 15 and tube 14*b* compressively stored as seen in Fig. 8. Such faces taper at 55*a* toward the leader annular storage zone between the grooves, and adjacent the outer surface 54*a* of the hub. The radial thicknesses of the grooves 64 are wide enough to allow one or more thicknesses of the leader to "snap" in place. Formation and storage of the tape in a tight pack 14*b* outwardly of the leader 15 in Fig. 8 is facilitated by the frictional capture of the leader in grooves 64, as described. A layer 203 of non-slip material such as rubber or soft plastic may be located at the take-up reel hub surface to prevent slippage of the leader captured in the grooves 64. The take-up rotor 56 may include a central land portion having a flat periphery 56*a* the width of which is slightly less than the gap width between the inner edges 55*b* of faces 55*a*.

In re-wind mode with the reels rotating clockwise in Fig. 4, the tape feeds off the pack 14*b* adjacent the periphery 56*a* of rotor 56, then travels lengthwise through slot 45; the tape is then guided by slot boundaries and roller guides 50 and 51 into adjacency to the hub surface 13*a*, of reel 10, and the tape wraps about that hub to form pack 14*a* seen in Fig. 6. Ultimately, the leader is stripped off reel 20 by roller 204, travels back through slot 45, and is stored in position about the tape pack 14*a* in the manner described above in connection with Fig. 6.

In operation, tape tension is generated and maintained primarily by a so-called "Pinch Zone Approach Radius Effect". As the belt 22 travels from A to B, in Fig. 4, it is bent so that it has a negative radius r_s being the belt contact radius of pack 14*a*. Since the approach radius of the belt is negative when it enters the pinch zone B—C, the supply tape pack 14*a* will attempt to rotate slower than the ratio of r_s over r_2 would indicate, r_2 being the belt contact radius of roller 27. Then as the belt travels from E to F it has a positive radius r_3 (with respect to the centre of roller 28), and therefore the take-up pack 14*b* attempts to rotate faster than the ratio of r_t over r_3 would indicate r_t being the belt contact radius of tape pack 14*b*. This speed differential between the surface velocity of the take-up pack and supply pack results in the tape tension across the magnetic head. Since the tape is rela-

tively stiff (compared to the belt), it is not stretched appreciably, therefore the surface velocities of the tape packs are forced to be the same. This, in turn, loads the belt system so that the speed difference is made up through belt strech, and shear deflection at the contact points. If the normal force is high enough on the idler rollers, no slippage will occur in the pinch zones B—C and F—G. This results in a positive drive coupling which, due to the system symmetry, operates equally well in both tape directions. Tape tension is controlled by selecting the radii for rollers 27 and 28 and by selecting the belt thickness and stiffness.

Referring now to Figs. 1, 3, 5 and 15, reel 10 defines an annular recess 70 extending about axis 11 and facing laterally parallel to that axis. A latch 71 and solenoid actuator 72 therefore are carried by the frame, i.e. by plate 23, the latch being actuable by the solenoid, as *via* bell crank 74, so as to advance and project into the recess 70 when the reel 10 is fully received into tape transport position (see Figs. 4 and 5). Accordingly, the reel cannot be retracted from that position during tape transport. Actuation of the latch solenoid may be accomplished by external electronic logic which prevents removal of the reel while the tape is still threaded in the transport. The switch 75 has a contact operating plunger 76, the latter is displaced by an arm 77 which is in turn displaced clockwise in Fig. 15 by plunger 78. Plunger 78 is displaced by a convex button or head 79 carried by the reel 10 central boss 80. Therefore, when the reel reaches Fig. 15 position, the switch actuates (if button 79 is in place) to permit the "write" electronics 206 to write on the tape. If the button 79 is not in place, the write electronics cannot be energised.

Referring to Fig. 16, a carrier, such as closure 85 and channel member 86 on the closure, is movably carried by the frame to releasably carry the reel 10. Thus, for example, the closure 85 may be pivotally carried by the frame panel or wall 23*a* to pivot between lowered retracted position as shown and raised advanced position, closing the opening 87 in transport housing 88. In retracted position as shown, the reel 10 may be placed into or removed from the channel member 86, the webs of which loosely support the reel periphery. In raised advanced position of the closure 85, the reel is inserted into transport position as seen in Fig. 4, and a latch is operated. When the latch is released, the closure may be opened to retract the reel into access position.

