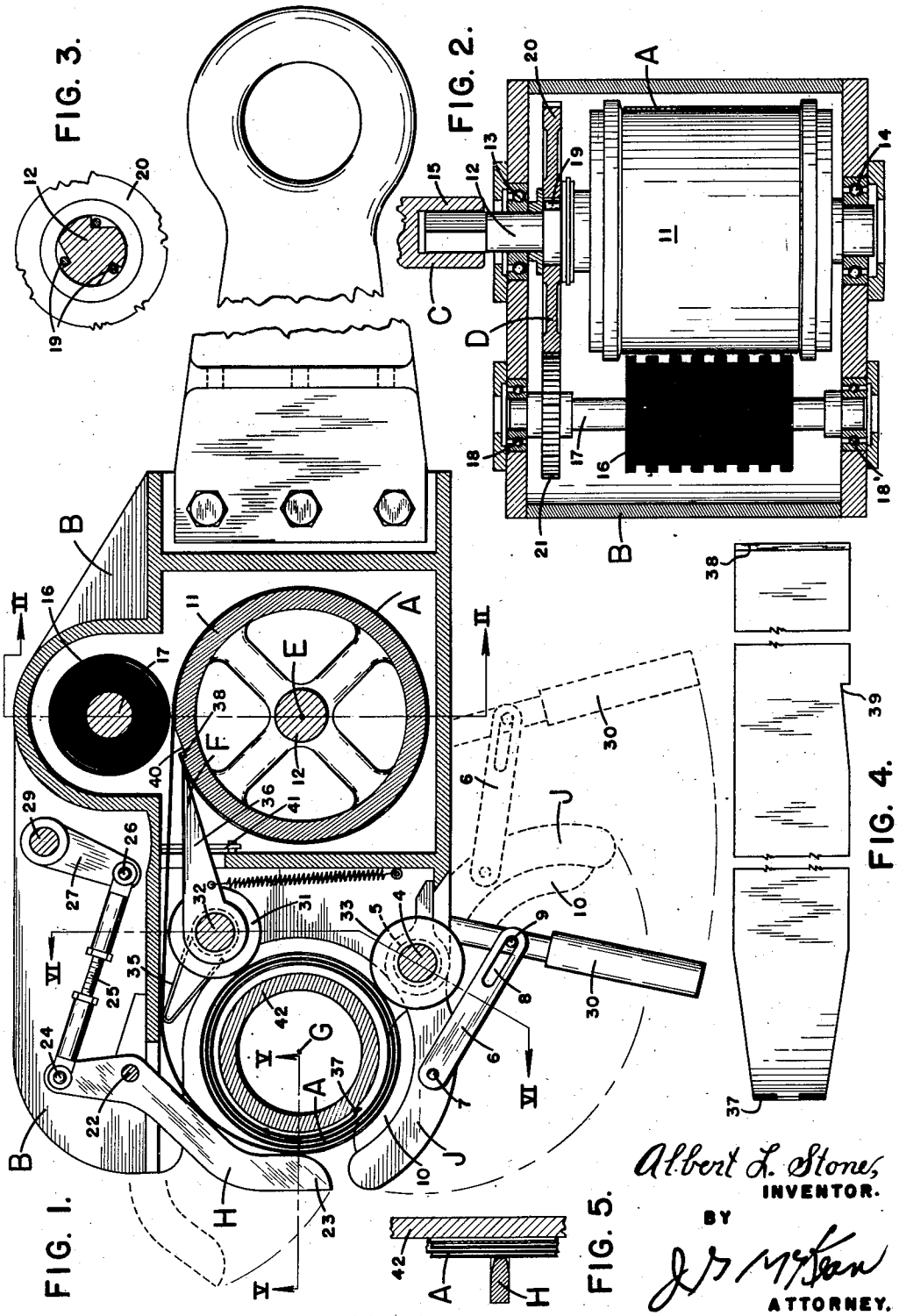
Jan. 15, 1952 A. L. STONE 2,582,724

PIPE SPINNER

Filed March 30, 1949 4 Sheets-Sheet 1



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PIPE SPINNER

Filed March 30, 1949 4 Sheets-Sheet 2

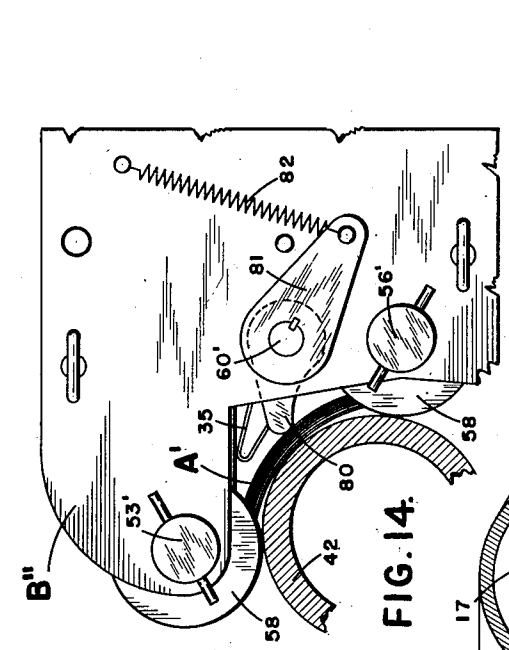


FIG. 14.

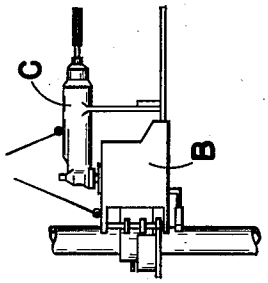


FIG. 7.

