Aug. 3, 1965 J. W. SCHER 3,198,449

INCLINE ROLL MOVEMENT MACHINE

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FIG. 1

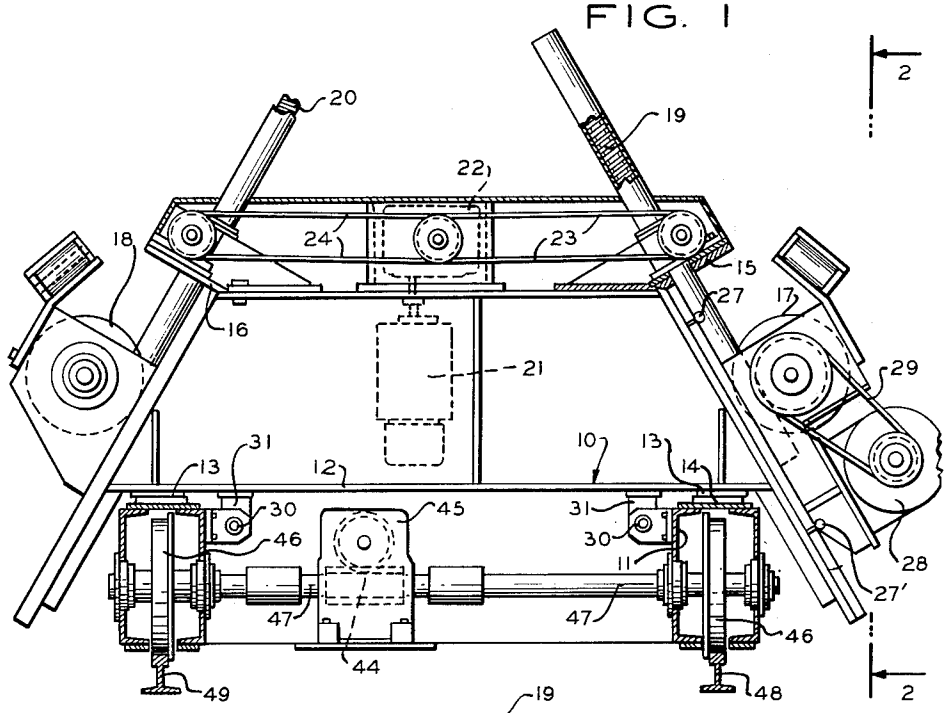
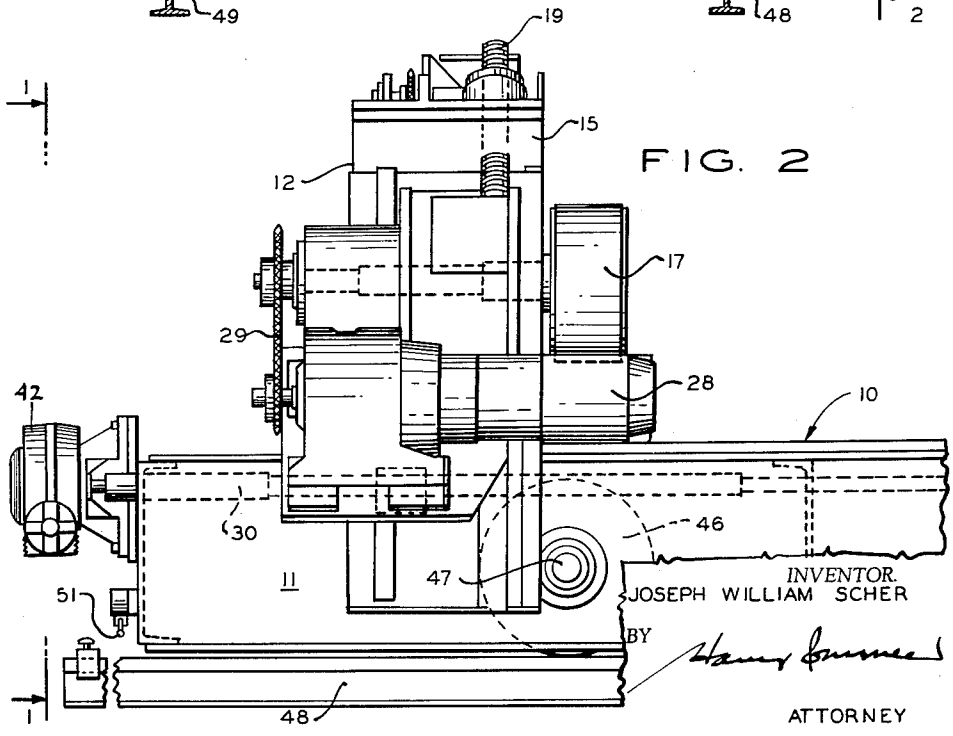


