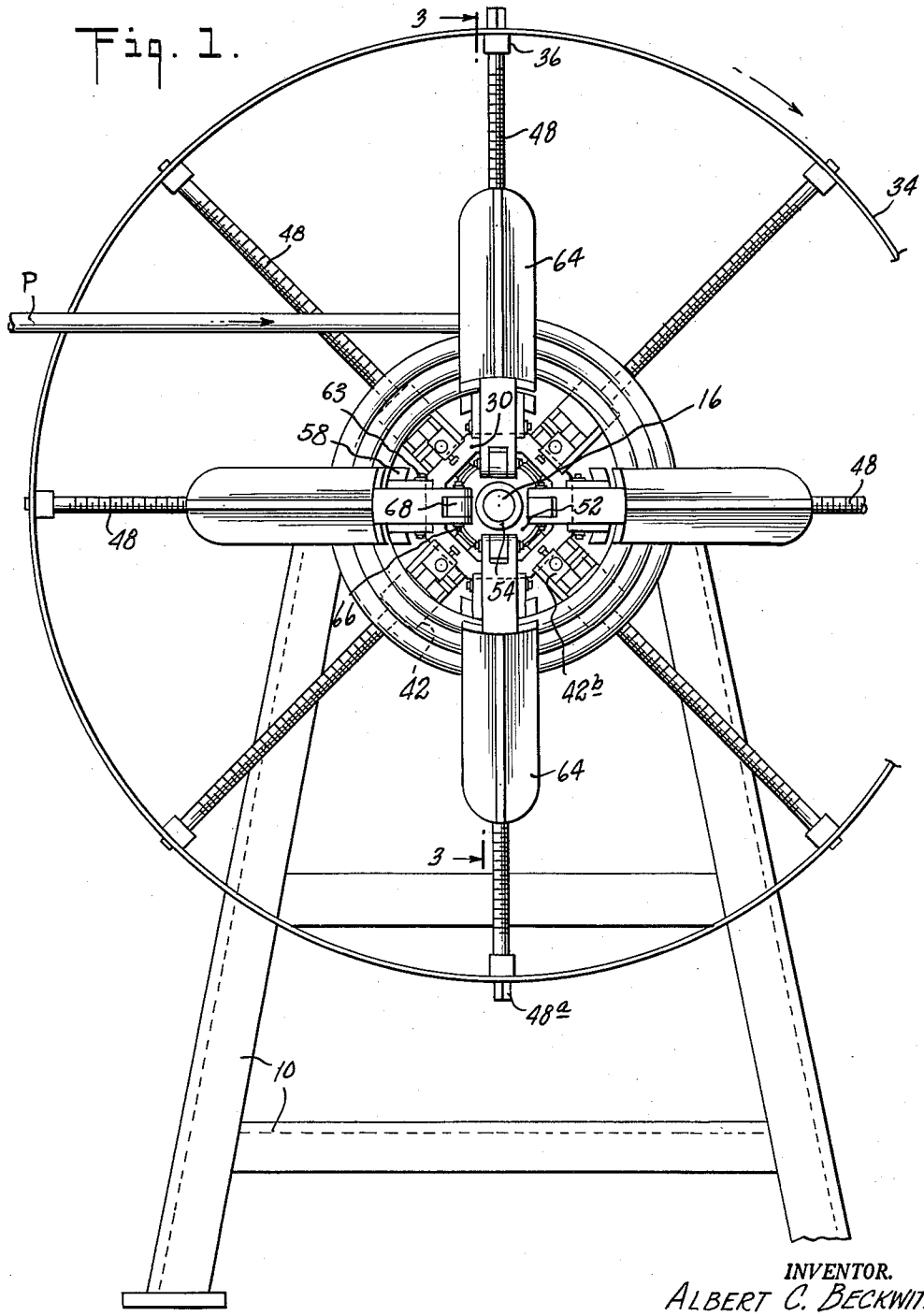
Oct. 1, 1963 A. C. BECKWITH 3,105,653

COIL FORMER

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Fig. 1.