As disclosde in our copending Patent Application No. 45033/76 (Serial No. 1,560,739), the leader strip 15 may consist of two sub-strips 15*b* and 15*c* which are interconnected in stacked relation, with edge portions 15*a* defined by one strip 15*b* projecting laterally beyond the edges 15*d* defined by the second sub-strip. The construction is such that the overall leader strip 15 has lengthwise bending stiffness which is substantially greater than leader strip characteristic widthwise bending stiffness; i.e. the two sub-strips may have different bending moduli, and one sub-strip 15*b* may consist of vinyl while the other sub-strip 15*c* may consist of MYLAR (with greater bending stiffness). Accordingly, the edge portions 15*a* of the leader are engageable with the non-grooved inner walls 12*a* of the flangse 12 and 12^1 of reel 10 to be frictionally retained in position between those walls, this construction being of unusual advantage in the herein disclosed belt driven transport since the belt cooperates with the leader 15 which may have different radial positions depending upon the tape wrap characteristics, there being no leader trapping grooves in the flange walls. Also, the width tolerances of the reel walls 12*a* are less critical.

Figs. 17 and 18 show alternative drive belts 122 and 222 respectively having triangular and rectangular cross sections, which can also be used in place of the round cross section belt depicted.

Referring now to Figs. 19—23, a modification is shown and is characterised as providing means to initially receive and peripherally support or locate a tape reel, together with means to subsequently centrally support the tape reel for rotation, and preferably in bodily displaced position to reduce or eliminate frictional engagement with one or more of the peripheral supports. As a result, wear and friction are reduced, less debris is produced by frictional wear (such debris otherwise tending to possibly gather on the tape to pass under the read/write head and produce an error) and the need for anti-friction bearings for the peripheral supports (such as rollers) is avoided.

In the illustrated example, certain elements remain the same as before, and therefore bear the same numerals. At least one peripheral support peripherally engages the one reel 10 to position same upon its initial reception (in a rightward direction normal to reel axis 11 in Fig. 19) into the assembly. For example, the support post 135 is initially engaged by the reel 10, as shown by the reel engagement locus 10*a* in Fig. 22; likewise, a second peripheral support in the form of rotor 18 peripherally engages and seats the reel 10, at reel broken line locus 10*b* in Fig. 22, upon its initial reception into the assembly as described. More specifically, the rotor annular peripheries 19*a* are initially engaged by the peripheries 12*c* of the reel flanges 12. The loci 10*a* and 10*b* are spaced about the reel axis 11 from the locus of

belt engagement with the tape roll, as seen in Fig. 19.

The centering support means for reel 10 is carried by the assembly for relative movement into reel centrally supporting relation or position, in which reel 10 is displaced out of peripheral engagement with at least one of the peripheral supports and the reel is also centrally supported for rotation. See for example the solid line reel peripheries in Figs. 19, 22 and 23 wherein there are slight gaps between the reel flange peripheries 12*c* and the rotor peripheries 19*a*, and also the post 135.

The centering support means may advantageously comprise a plunger 136 which is coaxial with the reel axis 11 in advanced position as seen in Fig. 20. The plunger 136 is shown to have a reduced diameter pin extension 136*a* which has running fit with the bore 137 in the reel hub or boss 80, the face of the boss slidably engaging step shoulder 138 on the plunger. A flat spring 139 attached to post 26 carries a bead 140 engaging the opposite side of the reel lightly biasing same toward the plunger. The end of pin 136*a* is rounded to cam into the bore 137 to bodily displace the reel normal to its axis, and away from the post 135 and rotor 18, as described, when the plunger is advanced to Fig. 20 position.

Actuating means is provided to bodily advance and retract the plunger into and out of reel centrally supporting position. Such actuating means may advantageously comprise a lever 141 operatively connected with the plunger, as *via* transverse pin 142 which extends through a bifurcated portion of the lever and through the plunger. Tongue and groove structure 143 carried between plates 23 and 25 supports the lever to pivot in plunger advancing and retracting directions, as is clear from Fig. 20. The lever may typically project at 141*a* free of a case 144 for the assembly, for manual manipulation.

Also included is a latch, as at 150 in Fig. 21, located to block retraction of the plunger 136 while the tape 14 is unwound from the reel 10. A solenoid 151 is connected with the latch, as *via* solenoid plunger 152 to displace the latch away from the end of cross-pin 142 to unblock retraction of plunger 136 as when tape becomes fully wound back on the reel 10. A switch 154, operated by lever 141 (as *via* engagement of arm 154*a* with pin 142) indicates whether the lever 141 is in the "run" or "unload" position so that the solenoid can be externally controlled.