FIG. 2



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FIG. 3

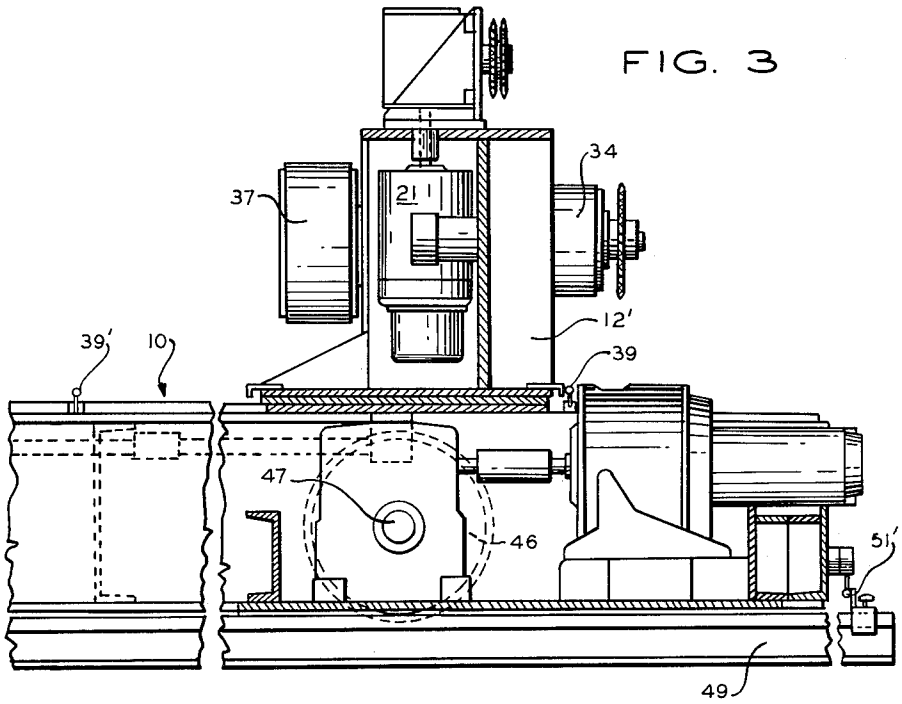
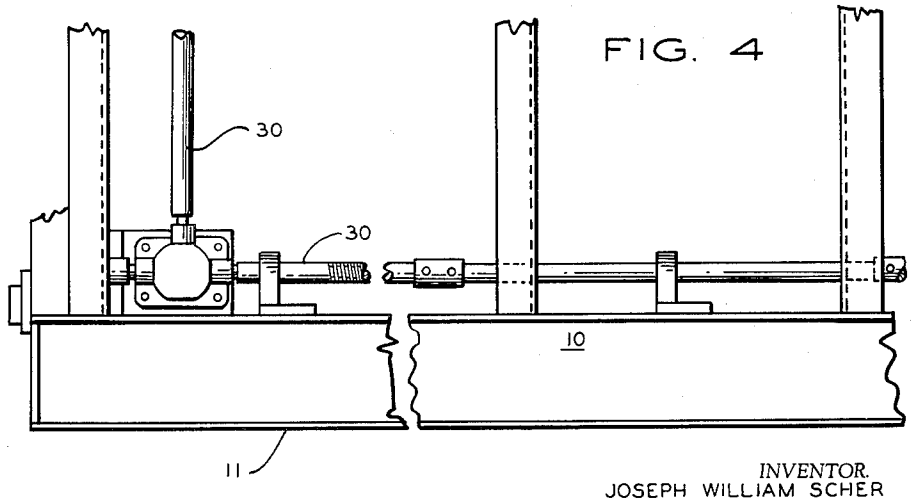