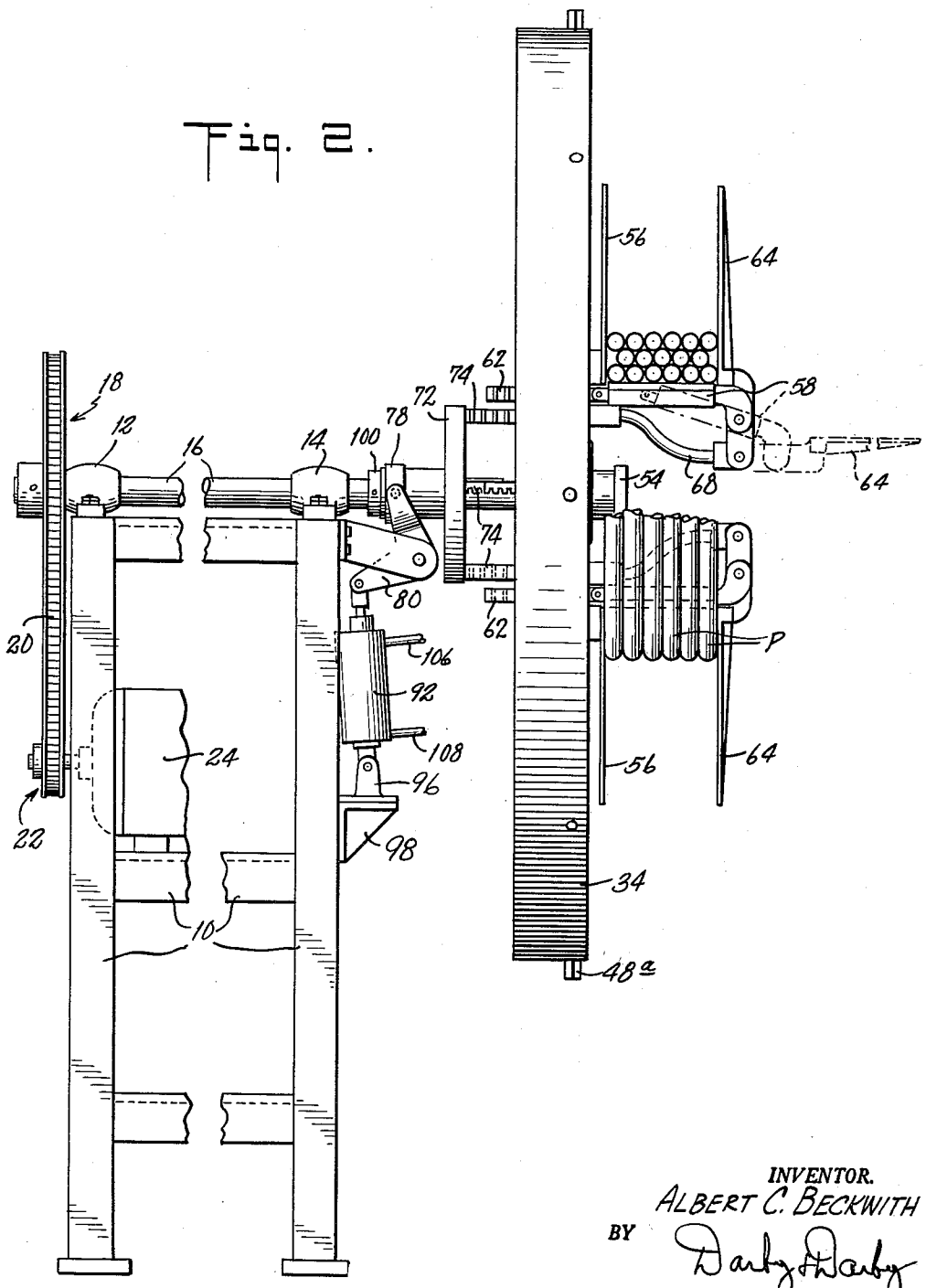
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COIL FORMER

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Fig. 2.