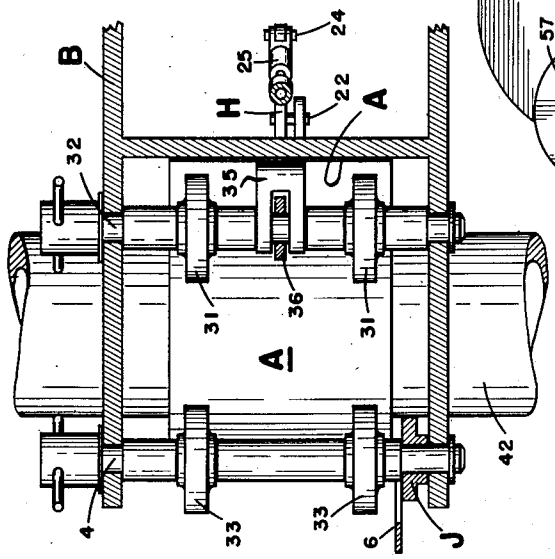


FIG. 6.

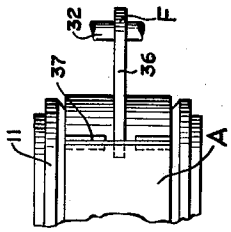
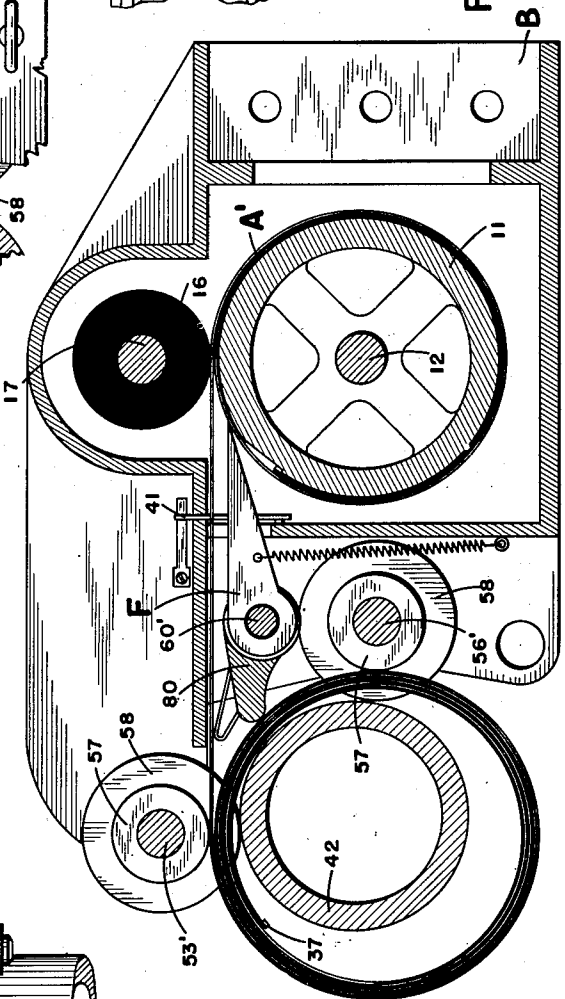


FIG. 16.

FIG. 13.



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Jan. 15, 1952 A. L. STONE 2,582,724

PIPE SPINNER

Filed March 30, 1949 4 Sheets-Sheet 3

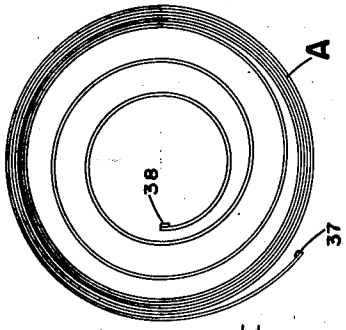


FIG. 8.

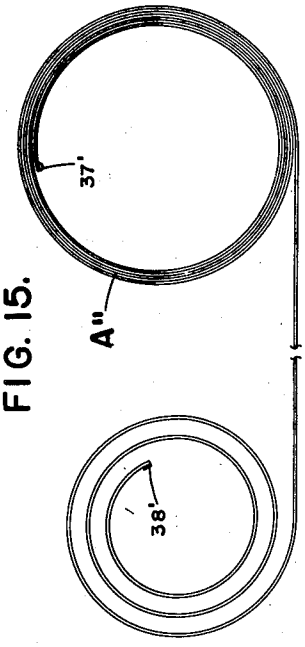


FIG. 15.