FIG. 4



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FIG. 5

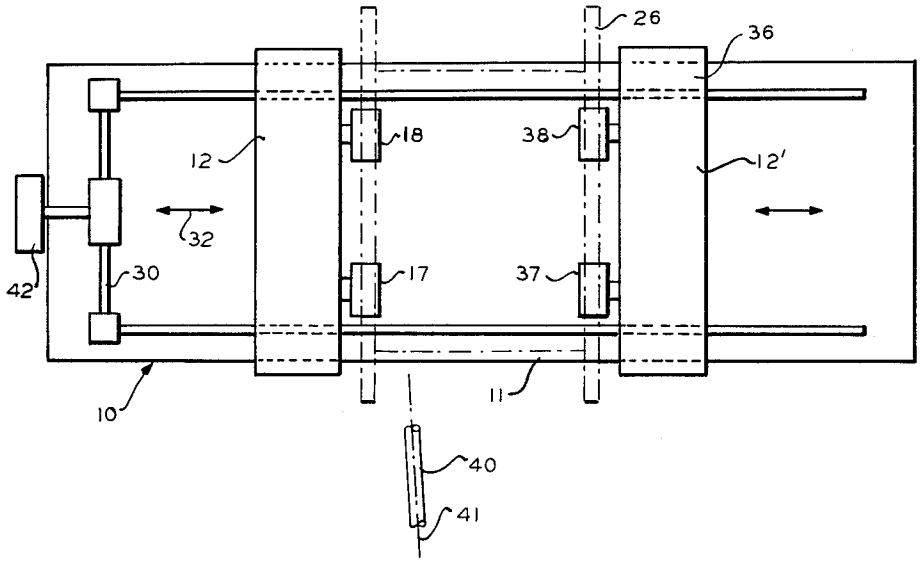
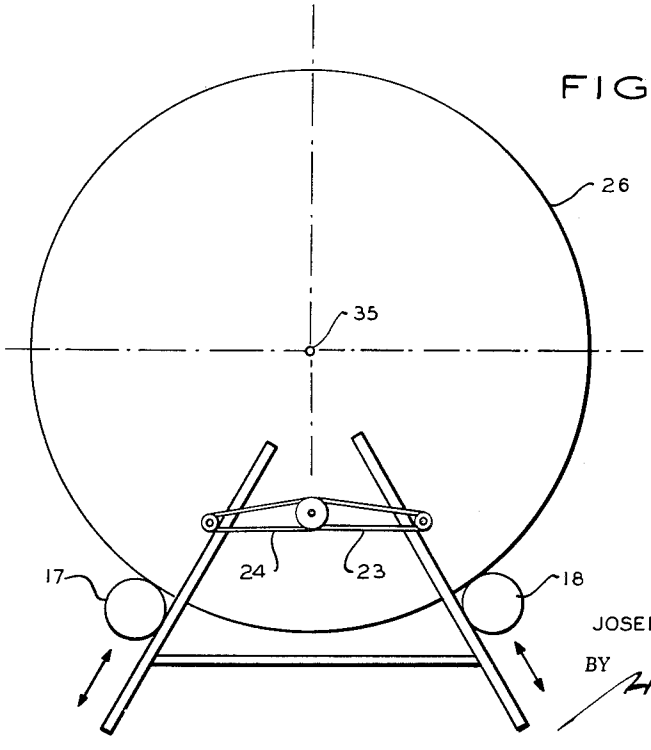