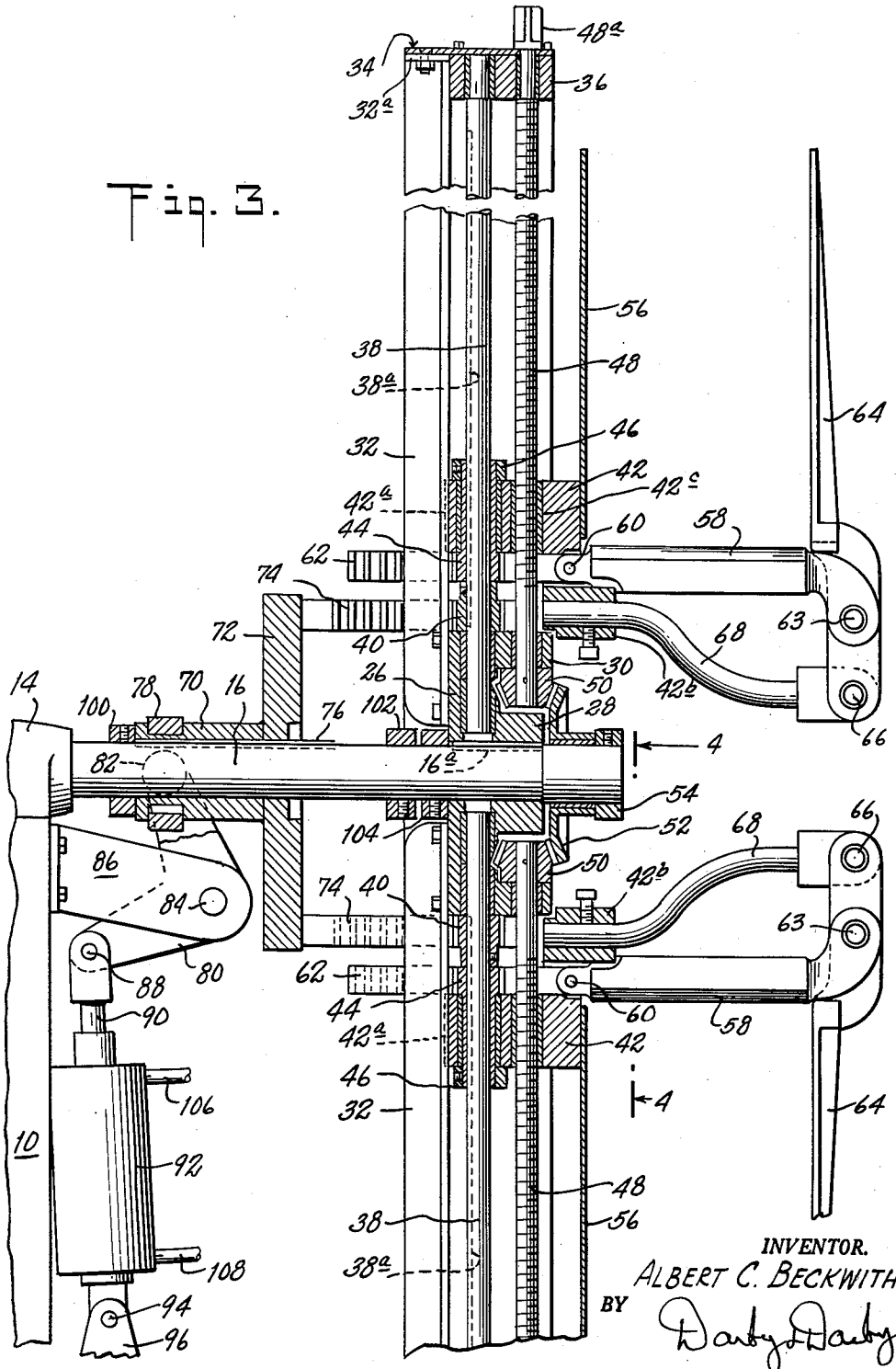
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Fig. 3.