Finally, a switch 156 is provided to be responsive to the WRITE protect ring 157. If the WRITE protect ring 157 is not in place in reel 10 the WRITE circuitry 161 associated with a tape WRITE head, as at 46, cannot be energised. Therefore, if the reel does not have a WRITE protect ring in place, the previously written information on the magnetic tape is protected. In Fig. 20 the switch has an arm 156*a* engageable wih a reel annular insert 157 at the plunger side of the reel, and at a location offset from the reel axis. In Fig. 25, the switch 156 has its arm 156*a* engageable with a WRITE protect plug 158 carried by the reel at the side thereof opposite the plunger, and at a location proximate the reel axis. The WRITE protect plug 158 may comprise a pin having opposite ends 158*a* and 158*b* of shorter and longer lengths. In the position shown, the short length 158*a* is engaged by the switch arm 156*a*, so that the switch 156 is not energised; however, if the pin is reversed in the reel, the long length 158*b* is engaged by the arm 156*a* to activate the switch thereby disabling the WRITE circuits and protecting previously written information on the magnetic tape. Bore 159 in the reel selectively receives the pin lengths 158*a* and 158*b*, there being a flange 158*c* spearating them and engaging the reel face 160.

In Fig. 24, the transport case 170 has a closure 171 swingable outwardly, as shown by broken lines 171*a*, and on hinge 172, to allow insertion of the reel 10. The lever 241 (corresponding to lever 141) is operatively connected with the closure as *via* link 173 and pivots 174 and 175. As the closure is opened, the plunger 136 is retracted to the "unload" position, and as the closure is closed, the plunger 136 is advanced to reel centrally supporting position, or "run" position.

WHAT WE CLAIM IS:—

1. In a tape transport assembly, the combination comprising

(a) a pair of reels for tape to be transported from a supply roll on one reel to a take-up roll on the other reel,

(b) an endless belt located to engage the tape only at the tape rolls on the respective reels for rotating the rolls and reels to effect said transport in response to lengthwise travel of the belt,

(c) support means for supporting the reels and belt to accommodate bodily displacement of at least one reel relative to the belt into and out of position in which the tape roll on said one reel arcuately deflects and engages a first section of the belt, the reels supported for free rotation,

(d) said support means including a pulley entraining the belt at a position spaced from the tape, and including a drive operatively connected with said pulley to effect said lengthwise travel of the belt which constitutes the only drive

for the belt, which in turn constitutes the only drive for the tape,

(e) said support means including a frame, and a fixed guide chute on the frame and extending between the reels to guide the tape therebetween, and

(f) said support means also including belt rollers entraining the belt, a first arm supporting one of said rollers to swing in an arc tending to maintain arcuate engagement of a first belt section with the tape roll on one reel, and a second arm supporting another belt roller to swing in an arc tending to maintain arcuate engagement of a second section of the belt with the tape roll on the other reel, said rollers located to squeeze the belt between said one roller and the tape roll on one reel, and between said other roller and the tape roll on the other reel.

2. An assembly as claimed in claim 1, wherein a second section of said belt arcuately engages the tape roll on the other reel, and said pulley turns the belt between said first and second belt sections.

3. An assembly as claimed in claim 1 or claim 2, wherein said support means includes auxiliary rollers carried by the frame to be engaged by said one reel in response to said bodily displacement thereof into said position.

4. An assembly as claimed in any preceding claim, including spring means resiliently urging said first arm to swing in said arc.

5. An assembly as claimed in any of claims 1 to 3, including spring means resiliently urging said first and second arms to swing in said arcs.

6. An assembly as claimed in any preceding claim, wherein said belt has circular cross section in undeflected condition.

7. An assembly as claimed in claim 3, wherein said support means includes a frame, there being a carrier swingably attached to the frame, and holder structure on the carrier for holding said one reel during swinging of the carrier to insert said one reel into a position of reel engagement by said auxiliary rollers and tape roll engagement with the belt.

8. An assembly as claimed in claim 1, wherein said one reel defines an annular recess extending about an axis defined by said reel and facing laterally parallel to said axis, and including a latch and actuator therefor carried by the frame, the latch being advanced by the actuator to project into said recess when said reel is in said position, and the latch being subject to retraction by the actuator to free the reel for displacement out of said position.

9. An assembly as claimed in claim 8, including a carrier movably carried by the frame to releasably carry said one reel, the carrier having a retracted position in which the one reel may be placed into the carrier or removed therefrom, and an advanced position in which the one reel is displaced into said position.

10. An assembly as claimed in any preceding claim, including said tape on the supply reel and a leader strip connected therewith, the leader strip comprising at least two sub-strips which are interconnected in stacked relation, edge portions defined by one sub-strip projecting laterally beyond the edges defined by another sub-strip.