FIG. 6



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FIG. 7

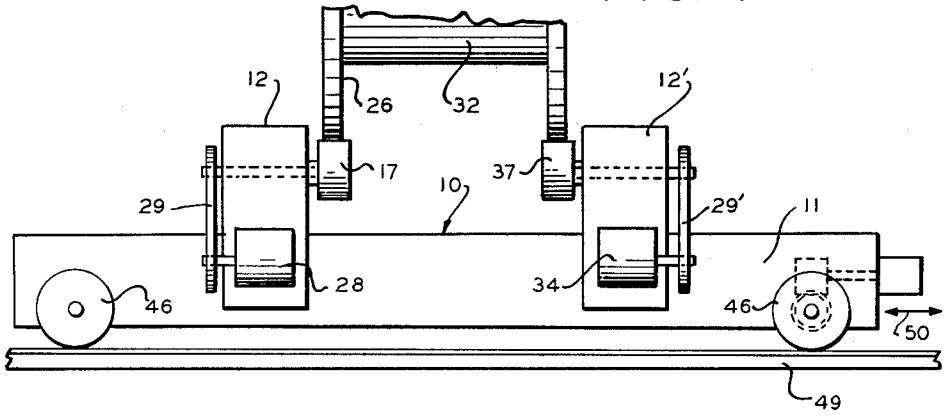
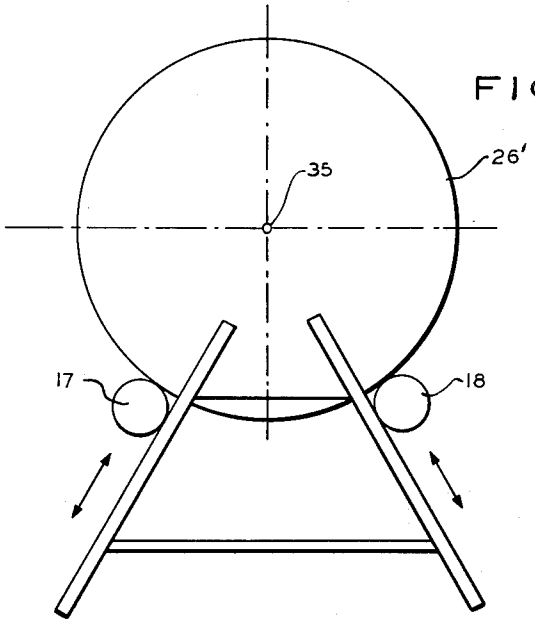