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Fig. 4.

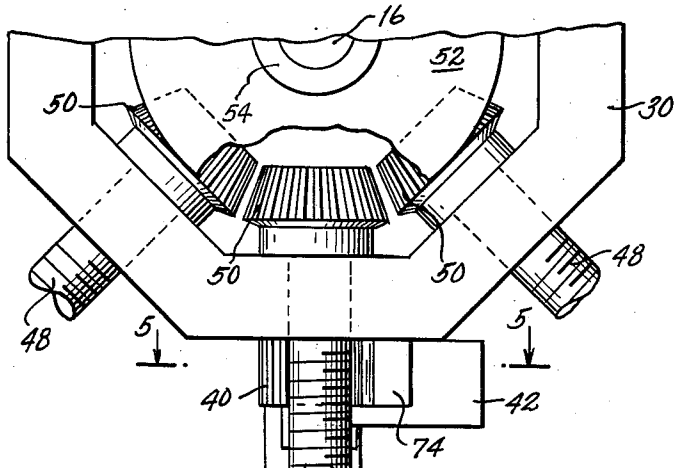
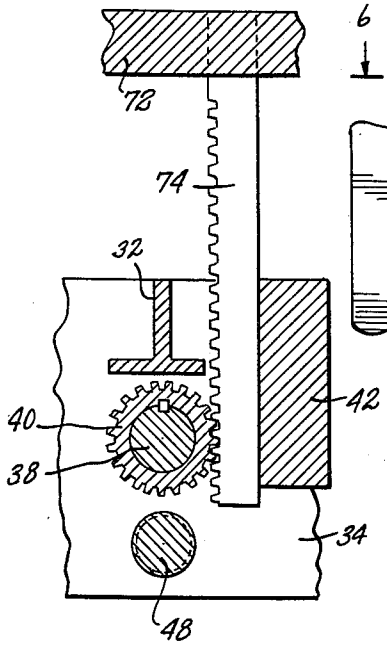


Fig. 5.



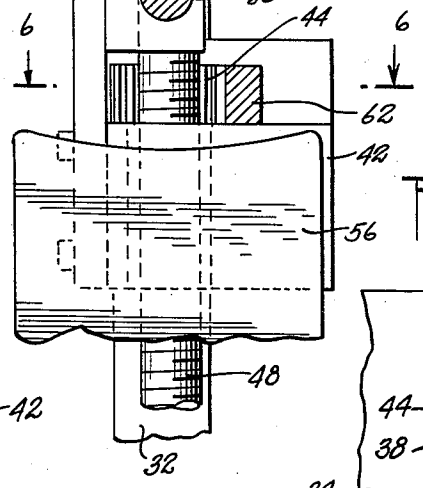
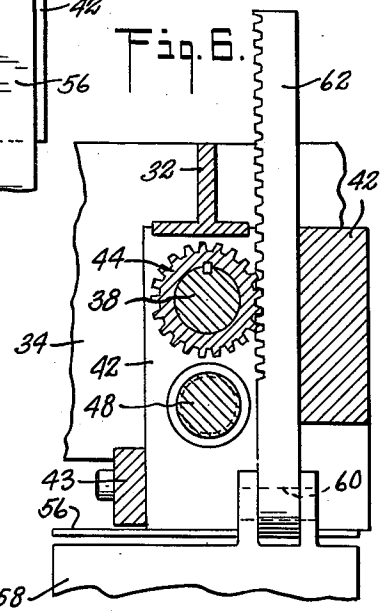


Fig. 6.



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3,105,653

COIL FORMER

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6 Claims. (Cl. 242—110.1)

This invention relates to a machine for forming coils of elongated flexible products such as rope, wire, cable and tubing or hose, such as for example plastic hose.