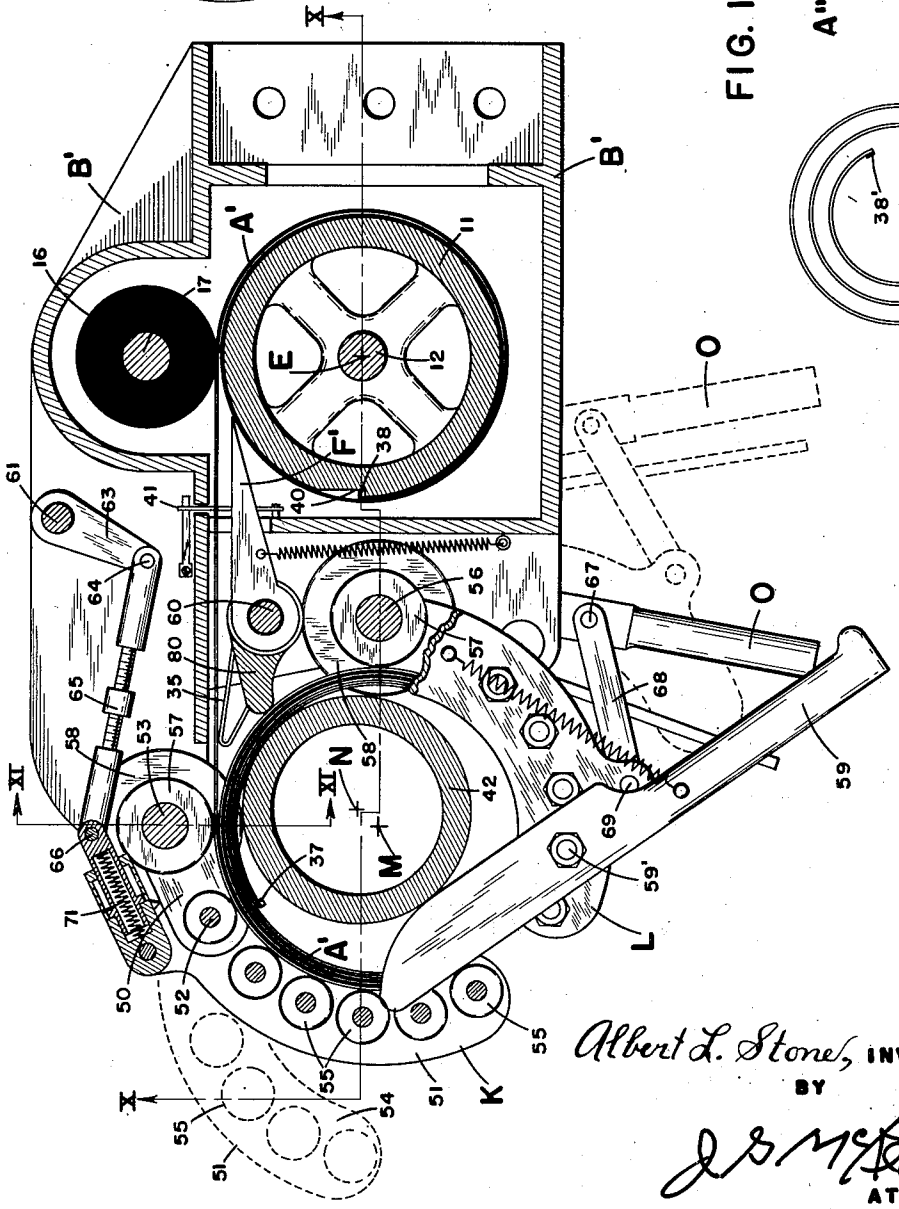


FIG. 9.

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Jan. 15, 1952 A. L. STONE 2,582,724

PIPE SPINNER

Filed March 30, 1949 4 Sheets-Sheet 4

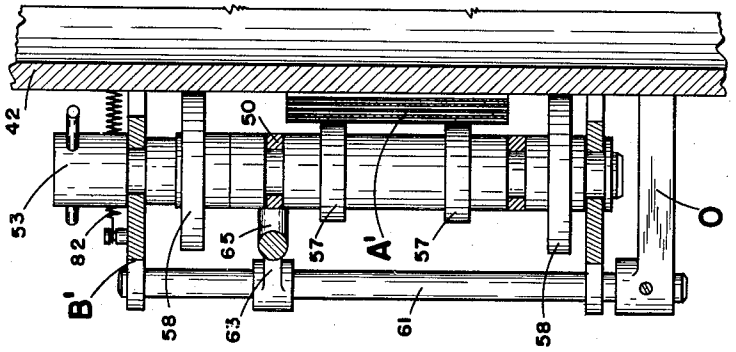


FIG. 11.

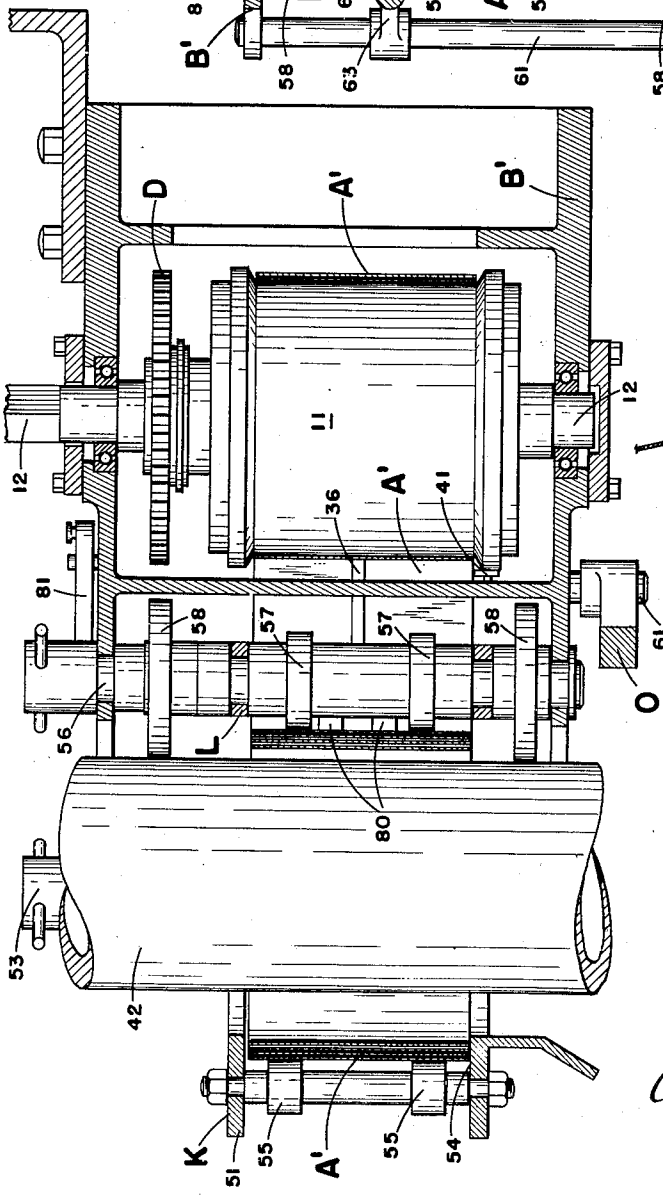


FIG. 10.