FIG. 8



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FIG. 9

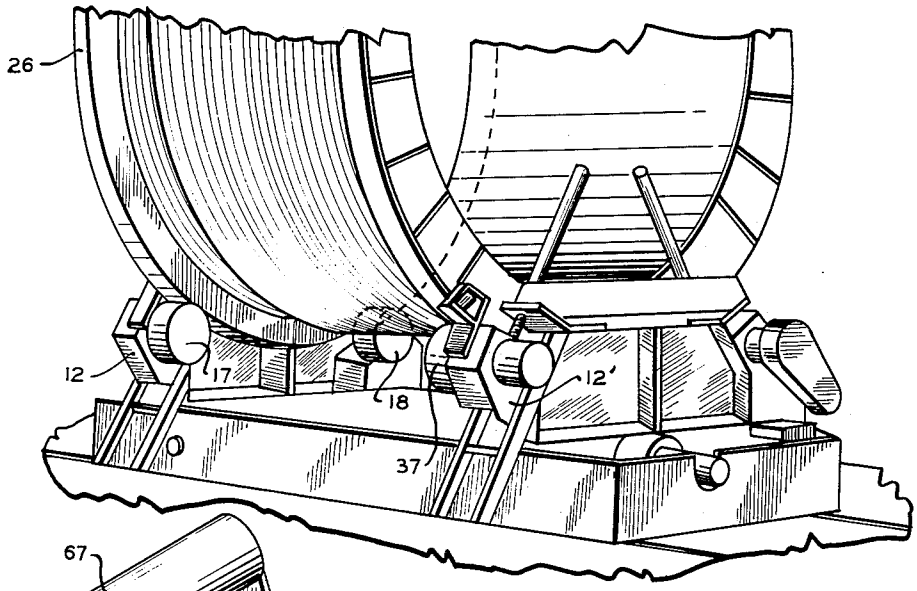


FIG. 10

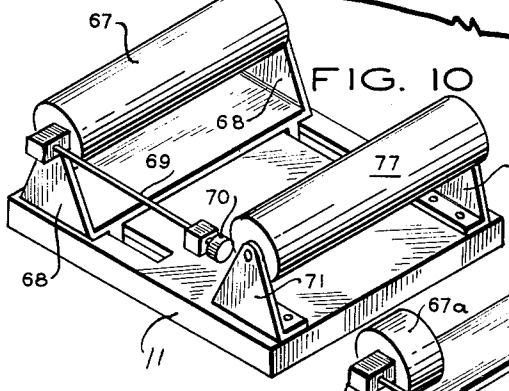


FIG. 11

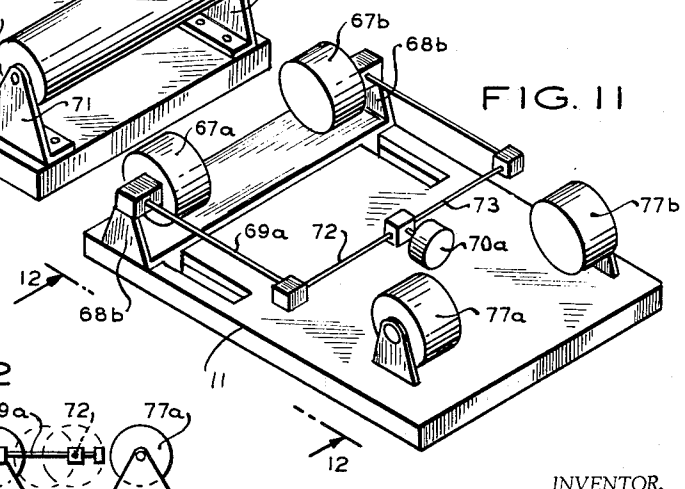
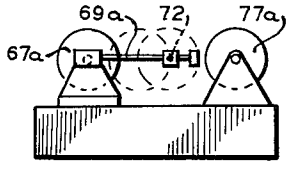


FIG. 12



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United States Patent Office 3,198,449 Patented Aug. 3, 1965

3,198,449

INCLINE ROLL MOVEMENT MACHINE

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Filed Apr. 15, 1964, Ser. No. 359,862
9 Claims. (Cl. 242—54)

This invention relates to reel-turning machinery of the class called roller and/or trunnion type of let-offs and take-ups. In such machinery reels of large diameter are used for winding material onto the reel (in the case of take-ups) or unwinding the material from the reel (in the case of let-offs) to perform manufacturing processes on the material or for other purposes. The unique features of the machines herein described and claimed are well adapted for use in connection with power and communication cables and equally well adapted for use in connection with reels for other purposes.

In all cases wherein reels are turned either to let-off material or to take-up material on a roller and/or trunnion type of machine, the driving force to turn the reel is applied to the reel flange by driving the rollers and/or trunnions. It is important that the center distance between the rollers and/or trunnions be of an optimum value in order to realize a high percentage of driving force transmitted to the reel flange for a given amount of torque being delivered by the rollers and/or trunnions, while still retaining a sufficient degree of stability, such that the reel will not "hop" out of the nest created by the rollers and/or trunnions. This optimum center distance dimension is a different value for every given reel diameter. As the center distance between the rollers and/or trunnions for a given size reel is increased, the magnitude of the force transmitted to the reel flange is a decreasing value. Conversely, the stability of the reel (its lack of inclination to "hop" out of the nest) is an increasing function with increasing roll and/or trunnion center distance. These two perimeters, plotted as a function of center distance, will intersect at a given value of roller and/or trunnion center distance, which is then the optimum value for that given reel diameter. Additionally, it is important in most cases (particularly in power cable manufacture) that the product be subjected to a minimal number of bends and that these which are unavoidable be of the least severity possible. This invention is intended to satisfy the requirements of optimum roller and/or trunnion center distance and to minimize bending of the product when using a variety of different reel sizes on the same machine.

In equipment of the general type herein referred to having a fixed roller and/or trunnion center distance, an optimum condition is achieved for one and only one reel diameter. The present invention includes the concept of moving one of the two rolls (or one set of trunnions) on a given machine relative to the other in order to adapt a single machine to changes of roller and/or trunnion center distance. In this manner, it is possible to obtain the optimum nesting condition (center distance between rollers and/or trunnions) for any given size reel that may be used on the equipment. Additionally, both rollers (and/or set of trunnions) may be moved simutaneously on an inclined angle relative to the physical center of the machine moving up relative to the floor as they are brought closer together. In this manner, on any given machine, it is not only possible pursuant to this invention to obtain the optimum nest (center distance between rollers and/or trunnions) for any given reel but the product will be subjected to a minimal amount of bending. Small diameter reels will require that the rollers and/or trunnions be closer together for optimum nesting and, in so doing with the inclined track of the rollers and/or trunnions, the O.D. of a small reel will be supported higher relative to the floor. In the case of a large diameter reel, the rollers and/or trunnions are further apart and the reel O.D. is nearer the floor. In so doing, the optimum nesting condition is achieved for any given reel O.D. and the mean position between the reel flange (O.D.) and the reel drum (I.D.) is maintained near the nominal center height of the process line and so minimizes bending of the product. By proper selection of ratios for reel flange diameter to reel drum diameter in regard to the various reels to be used on the equipment of this invention, it is possible to have optimum nesting for all reels and also to have the mean point between the reel flange and drum on each of the reels fall at the same height relative to the floor which is the height of the process line; thus the product will be bent the least in filling or emptying the reel.