An important object of this invention is to provide a coil forming machine which is quickly and easily adapted to the formation of coils of different internal diameters.

In this respect the more specific object of the invention is to provide a coiler having a circumferentially interrupted core consisting of a plurality of axially extending members which can be simultaneously positioned at different radial distances from a center of rotation to provide coils of different minimum internal diameter.

Another object is to provide end members for the core members which end members form the equivalent of a spool head which are power operated from coiling position to coil discharging position to facilitate removal of the finished coil from the machine.

A more specific object with respect to the core and spool head members is to provide a simultaneously acting power operated assembly whereby as the spool head members are moved to coil releasing position, the core members are readily contracted, thereby still further facilitating the removal of the finished coil.

Still another object of the invention is to provide in a single machine all of the foregoing structures and functions.

Other and more detailed objects of the invention will be apparent from the embodiment thereof selected for disclosure purposes herein and illustrated in the accompanying drawings.

In the drawings,

FIGURE 1 is a front elevation of the machine of this invention;

FIGURE 2 is a side elevational view thereof with some parts broken away to facilitate illustration;

FIGURE 3 is a vertical, cross-sectional view taken on the line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged fragmentary elevational view taken in the region 4—4 of FIGURE 3;

FIGURE 5 is a cross-sectional view taken on the line 5—5 of FIGURE 4; and

FIGURE 6 is a cross-sectional view taken on the line 6—6 of FIGURE 4.

The structure and the function of the apparatus comprising the invention will be better understood by first setting out in detail the elements and their relationship. The machine includes a suitable stand 10 of the proper configuration and materials on top of which are mounted in alignment a pair of bearing members 12 and 14. Journaled in the bearing members is a shaft 16 which projects rearwardly of the stand sufficient to receive a sprocket wheel 18. Mounted at a lower level on the stand is an electric drive motor 24 having a driving sprocket 22 mounted on its shaft in the same vertical plane of the sprocket wheel 18. The sprocket and sprocket wheels 22 and 18 are connected by a drive chain 20.

Shaft 16 also extends forwardly of the stand 10 and is mounted on and in the end of spider 26 which is keyed to the shaft 16 by means of a key 16a, see FIG. 3. The spider 26 includes a disc or plate at the lefthand end to which are attached and from which extend a plurality of spokes 32 which are positioned in spaced circumferential relation around and extend radially of the shaft 16. The spokes 32 are of T-shape in cross-section and are secured to the plate 26 of the spider in any suitable manner, as by means of bolts, as shown. In the particular machine illustrated there are eight such spokes. At the outer end of each spoke is secured, as by welding, a short circumferentially extending plate 32a to form seats for a circumferential band 34 which forms a sort of circular housing for the structure, as is clear from FIG. 1. Secured internally of the band which projects axially of the spokes, and at each spoke, is a supporting block 36 which can be secured to the band by welding or by means of bolts as shown in FIG. 3.

Formed integral with the plate 26 of the spider is a hexagonal ring 30 accurately bored in alignment with the spokes. At the center of the spider is an integral hub 28. In review it is noted that the spider consists of the plate 26, the ring 30 and the central hub 28. The spider can be a onepiece member or a built-up structure, depending on manufacturing conditions.

Positioned opposite each of the spokes 32 is a guide rod 38 positioned radially of the main shaft 16. Each guide rod can rotate and hence is rotatably supported at its outer end in a bushed bore in the associated support block 36. The inner end of each guide rod 38 is rotatably supported in a bushed bore in the spider assemblies 26—28—30. Thus there are in the case of the machine illustrated, eight guide rods, one opposite each spoke. Each of the guide rods 38 has a keyway 38a of substantial length, as shown in FIG. 3. Keyed to each of the rods towards its inner end is a pinion gear 40. Slidably mounted on each of the guide rods is the equivalent of a nut 42 which is slotted at its rear end at 42a to have guided movement on the side edges of the head of the T-shaped spokes 32.