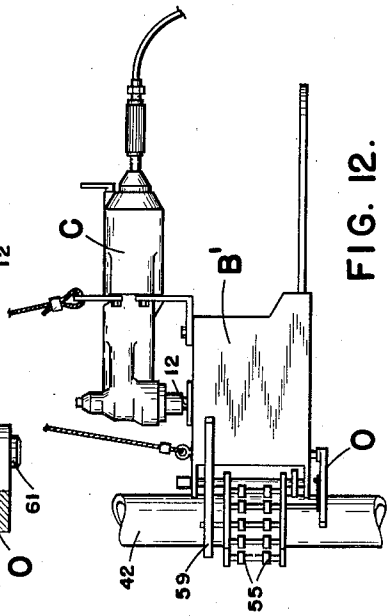


FIG. 12.

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Patented Jan. 15, 1952 2,582,724

UNITED STATES PATENT OFFICE

2,582,724

PIPE SPINNER

Albert L. Stone, Redondo Beach, Calif., assignor, by mesne assignments, to Standard Oil Development Company, Elizabeth, N. J., a corporation of Delaware

Application March 30, 1949, Serial No. 84,436

13 Claims. (Cl. 255—35)

1

This application is directed to a pipe spinner.

It is ofttimes necessary to rotate or spin a cylindrical member about its longitudinal axis. An example of such an operation is in the spinning of sections of pipe making up the drill stem used for drilling boreholes by the rotary method.

The present application is directed to a spinner for spinning cylindrical members and particularly sections of pipe, the spinning motion being given to such cylindrical members without deforming the outer surface thereof and requiring only relatively small amounts of power.

Other objects and advantages of the present invention may be seen from the following description taken in conjunction with the drawing in which

Fig. 1 is a top view, partly in section, showing an embodiment of the present invention;

Fig. 2 is a view taken along the line II—II of Fig. 1;

Fig. 3 is a fragmentary view showing details of construction of a portion of the device in Figs. 1 and 2;

Fig. 4 shows portions of a part of the device of Figs. 1 and 2 removed from the remainder thereof in order to show details more clearly;

Fig. 5 is a view taken along the line V—V of Fig. 1;

Fig. 6 is a view taken along line VI—VI of Fig. 1;

Fig. 7 is an elevation of the embodiment shown in Figs. 1 to 6;

Fig. 8 is a top view of the spring member of Fig. 4 in the coiled shape it naturally assumes;

Fig. 9 is a top view, partly in section, of another embodiment of the present invention;

Fig. 10 is a view taken along line X—X of Fig. 9;

Fig. 11 is a view taken along line XI—XI of Fig. 9;

Fig. 12 is an elevation of the embodiment shown in Figs. 9 to 11;

Fig. 13 is a top view, partly in section, of another embodiment of the present invention;

Fig. 14 is a fragmentary top view of the embodiment of Fig. 13 showing parts which were removed from the device in Fig. 13;

Fig. 15 is a top view of another embodiment of the spring member in the shape it naturally assumes with each end coiled and the coils connected by a straight portion; and

Fig. 16 is a fragmentary view showing the relation of the pick up finger and the spring A.

Turning now specifically to the drawing and first to the embodiment of Figs. 1 to 8, a leaf spring A preformed into a clock spring-type coil is mounted in frame B. A prime mover C, which

2

is shown in the drawing as a compressed air motor, is mounted on frame B. A driving assembly D is mounted on frame B and mechanically linked to motor C for winding and unwinding the spring A about an axis E. A guide means F is mounted on frame B arranged to slide between the end of the spring and the coil adjacent thereto when unwinding the spring about axis E whereby the spring may be allowed to form into a coil having an axis G. Finger H and door J are mounted on frame B.

Driving assembly D consists of a drum 11 mounted on a shaft 12 which, in turn, is carried by upper bearing assembly 13 and lower bearing assembly 14. The end of shaft 12 is coupled to the drive shaft 15 of prime mover C.

A flexible roller 16 which preferably is formed of rubber is mounted on shaft 17 which, in turn, is mounted on upper bearing assembly 18 and lower bearing assembly 18'. Roller 16 is designed so that either it or drum 16 is separated from spring A when only one thickness of the spring is between it and drum 16 and to remain in frictional contact with spring A when two or more thicknesses of the spring are between drum 11 and roller 16. The axis of roller 16 is fixed, hence it must deform as the number of thicknesses wrapped on drum 11 is increased or decreased. in order to allow roller 16 to deform readily it is preferable to form it with a plurality of circumferential grooves as shown in Fig. 2.

Roller 16 is mechanically coupled to shaft 12 through an overridding clutch 19, gear 20 and gear 21, which latter gear is keyed to shaft 17. This means for coupling shaft 17 to shaft 12 is proportioned so that the roller 16 is driven at a faster rate than drum 11 when the drum is rotated in the direction to unwind spring A from axis E, that is, in a counterclockwise direction when looking down on spring A as in Fig. 1. However, overriding clutch 19 disengages shaft 17 from shaft 12 when rotating the shaft in the opposite direction to wind spring A around axis E, that is, when rotating shaft 12 in the clockwise direction as when looking down upon it in Fig. 1.

Guide assembly F is mounted on frame B and arranged to slip under the tip of spring A upon rotating the spring to unwind it, that is, in the counterclockwise direction in the view of Fig. 1. Assembly F guides the end of the spring so that it uncoils from axis E and forms a second coil around axis G. Door J is provided with a bottom shelf member 10 which is adapted to support the lower edge of spring A when it is being coiled about axis G to prevent it from sagging.

Finger H is mounted on frame B by means of

pivot 22 with its freely movable tip arranged to guide spring A in a coil being designated as 23 and its other end provided with a hole for receiving pivot 24 which connects it to link 25 which, in turn, is connected through pivot 26 to lever arm 27. Lever arm 27 is secured to shaft 28 which is carried by frame B and free to turn therein. Hand lever 30 is also secured to shaft 28.

Door J is arranged to swing on rod 4 which is secured to frame B. A spring 5 is arranged to bias the door J to a closed position. A link 6 has one end secured to door J through pivot 7 and the other end provided with a slot 8 adapted to receive a pin 9 secured to hand lever 30. The linkages connecting finger H and door J to hand lever 30 thus allow movement of hand lever 30 to be transmitted to finger H so that finger H is opened or closed by movement of hand lever 30. However, door J is only opened by hand lever 30. When the hand lever is moved to close finger H, pin 9 moves freely in slot 8, the closing of door J being accomplished by spring 5 which exerts a substantially constant bias on spring A as its outside diameter decreases during the spinning operation.

Idler rollers 31 are mounted on post 32 which is fixed to frame B. Idler rollers 33 are mounted on rod 4 which is fixed to frame B. Guide means F consists of a spring finger 35 mounted on post 32 and guide member 36 also mounted on post 32.

Spring A is shown removed from frame B and straightened out in Fig. 4, and removed from the frame and allowed to assume its natural coiled shape in Fig. 8. For convenience end 37 is designated the pickup tip and end 38 the driving end. Notch 39 is spaced a predetermined distance from end 38.

The preferred preformed shape of spring A is shown in Fig. 8. The outer coils should have a diameter somewhat greater than the pipe to be spun so that the spring will readily slip on the pipe when the spring is being coiled on or when being removed from the pipe. At least the first coil of the spring adjacent driving end 38 should be of such diameter as to engage drum 11 snugly.

As seen in the drawing, tip 37 of spring A is thicker than the body of the spring. In manufacturing the device, this end portion may be a round file brazed to the end of the spring and ground away at its center section where the pickup finger operates. Thus, in effect (see Fig. 4), the spring is provided with two spaced pipe gripping members with a space between them at the center section of the spring. The additional thickness of pickup tip 37 insures that guide means F will pass under the end of the spring when it is to be uncoiled. The manner in which guide member 36 of guide assembly F passes under the end of spring A at its center section where the tip 37 is ground away is shown in Fig. 16. The thickened end also tends to hold to the pipe 42 when the direction of rotation of drum 11 is reversed to wind the spring on the drum, thereby assisting in tightening the spring on the pipe preparatory to spinning the pipe without undesirable slippage of the spring. End 37 is also preferably treated to reduce slippage on the pipe. Illustrative examples of how this may be done are by using a round file for this member, as described previously, or by cementing strips of emery cloth to the inside of the coil.

Driving end 38 of spring A is also thicker than the body of the spring. In manufacturing the device, one method of forming this thickened portion is by welding a bar to the end of the spring. Driving end 38 fits into a keyway 40 of drum 11. It will be seen that keyway 40 has one radial edge and one beveled edge. As the coil A is being unwound, when all but the last coil is unwound from the drum, end 38 will slide along the beveled edge of notch 40, thus permitting drum 11 to continue to rotate without further unwinding the spring. When the direction of rotation of drum 11 is then reversed, driving end 38 will catch in keyway 40, starting the spring to wind on the drum, even though there is no frictional contact between roller 16, drum 11 and spring A at this time. And after two and more thicknesses of spring are wound between drum 11 and roller 16, so that there is frictional contact, the engagement of driving end 38 in keyway 40 keeps the inside coil of the spring tight on drum 11.

It will be seen that it is not necessary to stop drum 11 at any critical point either when feeding out the spring A for engagement with the drill pipe or when coiling it back in its original position. Although normally the spacing between drum 11 and roller 16 prevents further unwinding of spring A when a single coil remains on the drum, it is possible for the spring to buckle and make such contact that all the spring is fed from the drum. To insure that the driving end 38 is kept in contact with drum 11, a notch 39 is formed in the spring, and a latch 41 is mounted on frame B. When latch 41 engages with notch 39, no more of the spring may be unwound from drum 11.

The arrangement of notch 39 and latch 41 allows a predetermined length of spring to be unwound from and rewound on drum 11. Usually it will be desirable to space notch 39 such a distance from driving end 38 that a single coil of spring A remains on drum 11 when latch 41 engages with the notch.