An additional advantage accrues in moving the rollers and/or trunnions up an incline as they are brought closer together. In some cases it may be desirable (in the case of a take-up, for instance) to move the reel vertically as the reel is being filled in order to keep the line of approach of the material to the reel the same.

With the material being put on to the reel from the bottom, it would be desirable to move the reel vertically upward as the reel fills. By moving the rollers and/or trunnions up an incline, these desired conditions are achieved pursuant to this invention: The driving force transmitted to the reel becomes greater; this is highly desirable in order to overcome the greater weight (inertia) of the reel due to its being filled; the line of approach of the product to the reel is kept the same as the reel is being moved vertically upward in proportion to its being filled; the center distance between the rollers and/or trunnions becomes less; this ordinarily would result in a greater tendency for the reel to "hop" out; however, in the machine of this invention, this is compensated for by the greater weight of material on the reel, thus giving the reel greater stability.

The drawings, illustrating procedures and devices useful in carrying out the invention, and the description below, are exemplary only of the invention, which shall be deemed to cover all other devices and procedures coming within the scope and purview of the appended claims.

Ii the drawings, wherein similar reference characters indicate like parts:

FIG. 1 is an end elevational, partly sectional view of an incline roll movement machine embodying the invention, taken at line 1—1 of FIG. 2,

FIG. 2 is a side elevational partly fragmentary view thereof, taken at line 2—2 of FIG. 1,

FIG. 3 is a similar view of the opposite side of said machine,

FIG. 4 is a fragmentary plan view of the bed thereof,

FIG. 5 is a schematic top plan view thereof,

FIG. 6 is a schematic end elevational view thereof,

FIG. 7 is a schematic side elevational view thereof,

FIG. 8 is a schematic end elevational view thereof,

FIG. 9 is a fragmentary perspective view of a machine embodying the invention,

FIG. 10 is a perspective view of a modified form thereof,

FIG. 11 is a similar view of a further form of the invention, and

FIG. 12 is a side elevational view thereof, taken at line 12—12 of FIG. 11.

As shown in the drawings and presently described in greater detail, an important feature of the invention is to provide a roller and/or trunnion type of machine with adjusting means to move closer together or farther apart the two axes of the rollers and/or trunnions, the surfaces of said rollers and/or trunnions describing a circle and

the two axes appearing as a point when viewed in a plane perpendicular to that in which the rollers and/or trunnions are being adjusted while maintaining said two axes parallel to each other, i.e. when viewed as in FIGURE 1 of drawings, to adjust the center distance between the axes about which rollers and/or trunnions 17 and 18 rotate.

A further feature is the additional advantages gained, as previously described, by moving said rollers and/or trunnions on an incline rather than in a horizontal plane when adjusting their center distance.

As shown in the drawings, the machine of this invention comprises a frame 10 (FIG. 1), including a bed 11 and a carriage 12 on which the bed may be slidably disposed, as, for example, by providing the bed 11 with rail plates 14 (FIG. 1) slidably engaged by corresponding rail plates 13 of the carriage 12. A first pair of support bearings 15, 16 is provided in the machine and rollers 17, 18 are movably mounted on said bearings by suitable means such as through screw means 19, 20, which may be synchronously actuated by a motor means 21 which may (through gear box 22) drive belts 23, 24 for rotation of pinions mashing with said screw means 19, 20, to thereby move the rollers 17, 18 toward and away from the axis 35 (FIGS. 6 and 7) on which the cable reel or drum 26, FIG. 6 (26' FIG. 8) is disposed. By the arrangement described the rollers 17, 18 which engage the reel flanges circumferentially may be moved to precisely the position required to conform to the diameter of the particular reel in use, the screw means 19, 20 moving the rollers to precisely the desired position for contacting the particular reel circumferentially. To that end suitable switch or other control means may be provided for the control and actuation of reversible motor 21. Stop means such as shown at 27, 27' (FIG. 1) may be provided for disengaging the motor when the rollers have moved to predetermined limits of movement. A second pair of support bearings corresponding with and spaced from the first pair of bearings 15, 16 may be provided, mounted on a second carriage 12' (FIG. 3 and schematically shown in FIG. 5).

Preferably one of the rollers, such as shown at 17 in FIG. 1 for the first set, is rotated by suitable motor means 28 of the first set of rollers 17, 18 and similarly motor means 34 (FIGS. 3 and 7) may be provided for rotating driving roller 37 of the second set of rollers 37, 38 (FIG. 5). The first set of bearings 15, 16 are fixed to or unitary with the first carriage 12 and thus slide therewith on the rail bed 11; the corresponding second set of bearings 37, 38 are similarly fixed to or unitary with the second carriage 12' (FIG. 3) which is also slidably mounted on the bed 11.

In operation of the device the reel 26 (FIGS. 5–7), 26' (FIG. 8) engaged by the first and second sets of rollers (17–18 and 37–38, FIG. 5) is preferably driven by driving rollers 17 and 37 which may be driven by separate motor means (28, 34, FIGS. 1 and 7); the idler rollers 18, 38 of the first and second sets of rollers respectively have idler engagement with the reel or drum flanges (FIG. 5). The motor means 28 (FIG. 1) and 34 (FIGS. 3 and 7) may be coupled with the roller and/or trunnions to be driven thereby by suitable belt, chain or other means as shown at 29, 29' (FIGS. 1 and 7), pursuant to the invention, for the purpose of imparting torque or driving force of the reel 26 (FIGS. 5–7) or 26' (FIG. 8) for the purpose of turning said reel to take-up the cable or let-off the cable from the reel. Achieving the relative adjustment of the position of the rollers and/or trunnions to conform to the specific diameter of the reel to be actuated by the device of this invention is accomplished by motor means 21 driving thru gear box 22, belts 23, 24, rotating pinions meshing with screw means 19, 20 to move rollers 17, 18 in housing along the incline slides (FIG. 1) which is typical on both carriages 12, 12'. The driving rollers 17, 37 of the first and second sets of rollers are (FIG. 5) preferably disposed in parallel relation along one of the sides of the bed 11; the idler rollers 18, 38 are similarly disposed in parallel relation along the other side of the bed. Means are provided, pursuant to the invention, for relative movement of the carriages 12, 12' toward and away from each other to thereby adjust the device to use in connection with reels of varying widths or axial lengths. Any suitable means may be provided for this purpose. Exemplarily, as shown in FIGS. 2 and 5, reversible motor means 42 (FIGS. 2 and 5) may be provided, for driving a screw or other actuator 30 engaging (FIG. 1) internally threaded bearings 31 fixed to the first carriage 12 and (FIG. 5) corresponding internally threaded bearings 31' fixed to the second carriage 12', so that, on rotation of motor 42 in one direction, the carriages 12, 12' will be moved apart, and on rotation of the motor in the other direction, will move toward each other, thus enabling the first and second sets of rollers 17, 18 and 37, 38 to be spaced apart precisely to the extent required to conform to the width 32 (FIG. 7) of the reel, in a rapid and facile manner. Suitable stop means 39, 39' (FIG. 3) may be provided to deactivate motor 42 when the carriages 12, 12' have been moved to predetermined extreme limits of movement.

Means are provided for movement of the entire bed 10 of the carriage assembly (and reel) so that (FIG. 5) as cable 40 is let off or taken up, the reel may be moved to maintain the let off or take up axis 41 of the cable constant. To that end, wheels 46 may be added to the bed 11 (FIGS. 7, 1 and 2) mounted on axles 47, the axle of at least one wheel being rotated by motor 45 (FIG. 1) through a gear train 44 or other transmission means to thereby drive the assembly 10 along the rails 48, 49 (FIG. 1) to the right or left positions when viewed as in FIG. 7 and therein indicated by the arrow 50. Suitable stop means 51 (FIG. 2, 51' FIG. 3) may be provided to inactivate the motor 45 at predetermined extremes of movement of the assembly and the motor 45 may be controlled by any suitable switch or other means.

The planes defined by the axes of movement of the rollers 17, 18 preferably intersect at the axis 35 of the wire reel 26 (FIG. 6) to define an included angle of substantially 45 degrees; thus the rollers will always engage reels supported thereon circumferentially at the 45 degree angle notwithstanding variations in diameters of the reels, said rollers moving along the 45 degree angle toward and away from the axis 35 of the reel, providing a constant angularly uniform and ideal torque arrangement.

While I have shown (FIGS. 7 and 5) and described a pair of rollers 17, 37 engaging the reel 26 circumferentially at one side of the machine, and a pair of rollers 18, 38 likewise engaging the reel, at the other side of the machine. An elongated single roller may be formed to conform to the diameters and spacing of rollers 17–37, and a like single roller may be formed to conform to diameters and spacing of rollers 18–38, as shown in FIG. 10, wherein the roller 67 is shown rotatably journalled in bearings 68 which in turn are movably mounted on the bed 11 and means 69 (which may be comparable with the screw means shown at 19–20 in FIG. 1) engage the bearings 68 and may be actuated by a reversible motor 70, controlled by the operator as through suitable switch means (not shown) for movement of the roller 67 toward and away from roller 77; the latter is an idler roller journalled in bearings 71 fixed to the bed 11. If desired, instead of a single trunnion or roller 67 a pair of trunnions or rollers 67*a* and 67*b* may be provided (FIG. 11) in which case, instead of the single screw 69 meshing with the internally threaded bearing 68, bearings 68*a*, 68*b* are meshed with and move along the screws 69*a*, 69*b* when the latter are rotated in synchronism by the gear means 72, 73 driven by the armature shaft of motor 70*a*. A second pair of rollers or trunnions 77*a*, 77*b* may be provided in place of single roller 77 and rotatably mounted in bearings 71*a*, 71*b*, is fixed to bed 11. While the arrangement shown in FIGS. 10 and 11 has the advantage of movement of a roller or set of rollers toward another in order

to compensate for variations in diameters of the reel to be driven, the torque advantages of the form of invention shown in FIGS. 1 and 5 are not attained thereby; thus the form of invention shown in FIGS. 1 and 5 may be preferred for many applications, particularly to attain the novel constant torque value attained thereby.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an incline roll movement machine for turning a cable reel disposed on a given axis, a machine frame, a pair of support bearings disposed on said machine frame on each side of a center line thereof in spaced relation and each pair having axes angularly inclined toward each other, rollers on said bearings, one roller of each pair being movably positioned along the axis of the respective support bearing for movement relative to the reel axis, means for positioning the movable rollers according to the diameter of the reel to be circumferentially engaged and means for rotating one of said rollers to thus rotate the reel.

2. In an incline roll movement machine for turning a cable reel as set forth in claim 1, the other roller of each pair being movably positioned on the other support bearing for movement therealong relative to the reel axis to adjust the position of said roller according to the diameter of the reel and for engagement of the reel circumferentially by the roller and means for moving said other rollers.

3. In an incline roller movement machine for turning a cable reel disposed on a given axis, a frame having spaced parallel sides and a pair of support bearings on each side of the center line of said frame disposed angularly relative to said sides with said bearings of each pair directed toward each other, and a roller rotatably positioned on each of said support bearings, one of said rollers of each pair being translatable for movement along its bearing and relative to the reel axis, and means for positioning the translatable rollers according to the diameter of the reel to be circumferentially engaged.

4. In an incline roll movement machine for turning a cable reel as set forth in claim 3, means engaging the first and second pairs of bearings for adjusting the spacing therebetween according to the width of the reel.

5. In an incline roll movement machine for turning a cable reel as set forth in claim 3, a second roller of each pair of bearings being also movably positioned on its respective support bearing for movement along its bearing relative to the reel axis and means to adjust the position of said second rollers according to the diameter of the reel to be engaged thereby.

6. In an incline roll movement machine for turning a cable reel as set forth in claim 3, means for rotating one of the rollers to thus rotate the reel.

7. In an incline roll movement machine for turning a cable reel as set forth in claim 3, means for rotating one of the rollers of each pair of support bearings to thus rotate the reel.

8. In an incline roll movement machine for turning a cable reel as set forth in claim 3, means for moving said machine to thereby move the rollers and reel engaged thereby as the cable is coiled and uncoiled relative to the reel.

9. In an incline roll movement machine for turning a cable reel as set forth in claim 3, wherein the means for moving the rollers comprises motor driven means on said bearings engaging the rollers to move the latter axially of the bearings and means to drive the motor driven means.

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MERVIN STEIN, *Primary Examiner.*