Slidably mounted on each guide rod is another pinion gear 44, which has an elongated integral sleeve which can rotate its associated rod in a bushed bore in the nut 42 and also moved longitudinally of the guide rod through a key connection with the keyway 38a. Each pinion gear 44 has its elongated sleeve projecting beyond vent endwise movement of the gear in the nut.

Associated with each spoke and guide rod is an externally threaded rod 48 which is rotatably supported in a bushed bore in the associated supporting block 36 at its outer end. Threaded rods 48 extend radially and externally of the circumferential band 34 and are provided with wrench receiving heads 48a. The inner ends of each of the threaded rods 48 are rotatably supported in bushed bores in the ring 30 of the spider, and each has attached to its intermost end a bevel gear 50. As clearly shown in FIG. 3, each threaded rod 48 passes through a threaded insert 42c, thus justifying calling the members 42 nuts.

Rotatably mounted on the end of shaft 16 is a bevel gear 52 held in position by a lock collar 54 so as to coact with the bevel gears 50.

Secured to the exposed faces of the nuts 42 in any suitable manner are arms 56, which together form the inner end of the coiling spool. The interrupted core consists of a series of circumferentially spaced axially extending members 58, each of which is pivotally connected at 60 to a toothed rack 62, which can slide axially in the associated nut 42. The opposite ends of the members 58 have inwardly curved extensions which are pivotally connected at 63 intermediate the ends of the radially extending arms 64 which form the equivalent of the outer end of the spool head. The inwardly extending ends of the arms 64 are pivotally connected at 66 to links 68, the other ends of which are locked in bores in the inwardly extending projections 42b integral with the nuts 42.

Slidably mounted on the shaft 16 adjacent the bear-

ing 14 is a sleeve 70 to which is connected a plate 72 on which are mounted a series of toothed racks 74 extending axially of the shaft 16 and in circumferentially spaced relation with respect to each other.

At this point it will be noted that the racks 62 cooperate with the pinion gears 44 and the racks 74 cooperate with the pinion gears 40, all as clearly shown in FIG. 3. The assembly comprising the sleeve 70 and plate 72 rotates with the shaft 16 through the agency of a key 76 mounted thereon but can slide axially of the shaft. The sleeve 70 is provided with an annular groove in which a yoke or ring 78 is mounted. This yoke is provided with pivot pins at diametrical opposite points which pivotally connect with a bell crank lever 80 pivotally mounted at 84 on a bracket 86 attached to the stand 10. The lever 80 is also pivotally connected at 88 to the piston rod 90 of an air cylinder 92. This motor is pivotally mounted at 94 on a fixture 96 also attached to the stand 10, see FIG. 2. Secured to the shaft 16 on opposite sides of the sleeve 70 and plate 72 are a pair of collars 100 and 102. These collars are provided with set screws and can be adjustably positioned on the shaft 16. They provide stops limiting the movement of the parts actuated by the air cylinder 92. It is also noted that a similar collar 104 coacting with the collar 54 holds the parts of the general rotor assembly in actual position on the shaft 16.

Before describing the operation of this machine it is noted by referring to FIG. 1 that there are eight assemblies including the threaded shafts 48 and nuts 42 and associated parts, but that there are only four arms 64. Where required, however, additional arms could be provided up to a maximum of eight, so that there would be one associated with each of the assemblies 48—42.

In describing the operation of this device it will be assumed that the parts are in the position shown in FIG. 3. In this position of the parts the core members 58 are on the minimum diameter possible with the mechanism. Assuming, therefore, that it is desired to coil a plastic pipe P into a coil having a greater minimum diameter, the operator will move the core members 58 radially outwardly. All of them, four in the case of the device illustrated, can be moved outwardly simultaneously by applying a suitable wrench to one of the wrench heads 48^a on one of the threaded rods 48. Upon turning the associated rod all of the nuts 42 with the parts attached thereto will move outwardly in a radial direction.