11. An assembly as claimed in claim 1, wherein the other reel has fixed location relative to the frame, and including guide means on the frame to guide the tape being transported between said tape rolls on the reels.

12. An assembly as claimed in claim 1, wherein said support means includes a peripheral support to engage said one of said reels to position same upon initial reception thereof in said assembly, and centering support means carried by the assembly for relative movement into and out of centrally supporting position in which said one reel is displaced out of peripheral engagement with said peripheral support and is centrally supported for rotation.

13. An assembly as claimed in claim 12, in which the belt remains in engagement with the tape roll on said reel during said reel displacement by said centering support means.

14. An assembly as claimed in claim 13, including belt rollers entraining the belt, one of the rollers carried for bodily movement relative to the frame in response to said displacement of the one reel by said centering support means.

15. An assembly as claimed in claim 14, including a drive engaging the belt for lengthwise advancing same.

16. An assembly as claimed in claim 12, wherein the one reel has an axis and said one peripheral support comprises a post initially engaging the periphery of the one reel upon said initial reception thereof in a direction normal to the reel axis.

17. An assembly as claimed in claim 13, wherein the one reel has an axis, and including a second peripheral support, said first and second peripheral supports initially peripherally engaging said one reel upon said initial reception thereof in a direction normal to the reel axis, and at loci spaced about said axis from the locus of belt engagement with the tape on said one reel.

13. An assembly as claimed in claim 17, wherein said second support comprises a rotor having a land to project between flanges defined by said one reel to forcibly bow a leader into position between the

flanges in response to winding of the leader onto tape on said one reel, said rotor having annular peripheries to engage peripheries of said flanges, said flange peripheries subject to displacement out of engagement with said rotor annular peripheries during said one reel displacement into centrally supported position.

19. An assembly as claimed in claim 18, wherein said one support comprises a post located between said second support and the locus of belt engagement with the tape on said one reel, in a circular direction about the reel axis.

20. An assembly as claimed in claim 12, wherein said centering support means comprises a plunger, and there being actuating means to bodily advance and retract the plunger into and out of reel centrally supporting position.

21. An assembly as claimed in claim 20, wherein said actuating means comprises a lever operatively connected with the plunger, and structure supporting the lever to pivot in plunger advancing and retracting directions.

22. An assembly as claimed in claim 21, including a case for said assembly, said lever projecting free of the case for manual operation.

23. An assembly as claimed in claim 22, including a case for said assembly, the case having a closure, the lever operatively connected with the closure to advance the plunger into reel centering position in response to displacement of the closure to closed position.

24. An assembly as claimed in claim 21, including a latch located to block retraction of the plunger while tape is unwound from the one reel.

25. An assembly as claimed in claim 24, including a solenoid operatively connected with the latch to displace same to unblock retraction of the plunger, when tape is fully wound on the one reel, there being a lever operated switch to sense the position of the plunger for external control of the solenoid and tape drive circuits defined by the assembly.

26. An assembly as claimed in claim 21, including a switch actuated in response to reception of the one reel by the assembly to prevent WRITE circuitry associated with a tape WRITE head defined by the assembly from being inadvertently energised.

27. An assembly as claimed in claim 26, wherein said switch has an arm engageable with an annular ring carried by the reel at the plunger side thereof, and at a location offset from the reel axis.

28. An assembly as claimed in claim 26, wherein the switch has an arm engagable with a WRITE protect plug carried by the reel at the side thereof opposite the plunger, and at a location proximate the reel axis.

29. A tape transport assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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1561012 COMPLETE SPECIFICATION
7 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG. 1.

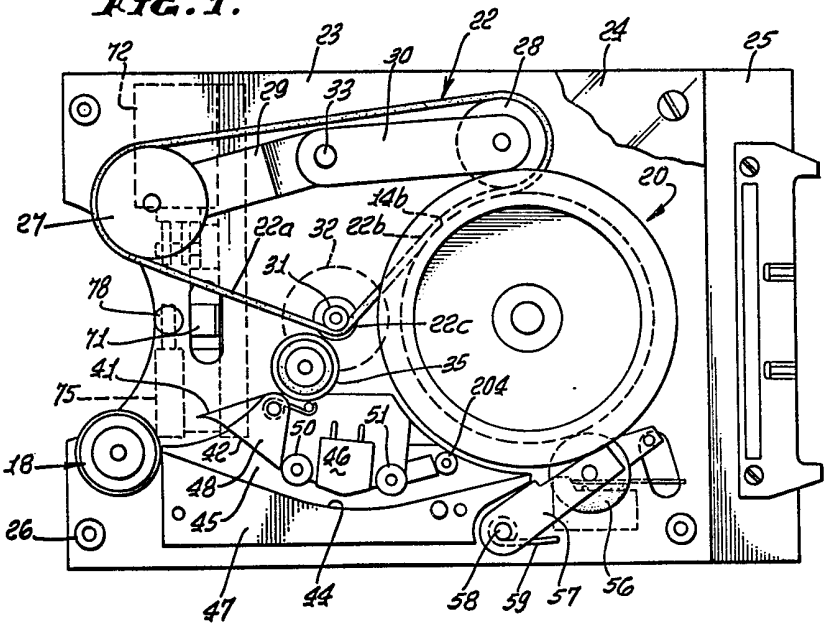


FIG. 2.