When using the embodiment of Figs. 1 to 8 for spinning pipe, the spring A will initially be coiled around axis E for engaging the spring with the section of pipe to be spun, door J and finger H will be opened by moving hand lever 30 to the position shown by dashed lines and the spinner placed on the pipe 42 so that the axis of the pipe will substantially coincide with axis G. Hand lever 30 will then be returned to a position allowing finger H and door J to embrace loosely pipe 42. Prime mover C is rotated counterclockwise, as the device is viewed in Fig. 1, to cause spring A to be unwound from axis E. When the drum 11 is rotated in this direction, roller 16 is also rotated but at a faster rate than drum 11. This insures that a tension is maintained on spring A as it is fed from drum 11 whereby the spring is kept in a tight coil as it is fed out. When the drum 11 begins to rotate as described, the pickup end 37 of the spring strikes guide means F causing the end of the spring to slide along the guide finger until it is beyond the guide finger whereupon it forms another coil by sliding around the outer surface of pipe 42, the spring being guided by contact with finger H, door J and idler pulleys 31 and 33. The spring is kept from sagging as it coils about axis G by the ledge 10 of door J. The force used to feed out the spring is maintained by frictional contact between roller 16 and the spring. Spring A stops feeding out either when frictional contact between spring A, drum 11 and roller 16 becomes insufficient to overcome the resistance afforded by that portion of the spring coiled about axis G or when latch 41 engages notch 39, depending upon which event occurs first.

The operator then moves operating handle 30 back to the position shown in solid lines in Fig. 1, which movement forces tip 23 of finger H into firm frictional contact with that portion of power spring A coiled around axis G and allows spring 5 to bias door J against power spring A. The operator also reverses the direction of rotation of prime mover C; this causes shaft 12 to rotate in a clockwise direction as viewed in Fig. 1. When the drum rotates in this direction, the overriding clutch 19 disengages roller 16 inasmuch as the tension exerted on spring A by drum 11 is in itself sufficient to insure that the spring is wound tightly on the drum. The rotation of drum 11 while finger H and door J maintain a bias on the portion of the spring coiled around axis G forces the spring to tighten upon the drill pipe as it uncoils the spring from axis G and coils it on axis E. If the spring A becomes totally unwound from the pipe before the pipe is spun the required number of revolutions, it will be necessary to engage the spring again with the pipe and repeat the operation. However, if the pipe is spun the required amount and a portion of spring A is still coiled around axis G, it will be necessary to release the spring from the drill pipe. This is accomplished by opening finger H and door J and reversing the direction of rotation of drum 11 to allow the coils of spring wound around the pipe on axis G to loosen. This may require the rotation of drum 11 through one or two revolutions. When that portion of spring A coiled around the drill pipe has loosened, its direction of rotation may again be reversed while finger H and door J are maintained in open position and as the drum 11 rotates in a clockwise direction as seen in Fig. 1, the portion of the spring which was coiled about the axis N may be withdrawn from the drill pipe to restore the spring to its original coiled position on drum 11.

Another embodiment of the present invention is shown in Figs. 9 to 12, inclusive. In this embodiment prime mover C and driving assembly D are identical with corresponding parts of the embodiment of Figs. 1 to 8.

In the embodiment of Figs. 9 to 12 coil spring A' is mounted on frame B'. Prime mover C is arranged for operating the coil spring A' by means of driving assembly D. Guide means F' is mounted on frame B' to guide the end of spring A when unwinding it from a coil about axis E. Gates K and L are pivoted on frame B'. Spring A' is proportioned so that when it is driven to form a coil within gates K and L it forms a coil having an axis M but when tightened on a section of drill pipe it will be tightened on an axis N.

Spring A' is a preformed leaf spring as is member A. However, spring A' is preformed so that it will normally assume the form of a coil of considerably greater diameter than the section of drill pipe with which it is to be engaged and in this respect differs from spring A which normally assumes the shape of a coil of but slightly larger diameter than the section of drill pipe with which it is to be engaged.

In the embodiment of Figs. 9 to 12, inclusive, gate K is constructed in two pieces 50 and 51 which are secured together by pivot 52. Piece 50 is arranged to pivot on post 53 which in turn is mounted on frame B'. Member 51 defines a lower ledge 54. Shaft 56, mounted on frame B', has gate L pivoted thereon. Rollers 55 carried by gates K and L assist in guiding spring A' into a coiled position about axis M as it is uncoiled from drum 11.

Post 53 and shaft 56 each have two pairs of idler rollers mounted thereon. The pairs of idler rollers 57 make contact with spring A'. The other pair of idler rollers 58 are designed to contact the drill pipe during the spinning operation.

A lever 59 is secured to gate L by pivot 62. Guide assembly F' includes a shaft 60 which has a lever arm 80 secured to its center portion for making contact with spring A'. (This lever is shown in greater clarity in the embodiment of Figs. 13 and 14.) Another lever arm 81 is secured to the end of shaft 60 which projects above the frame (see Fig. 14) and a spring 82 is secured thereto so as to force the end of lever arm 80 against spring A'. The purpose of this arrangement is to back up coil A' to keep it from squeezing out of shape between rollers 57 when the coil is being forced down to the diameter of the pipe to tighten it thereon.

Operating handle O has an end secured to shaft 61 which passes through a suitable bearing carried by frame B'. A lever 63 is secured to shaft 61 and is connected through pivot 64, link 65 and pivot 66 to member 51 of gate K. Operating lever O is also secured through pivot 67, link 68 and pivot 69 to gate L. When operating lever O is in the position shown in solid lines, it moves gate members K and L to their closed positions shown by solid lines and when it is pivoted to the position shown by dashed lines it moves gate members J and K to their open positions as indicated by dashed lines in the drawing.

A spring assembly 71 has one end linked to member 50, and the other end pivoted to part 51 of gate K. This spring assembly biases the end of gate K and is forced inwardly when the part of spring A' coiled within the closed gate members is reduced in diameter.

In the embodiment of Figs. 9 to 12, inclusive, the preformed spring A' is of sufficiently larger diameter than the pipe to be spun so that it will readily pass over the enlarged tool joints (not shown in the drawing) at the end of the pipe.

The embodiment of Figs. 9 to 12 may be employed for spinning pipe in either of two ways As one operation, the spring A' may be coiled about axis M and the gates K and L opened and engaged with a section of pipe 42. With the gates K and L closed, drum 11 is rotated counterclockwise, as viewed in Fig. 9, to run out spring A' with guide means F extending the end so that it forms a coil about axis M which substantially coincides with the axis of the pipe during this step. The spring may be run off axis N until the number of layers between drum 11 and roller 16 is insufficient to overcome the resistance offered by the coils of spring A' coiled around axis N. When the spring A' is first run out with its end extended, the rollers 55 of gates K and L and rollers 57 on posts 53 and 56 help to guide it, the force of spring A' overcoming the force of spring assembly 71 to hold member 51 outwardly thereby allowing the coil to form about axis M. When the coil has been formed about axis M, rotation of drum 11 is stopped and the coil may then be pressed between pipe 42 and rollers 57 with such force that the axis of the pipe no longer coincides with axis M. This force may be exerted by the use of lever 59 as shown in Fig. 9. In this position, the rollers 57 squeeze the spring A' against one side of the pipe. Drum 11 is then rotated in the clockwise direction and the spring A' is tightened on the pipe, the pickup tip 37 being wedged between the pipe and the adjacent turn of spring A' so that it remains fixed until

the balance of spring A' wrapped around the pipe is pulled into a tight coil. Continued rotation of drum 11 then spins the drill pipe as the coil is unwound from the pipe, at this time both the pipe and the coil have a common axis. In this operation idler rollers 57 are in contact with coil A' and rollers 58 are in contact with drill pipe 42. If the pipe is spun tight before all of the coil is unwound therefrom, the coil may be released by reversing the direction of rotation of drum 11 (that is, rotating it in the counterclockwise direction) and at the same time moving spring A' away from pipe 42. This allows the spring to assume its preformed diameter which is substantially greater than the diameter of the pipe 42 and thereafter when drum 11 is again rotated in the clockwise direction the end of the spring is readily uncoiled from pipe 42.

However, it will often be found advantageous to preform the end of the spring into a coil about axis M and then slip the entire preformed coil formed about this axis over the end of pipe to be spun. This may allow a saving of time with regard to other operations. For example, when adding a section of pipe to a drill stem the end of the coil may be formed about axis M and this coil slipped over the upper end of that portion of the drill stem which is in the borehole. A section of pipe is then moved over and stabbed on to the drill stem whereupon the spinner simply moves upwardly so that it embraces the lower end of the added section and the assembly then moves horizontally so that the friction rollers 57 force coil A' into contact with one side of the pipe. Thereupon the drum 11 may be rotated in a clockwise direction as seen in Fig. 9 and the pipe spun. When the spinning operation is completed, the direction of rotation of drum 11 may be reversed and spring A' moved away from rollers 57. When the coil assumes its preformed size, it may be readily slipped over the end of the pipe inasmuch as the coil is preformed to such a size that it will readily pass over the largest portion of the pipe, such as an enlarged tool joint conventionally used in drill pipe.

Although the operation of the embodiments of Figs. 1 to 8 and Figs. 9 to 12 have been described for spinning vertical pipe, it is to be understood that they may be used to spin pipe in any position. However, if the pipe to be spun is in a horizontal position, as when screwing joints of pipe for a pine line, a simpler device may be used. An embodiment suitable for connecting horizontal sections of pipe is shown in Figs. 13 and 14.

The device of Figs. 13 and 14 has a frame B'' which is generally similar to frame B' of Figs. 8 to 12 but without gates K and L or operating levers 59 and 60. In order to simplify the drawing no elevation has been shown, nor have the means for driving the drum and roller been shown. It will be understood that a prime mover, such as C of Fig. 7 or Fig. 12, may be mounted on frame B'' and that a driving means D will be provided such as shown in Fig. 2 or Fig. 10.

Frame B'' has drum 11, roller 16, latch 41, posts 53' and 56' and guide means F' mounted thereon. Spring A' is mounted as in the embodiment of Figs. 8 to 12 on means F'. Rollers 57 and 58 are mounted on posts 53' and 56' to assist in guiding spring A' in a coil. The guide means F' includes shaft 60' with lever arms 80 and 81 secured thereto. Spring 82 has one end connected to lever arm 81 and the other end connected to frame D''.

The device of Figs. 13 and 14 is adapted for spinning pipe which is near a horizontal position. The spring A' is coiled on pipe 42 by driving it from drum 11 with roller 16 as in the previously described embodiments. Since the pipe is horizontal, no guide is required for the edges of coil A'. When spring A' is engaged with pipe 42, the coil on the pipe is squeezed between the pipe and rollers 57 as shown in Fig. 13. Upon rotation of drum 11 in the clockwise direction the coil is first brought down to the size of the pipe and then when pickup tip 37 becomes firmly wedged between pipe 42 and the adjacent coil of spring A', the pipe is spun.

The embodiment of Figs. 13 and 14 cannot be satisfactorily used for spinning vertical stands of pipe because the lower edge of the spring, not being supported by a ledge, such as 10 in the embodiment of Figs. 1 to 8 or 54 in the embodiment of Figs. 9 to 12, would fall into a long spiral when fed from drum 11. However, it represents a simple embodiment adapted for spinning horizontal pipe.

The spring of the device of the present invention which embraces the pipe need not be formed in the preferred preformed spiral shown in Fig. 8. Another preformed shape of spring which may be employed satisfactorily in any of the devices shown is illustrated in Fig. 15. The portion of the spring terminating in pick-up tip 38' is formed into a relatively tight spiral, while that portion adjacent driving end 38' is formed into a relatively loose spiral with the two spiral portions connected by a straight portion.

Spring A'' may be substituted for spring A in the embodiment of Figs. 1 to 7 and the device will operate as heretofore described without any additional change. Similarly spring A'' may be substituted for spring A' in the embodiment of Figs. 9 to 12. A preformed spring having only its driving end shaped as a coil with the remainder straight is also suitable for use in the embodiments provided with gates if the gates are closely fitted to guide the straight end around the pipe to be spun. However, this is not a preferred embodiment since additional energy is required to deform the preformed straight end.

The spring itself which is used for transmitting power from the prime mover to the pipe (shown as spring A in Figs. 1, 2, 4, 5, 6 and 8, as A' in Figs. 9, 10, 11, 13 and 14 and as A'' in Fig. 15) is described and claimed in my copending application Serial No. 111,289, filed August 19, 1949.

While I have disclosed specific embodiments of the present invention, it will be apparent to a workman skilled in the art that various changes in the size, shape and proportion in the several parts may be made without departing from the scope of the invention.

What I desire to claim as new and useful and to secure by Letters Patent is:

1. A pipe spinner for rotating a section of pipe about its longitudinal axis comprising, in combination, a frame member, a drum mounted on said frame member for reversible rotation about a first axis, a leaf spring having at least one end thereof preformed in a spiral coil mounted on said drum in a coil with the outer end of the coil free, a driving roller mounted on said frame member contacting said spring for uncoiling said spring from the first axis, a power means mounted on the frame mechanically coupled to

said driving roller and to said drum, a guide finger mounted on said frame adapted to fit between the free outer end of said spring and the next adjacent coil for uncoiling the spring from a coil about said first axis and a gate member hingedly mounted on said frame for arcuate movement about a second axis parallel to said first axis, said gate member comprising a projecting ledge adapted to support the lower edge of said coil spring, said gate member defining a circular path for coiling the outer free end of said spring about the longitudinal axis of said section of pipe as it is being unwound from said first axis.

2. A device in accordance with claim 5 in which two gate members are pivoted to said frame member for arcuate movement about second and third axes, respectively, parallel to said first axis, whereby said gate members may assume open and closed positions, at least one of said gate members comprising a ledge for supporting said lower edge of said spring when it is uncoiled from said first axis, the inner surfaces of said gate members being arcuate for guiding the free outer end of the spring into a coil about the longitudinal axis of said section of pipe.

3. A pipe spinner comprising, in combination, a frame member, a drum mounted on said frame member arranged for reversible rotation about a first axis, a leaf spring having at least one end preformed to a circular shape mounted on said drum in a coil with the outer end of the coil spring free, a power means mounted on said frame member in driving connection with said drum for coiling and uncoiling the spring about the first axis, and a guide member mounted on said frame member defining a circular path for coiling the outer free end of said spring about a second axis when uncoiled from the first axis.

4. A pipe spinner comprising, in combination, a frame member, a drum mounted on said frame member arranged for reversible rotation about a first axis, a leaf spring having at least one end preformed to fit said drum member mounted on the drum in a coil with the outer end of coil spring free, a guide member mounted on said frame member defining a circular path for coiling the outer free end of said spring about a second axis parallel to said first axis when the spring is being uncoiled from the first axis, and means to limit the amount of spring uncoiled from said axis to a predetermined length.

5. A device in accordance with claim 1 in which the inside surface of the outer free end of the spring has a pipe gripping member thereon whereby the outer end of the spring has a greater affinity for the pipe than the subsequent coils have for each other.

6. A device in accordance with claim 5 in which a means for biasing the pipe toward the inner surface of the coil spring is mounted on said frame member.

7. A device in accordance with claim 3 in which the inside surface of the outer free end of the spring has a pipe gripping means thereon whereby the outer end of the spring has a greater affinity for the pipe than the subsequent coils have for each other.

8. A device in accordance with claim 3 in which the entire spring is preformed into a coil.

9. A device in accordance with claim 3 in which a pipe gripping member is secured to the inside surface of the outer free end of the spring, the pipe gripping member having a pipe gripping surface displaced away from the inside surface of the spring and in which a pick up finger is mounted on said frame arranged to project between the free outer end of said spring member and the adjacent coil when said spring is driven to uncoil it.

10. A device in accordance with claim 3 in which two spaced pipe gripping members are secured to the inside surface of the outer free end of the spring with each pipe gripping member having a pipe gripping surface displaced away from the inside surface of the spring and with a space between the two pipe gripping members at the center section of the spring, and in which a pick up finger is mounted on said frame arranged to project between the free outer end of said spring member in the space between said pipe gripping members at the center section of the spring and the adjacent coil when said spring is driven to uncoil it.

11. A device in accordance with claim 1 in which a biasing spring is operatively connected with said frame and with said gate to bias the gate against the leaf spring while said spring is being formed into a coil about the second axis.

12. A device in accordance with claim 3 in which the guide member is pivotally mounted on said frame and in which a biasing spring is operatively connected with said frame and with said guide member to bias the guide member against the leaf spring while said spring is being formed into a coil about the second axis.

13. A device in accordance with claim 4 in which the guide member is pivotally mounted on said frame and in which a biasing spring is operatively connected with said frame and with said guide member to bias the guide member against the leaf spring while said spring is being formed into a coil about the second axis.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
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