Assuming from FIG. 3 that the upper threaded rod 48 is thus operated it will follow that all of the other rods 48 will be simultaneously operated in the same amount through the interconnection of the bevel gears 50 with the bevel gear 52. The latter gear is free to rotate on the end of the shaft 16 and thus is driven by any one of the bevel gears 50, the one on the lower end of the upper threaded rod 48 in the illustrated case. Thus all the core members 58 move outwardly the same amount when any one of the threaded rods 48 is turned. With these nuts of course will go all the parts mounted thereon which include in addition to the members 58 the racks 62, the pinion gears 44, the arms 64 and the connected links 68.

When the members 58 have been adjusted outwardly to a desired minimum diameter for the coil to be formed the machine is ready to be operated after the end of the plastic pipe or cable is attached to the spool assembly comprising of course generally the members 56, 58 and 64. Since it is not important how the end is attached to the spool no example of the many possible fixtures for that purpose is illustrated. The electric motor 24 is then energized, causing the shaft 16 to rotate in its supporting bearings, and of course to cause all of the parts of the rotor assembly to revolve with it. Thus the pipe is coiled up to the proper depth, whereupon motor 24 is de-energized.

The pipe is then cut off from the supply if necessary and several ties or the equivalent are made around the convolutions of the coil to bind it into a transportable bundle. A hydraulic fluid such as compressed air is then supplied to the cylinder of the air engine 92 through the conduit 108, causing the piston rod 90 to move upwardly, which motion acting through the bell crank causes the assembly 70—72 to move to the right, FIG. 3. The racks 74 move with this assembly, causing the pinion gears 40 to rotate on the guide rods 38 to which they are keyed. Thus the guide rods also rotate and through their sliding key connections with pinion gears 44 these gears also rotate, thereby reacting on the racks 62 causing them to move to the right. The result of this motion is diagrammatically illustrated in dotted lines in FIG. 2, wherein the core members 58 also move to the right and dip downwardly pivoting on the pivot connections 60. This movement of the core members 58 causes the arms 64 to rotate to a horizontal position on the pivots 66, which are prevented from having relative movement by the rigid links 68.

It is here emphasized, since it might not be too easily apparent from FIG. 3, that there is of course one rack 74 for every assembly which includes the spool head arms 64, and of course there is one rack 62 for each. Thus all of the core members 58 move outwardly and dip inwardly as illustrated in FIG. 2, and all of the arms 64 move out to horizontal position. It will be at once apparent as a result of the movement of these parts the coiled or plastic pipe is freed in all directions and can be very quickly slipped off the machine. Air is then supplied to the opposite end of a cylinder of the air engine 92 through the connection 106 while the connection 108 is exhausted to the atmosphere, so that the piston of the engine returns to orignal position and through the bell crank 80 returns the parts 70, 72 and 74 back to the position shown in FIG. 3.

The return movement of the racks 74 causes a reverse rotation of the pinions 40 and 44, thereby through the action of the racks 62, causes the core members 58 to return to parallel relation with the axis of the machine and at the same time to move the arms 64 back to right angle relation, that is to put the parts in the position shown in FIG. 3. The machine is now ready for a new coiling operation.

The spacing between the members 56 and 64 can be accurately adjusted so that the first layer of tubing P to be supplied as shown in FIG. 2, will just fill in the space between them. This adjustment is effected by loosening the collar 100 and the set screw on the member 42^b, whereupon the sleeve 70 can be moved to the right or left, as the case may require. Also, the link 68 can be adjusted in the support 42^b to bring the arms 64 in vertical position, that is parallel to the members 56 for the new adjustment. The collar 100 is then locked in place and the set screw of member 42^b is reset.

Those skilled in the hydraulic art will understand that there are many single stroke air engines and air supply systems with valves for effecting these operations, and hence details with respect thereto are not illustrated.

It will be apparent to those skilled in the art that the subject matter of this invention is capable of variation in its detail, and it is intended, therefore, that the form of the invention selected for illustrative purposes is not to be taken in a limiting sense. It is preferred that the scope of this invention be determined by the appended claims.