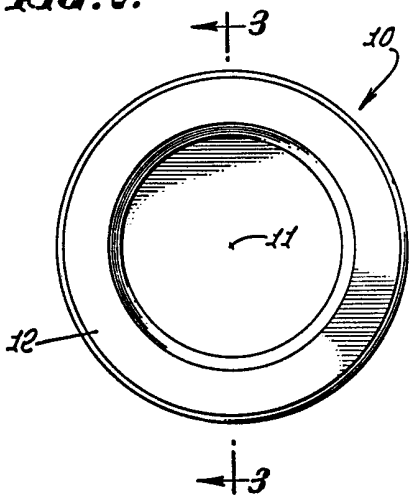
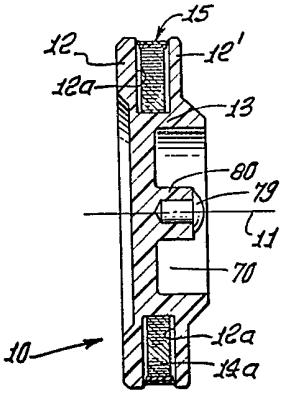


FIG. 3.



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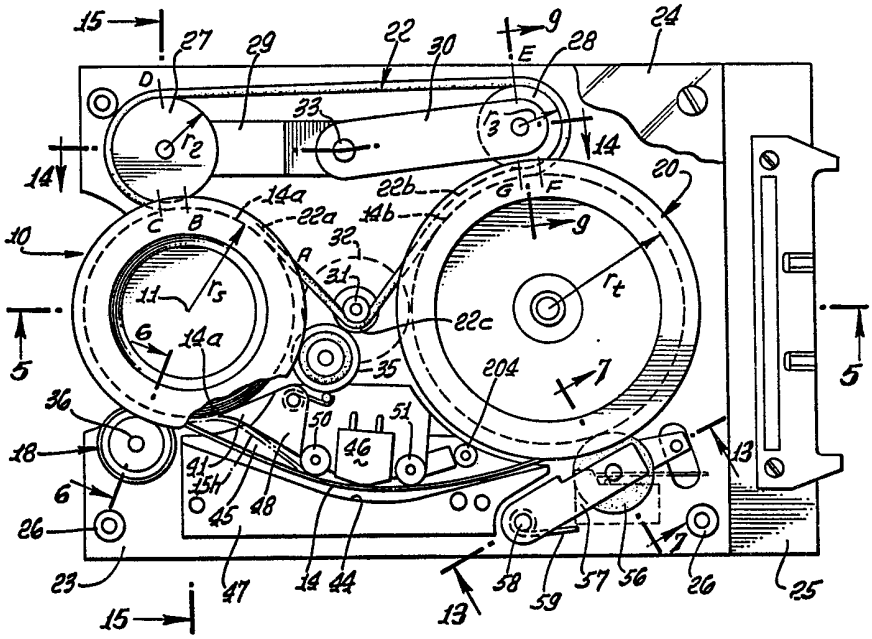
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E
28
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D
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r3
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14
20
22b
G
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22a
14b
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C
B
32
A
31
9
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r5
rt
6
14a
22c
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204
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FIG. 5.

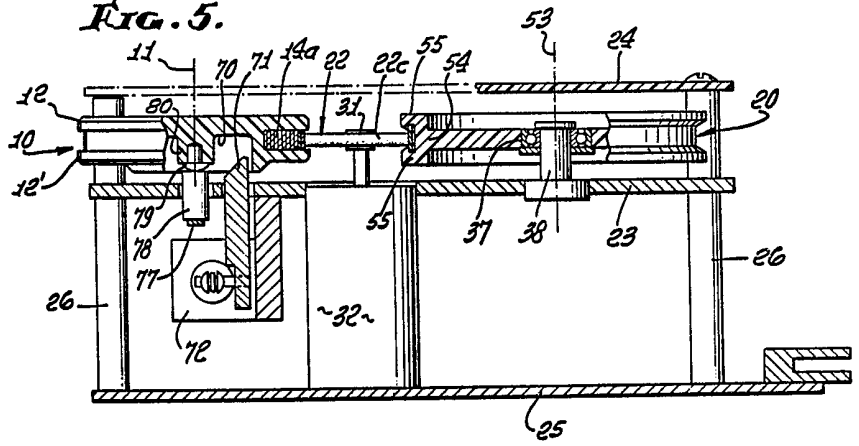
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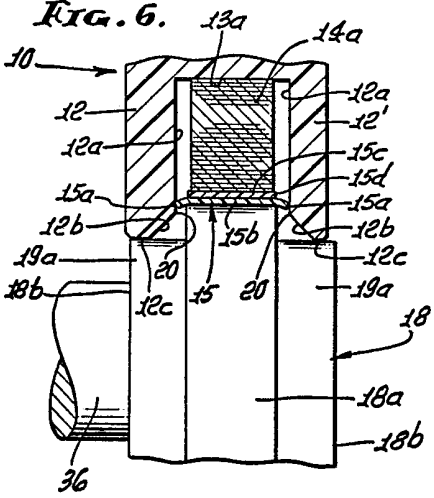
FIG. 6.



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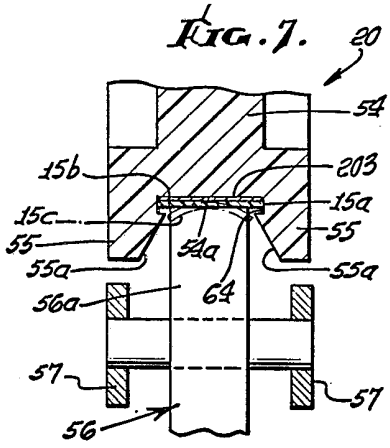
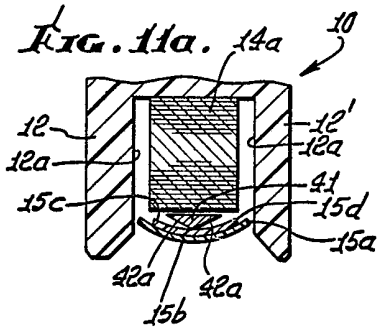


FIG. 11a.



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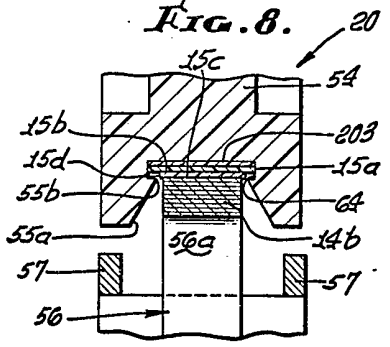


FIG. 11b.

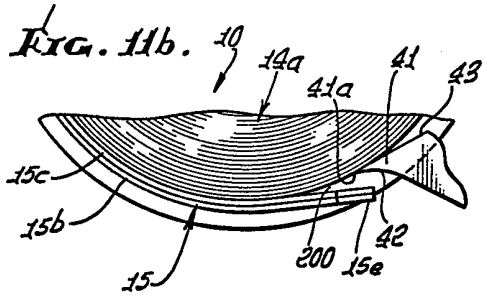
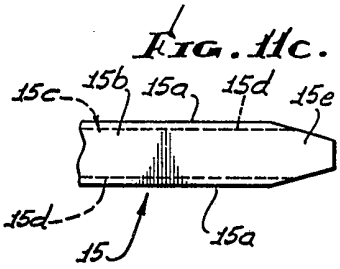


FIG. 11c.



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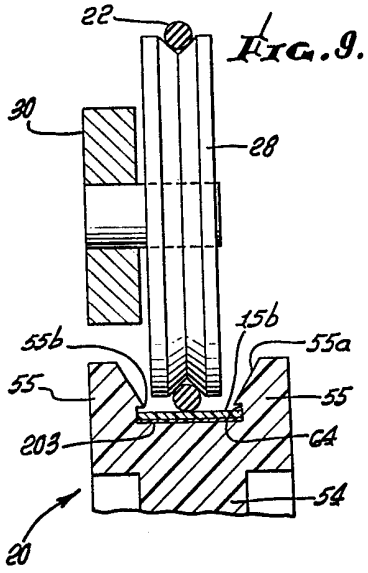
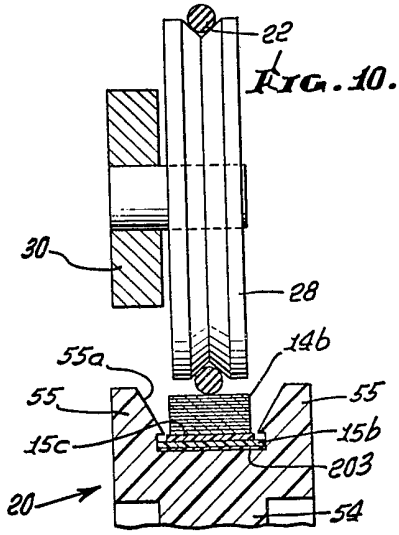


FIG. 10.



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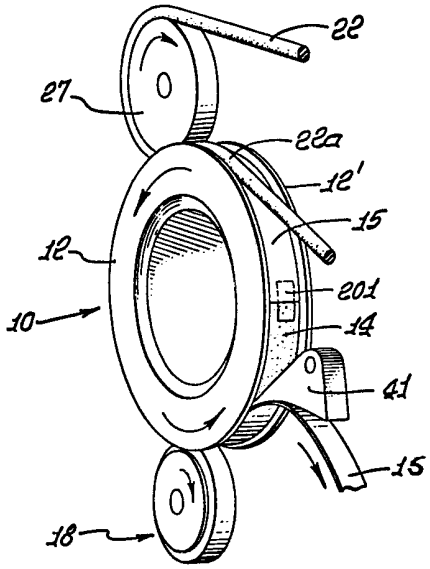


FIG. 12.

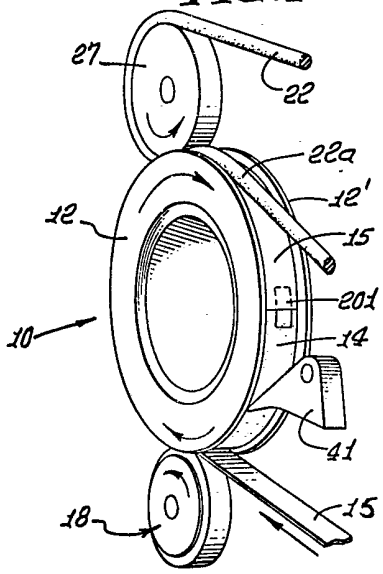
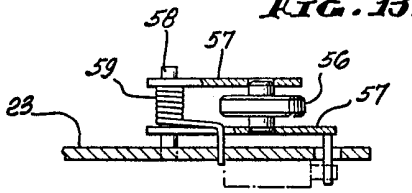


FIG. 13.



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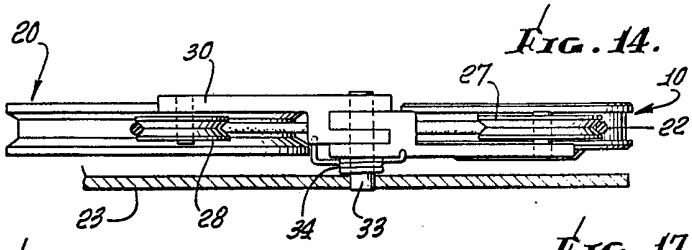


FIG. 15.

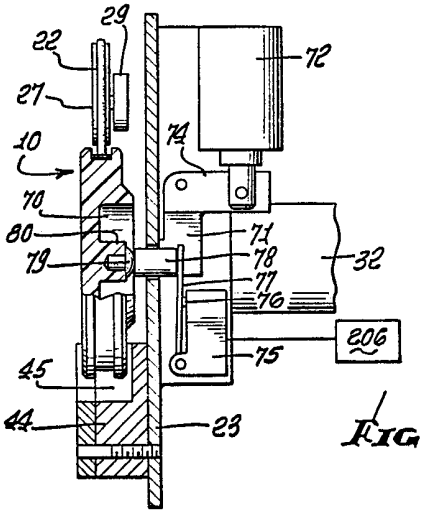
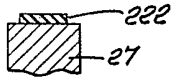


FIG. 17.

FIG. 18.



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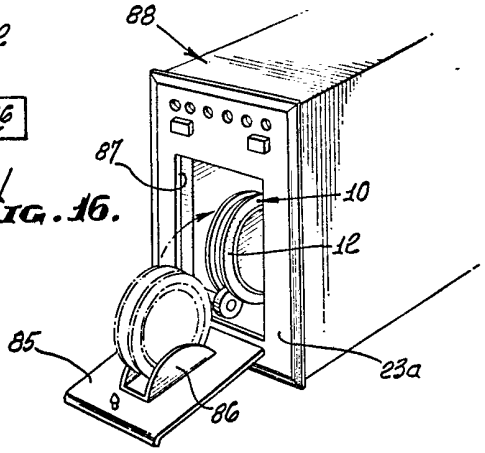


FIG. 19.

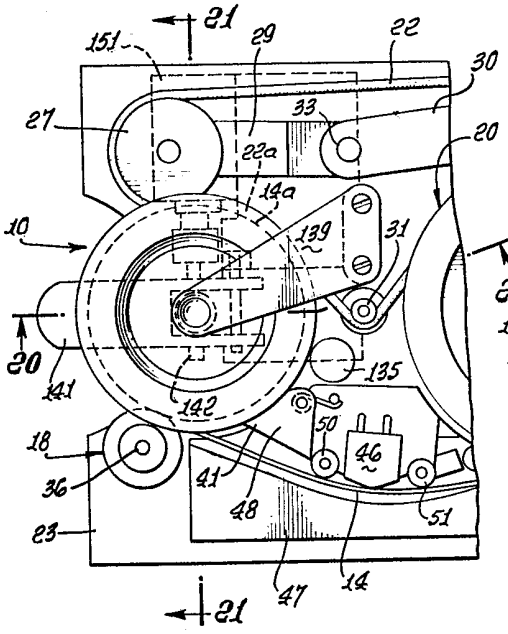


FIG. 21.

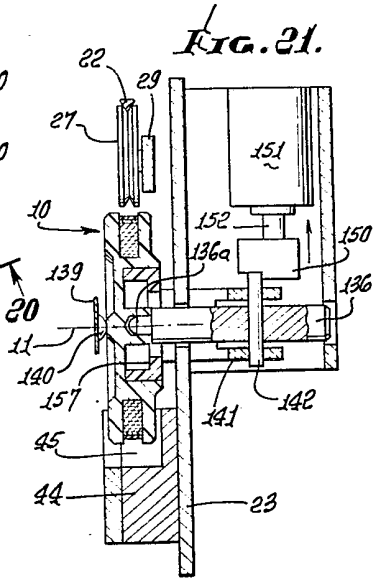
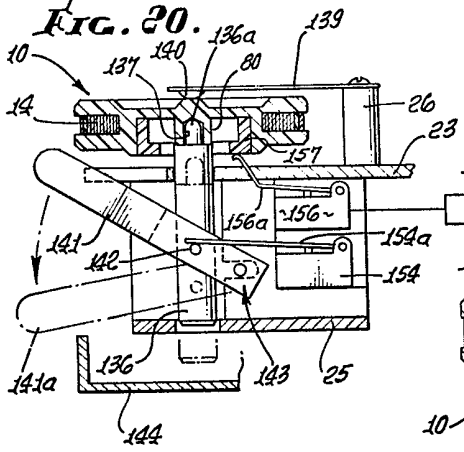


FIG. 20.



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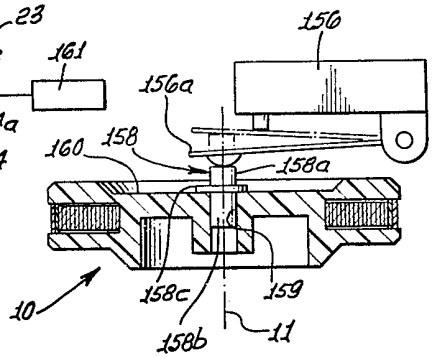

FIG. 22.

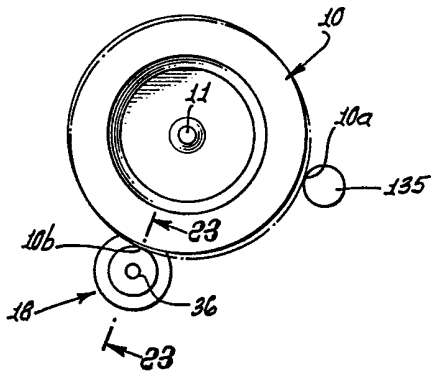

FIG. 23.

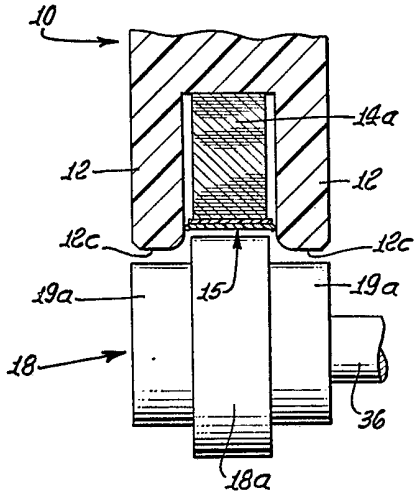

FIG. 24.