What is claimed is:

1. A machine of the type described comprising a rotatably supported framework, a plurality of circumferentially spaced core members pivotally mounted on said framework and extending parallel to the axis of rotation of said framework, means for simultaneously radially positioning said core members, a plurality of spool head arms pivotally mounted on the ends of said

core members so as to normally extend radially of said axis, and means for effecting simultaneous pivotal movement of said arms from radial to parallel position and return and for pivotally moving said core members towards said axis of rotation simultaneously with the pivotal movement of said arms.

2. A machine of the type described comprising a rotatably supported shaft and a central spider secured to said shaft having a plurality of radially extending assemblies thereon each including a sypoke, a rotatable guide rod, a rotatable threaded rod, a pinion gear secured to each guide rod, a fixture having a thread connection with said threaded rod, a pinion journaled on said fixture having a splined connection with said guide rod, a toothed rack coacting with said second pinion, a coil core member pivotally connected to one end of said rack, a spool head arm pivotally mounted on said member, power operated means coacting with said first pinion to rotate all of said guide rods to cause all of said core members and arms to pivot simultaneously on their respective racks and core members and a gear assembly coupling said threaded rods whereby rotation of one of said threaded rods causes rotation of all of said threaded rods to simultaneously position said fixtures radially.

3. A machine of the type described comprising a rotatably supported shaft and a central spider secured to said shaft having a plurality of radially extending assemblies thereon, each including a spoke, a rotatable guide rod, a rotatable threaded rod, a pinion gear secured to each guide rod, a fixture having a thread connection with said threaded rod, a pinion journaled on said fixture having a splined connection with said guide rod, spool head arms pivotally mounted on said fixture, power means for actuating said pinions to effect simultaneous pivoted movement of all of said arms and means for conjointly rotating said threaded rods to effect radial movement of said fixtures.

4. A machine of the type described comprising a rotatably supported shaft and a central spider secured to said shaft having a plurality of radially extending assemblies thereon, each including a spoke, a rotatable guide rod, a rotatable threaded rod, a pinion gear splined to each guide rod, a fixture having a thread connection with said threaded rod, a pinion journaled on said fixture having a splined connection with said guide rod, a core

member pivotally mounted on said fixture, power means for simultaneously effecting rotation of said first pinions to cause pivotal movement of said core members to release a coil wound on the core members and within said arms and means for conjointly rotating said threaded rods to effect radial movement of said fixtures.

5. A reeling mechanism comprising a main shaft, a rotatable spider supported by said shaft, a plurality of rotatable threaded shafts supported on said spider radially of said main shaft, means interconnecting said threaded shafts to effect simultaneous rotation thereof, a plurality of rotatable splined shafts supported on said spider radially of said main shaft, a plurality of fixtures having a threaded connection with said threaded shafts respectively for radial movement on said splined shafts, a plurality of pairs of pinions having splined connections with said splined shafts respectively, one pinion of each pair being connected to the related fixture to move radially with it, racks on said fixtures respectively driven by said connected pinions, core members pivotally mounted on the ends of said racks respectively, spool head arms pivotally mounted on said core members respectively, links secured to said fixtures respectively, and pivotally connected to said arms respectively, and means for effecting simultaneous rotation of the other pinion of each pair to move said core members towards or away from each other and to move said spool head arms outwardly to release a coil wound on the core members within said arms.

6. In the combination of claim 5, said last means including a support slidably mounted on said main shaft and having a plurality of racks engaging said other pinions respectively, and means for effecting movement of said support.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,105,653 October 1, 1963

Albert C. Beckwith

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 40, after "beyond" insert -- the nut 42 to receive a screw locked collar 46 to pre- --; column 5, line 10, for "sypoke" read -- spoke --.

Signed and sealed this 14th day of April 1964.

(SEAL)
Attest:
ERNEST W. SWIDER

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents