

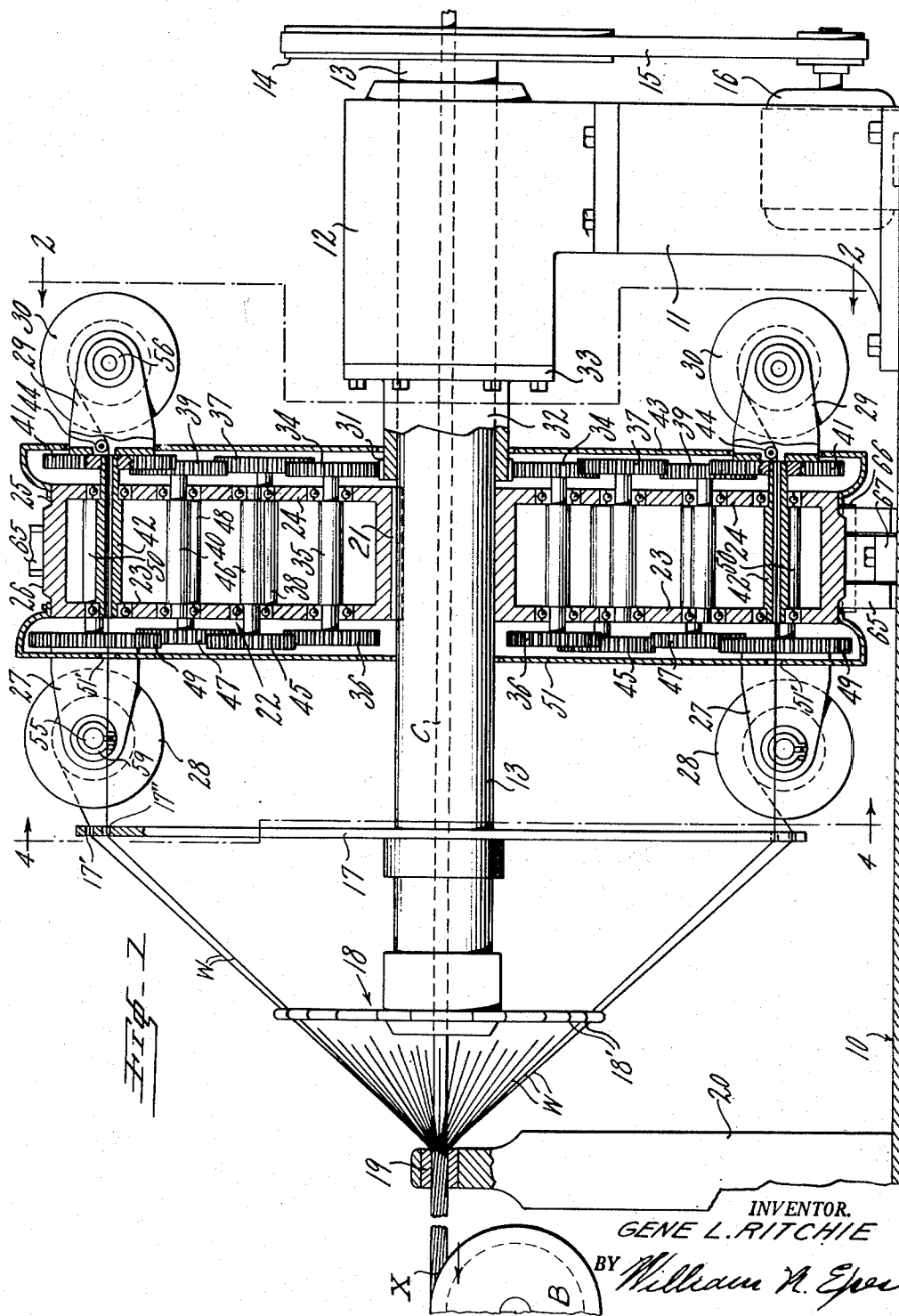
Aug. 13, 1957

G. L. RITCHIE
CABLE MAKING MACHINE

2,802,328

Filed April 2, 1953

3 Sheets-Sheet 1



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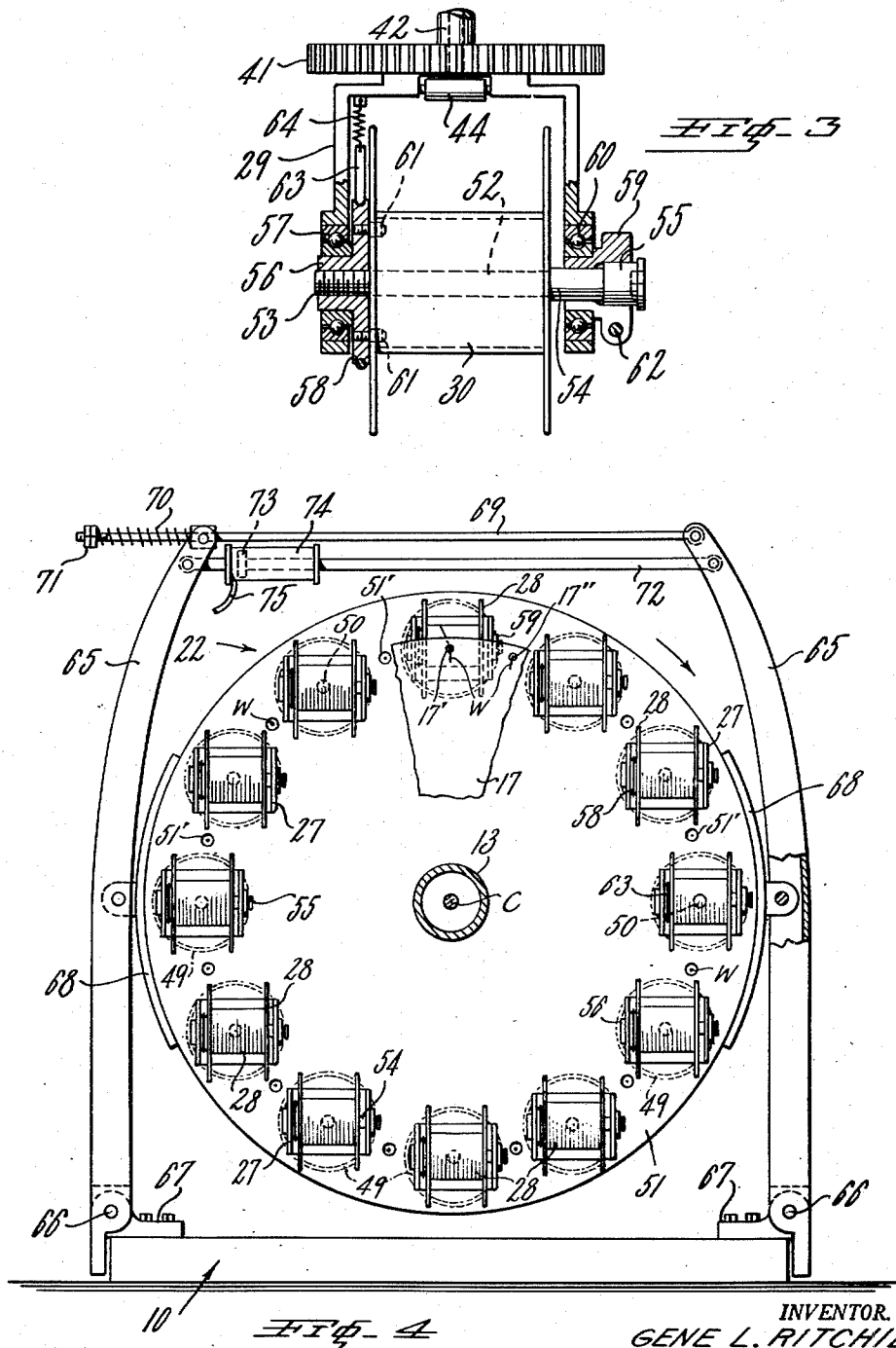
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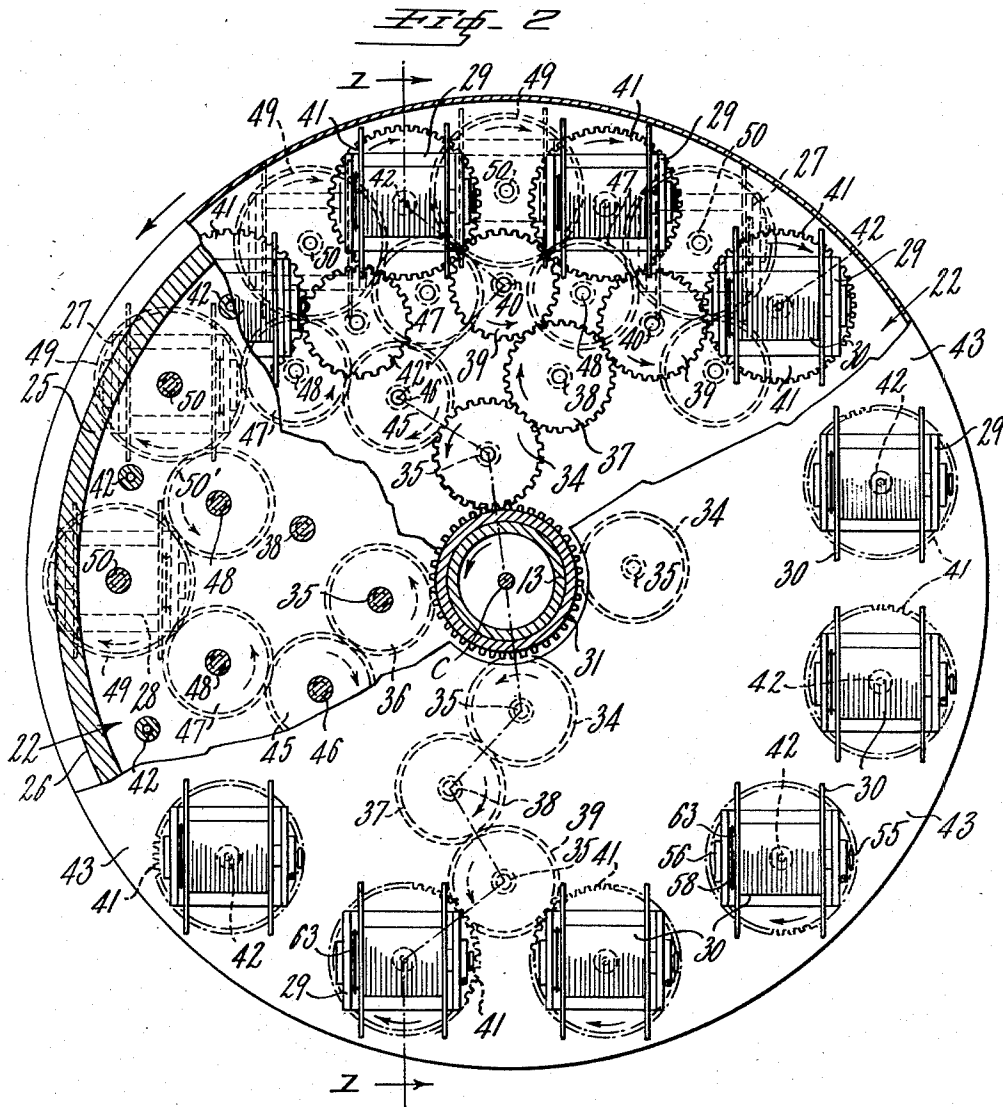
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CABLE MAKING MACHINE

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Application April 2, 1953, Serial No. 346,343

10 Claims. (Cl. 57—13)

This invention relates primarily to a machine for forming a large number of covered or uncovered wires into a cable, but it can be used to twist other strands together to form a cord, rope or cable.

Cabling machines as constructed heretofore frequently consist of a rotating head that is power driven and which has mounted on the front face thereof a number of reel-frames or reel-cradles each adapted to support a reel that supplies a wire to the cable forming position. In setting up such prior machine ready for action, a wire is drawn forward from each reel supported by a reel-frame at the front face of the head to a central guide position in axial alignment with the head, and disposed some distance in front of the head. When power is applied and the head is rotated the wires supplied by the various reels are laid helically about a central core to form the cable. Usually it is desirable to prevent the wires supplied by such reels from being individually twisted by the revolving action of the head. It has therefore been proposed heretofore to rotatably mount the reel-frames on the head and to provide planetary gear mechanism adapted to turn the reel-frames, at the proper speed, in the reverse direction to that in which the head rotates, to thereby lay the wire strands about a central core in the form of a cable, without twisting the individual strands.

The present invention contemplates a cable making machine of the general type just described, but which differs from such prior constructions by providing a more compact arrangement of the reel-frames, whereby the size of a cabling machine capable of supplying a large number of wires to the cable forming point is greatly reduced, and other advantages are secured.

One important feature of the present invention resides in a cable making machine, comprising a rotating head having a front face and a rear face, and having a number of reel-frames mounted on each face, so that a rotating head of a selected diameter will supply twice the number of wires to a cabling point that a cable making machine of the same diameter but having the prior construction above described would supply.

Another feature of the present invention resides in the construction whereby a rotating head is provided having reel-frames mounted on the front and rear faces thereof, as just mentioned, and in which the wires from the reels disposed at the rear face of the head pass through openings in the head, to travel with the wires from reels disposed at the front of the head, to the cable forming position in front of the rotating head.

Another feature of the present invention resides in the construction whereby the reel-frames disposed at both faces of the rotating head are rotated about their own axis in a reverse direction to that in which the rotating head revolves, to thereby retain the supporting axis of each reel in a horizontal position as the head rotates, and keep the wires from being twisted upon their own axis as they pass to the cabling point. This object of the in-

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vention is secured by providing a planetary gear system having gears mounted at both the front and rear faces of the rotating head, so that all of the reel-frames are turned by this planetary system to operate in the manner just described.

Another feature of the present invention resides in the construction wherein all reel-frames are disposed at the same distance from the central axis of the rotating head, but the reel-frames disposed at the rear face of the rotating head are out of alignment with the reel-frames at the front of such head. As a result of this arrangement the wire supplied by a reel at the rear face of the rotating head can travel through the head at a position between a pair of reel-frames at the front of such head, so that it will lie between a pair of front frames and will not contact them.

Another feature of the present invention resides in the construction whereby the rotating head having reel-frames mounted upon both the front and rear faces thereof, are supported entirely by a bearing disposed at the rear of the rotating head where this bearing is out of the way and does not interfere with the travel of the wires from the various reel-frames to the cabling point.

As a result of the construction of the present invention whereby the reel-frames are disposed upon both faces of the rotating head, these reel-frames are readily accessible to workmen engaged in supplying the frames with full reels, and in removing empty reels therefrom. The gears that rotate the reel-supporting frames are protected by circular guard plates and the reel-frames rotate in openings provided in such guard plates. The rotating head with the reel-frames rotatably mounted on each face thereof, makes a compact and symmetrical construction wherein all gears are covered by the guard plates attached to the front and rear faces of the rotating head.

Still another feature of the present invention resides in brake means comprising a pair of upright brake members disposed at opposite sides of the rotating head, where they serve to stop the rotating head quickly, and also to guard the rotating head.

The above and other features of the present invention will be further understood from the following description when read in connection with the accompanying drawings; wherein

Fig. 1 is a longitudinal view of a cable making machine embodying this invention, and shows some parts in section on the zigzag line 1—1 in Fig. 2;

Fig. 2 is a sectional view taken approximately on the line 2—2 of Fig. 1, one of the guard plates being partly broken away and the rotating head also being partly broken away;

Fig. 3 is a sectional view through one of the rear reel-frames for supporting a wire-carrying reel; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1.

The cable-making machine of the present invention was designed primarily for supplying a large number of wires or strands to the cabling position, and to this end the cabling machine is provided with a rotating head or annular frame having a front face and a rear face with reel-supporting frames mounted on each of these faces. The rotating head shown in the drawing has twelve of these reel-supporting frames on the front face and twelve more reel-supporting frames on the rear face, but it will be understood that the number of such reel-frames on each face may be varied as desired within the scope of the present invention.

Referring to Fig. 1 of the drawing, the entire machine is shown as having the metal base 10 which may rest upon a concrete floor, and to the rear portion of this base is bolted an upright casting 11 to which is secured a long

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bearing 12 for rotatably supporting the central shaft 13 of the machine. This shaft has secured to its rear end a driving wheel or sprocket 14 adapted to be driven by the belt or chain 15 from the electric motor 16. The shaft 13 extends frontwardly a substantial distance from the supporting bearing 12 and has secured thereto a wire guiding disc 17, having openings 17' and 17'' through which the wires W pass. The forward end of the shaft 13 has secured thereto a lay plate 18, the outer periphery of which is notched as indicated at 18' to receive the cable-forming wires W, twenty-four of these wires are shown as extending from adjacent the plate 18 to the cable guide eye or die 19, which guide eye is supported by the post 20 attached to the machine base 10.

The main shaft 13 has rigidly secured thereto by the key 21 the large rotating head or annular frame 22 which may be in the form of a hollow casting having the front wall 23, rear wall 24 and outer cylindrical portion 25, and this cylindrical portion has the braking surface 26. This head 22 also has a central sleeve portion that fits snugly upon the shaft 13 and is secured thereto by the key 21, above mentioned. The head or annular frame 22 may be rotated by the motor 16 in the direction indicated by the arrow in Figs. 2 and 4.

The rotating head 22 has mounted on its front face, in the construction shown, twelve reel-supporting frames 27, each of which carries a wire supply reel 28. The rear face of the rotating head 22 is likewise provided with twelve reel-supporting frames 29, each of which carries a wire supply reel 30.

If the reel-supporting frames 27 and 29 should be rigidly secured to the rotating head 22 and the head rotated to form the wires W into a cable X, each wire W would have a twist imparted thereto for each rotation of the head 22 through an angle of 360°. This usually is undesirable, and therefore means are provided whereby each reel-supporting frame is rotated in the reverse direction to that of the rotation of the head 22. Therefore all of the reel-supporting frames 27 and 29 are rotatably mounted on the head 22. The wires W supplied from the front reels 28 converge towards the cable-forming point defined by the die 19 supported by the post 20. It is important that the wires supplied by the rear reels 30 shall take a similar path, and in order that such rear wires may travel freely towards the cable-forming point, the wire from each rear reel 30 is led through a passage or an opening extending through the rotating head 22, and such opening is disposed at the axis about which each reel-supporting frame 29 rotates.

Means for rotatably supporting the front reel-frames 27 and rear reel-frames 29 will now be described, together with gear means provided for rotating each reel-frame in the reverse direction to that in which the head 22 is turned and at a speed that will cause each reel-frame to turn through one complete revolution for each revolution of the head 22.

To rotate the reel-frames in the manner just described there is provided, in accordance with the present invention, the sun gear or fixed gear 31 which is mounted concentric with the shaft 13 and is supported in its non-rotating position by the tubular bracket 32 that has the flange 33 bolted to the bearing 12. As shown, four gears 34 are mounted upon the head 22 adjacent its rear wall 24 and are spaced 90° apart as shown in Fig. 2. These constitute four planetary gears which mesh with and are rotated by the sun gear 31 as the supporting shaft 35 for each such gear is advanced by the head 22 in a circular path about the sun gear. Each gear 34 is rigidly secured to its shaft 35 which is journaled in the opposite walls 23 and 24 of the head 22, as best shown in Fig. 1. It should be noted that each shaft 35 is provided with a gear at each end thereof, that is, a gear 34 disposed at the rear wall of the rotating head and a similar gear 36 rigidly secured to the other end of the shaft 35 near the front wall 23. The arrangement is such that the rear planetary gears 34,

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through a series of rear gears to be described, turn the rear reel-frames 29, and the front gears 36 through a similar series of gears, to be described, turn the front reel-frames 27. All of the gears shown are keyed or otherwise rigidly secured to relatively long supporting shafts that are journaled in both walls 23 and 24 of the rotating head 22, as will be apparent from Fig. 1.

Having described the fixed sun gear 31 and the planetary gears 34 which mesh therewith, the gears provided to impart rotative movement from such gears 34 to the rear reel frames 29 will now be described, and at the outset it is desired to state that in the present construction each rear gear 34 serves to drive a group of three reel-frames 29, as will be seen by observing the group of gears shown in Fig. 2 in the upper quadrant of the head 22, and wherein the guard or cover plate for these gears is broken away so that the gears for driving a group of three reel-supporting frames are seen in full lines. Now referring to the quadrant just mentioned, it will be noted that the upper gear 34 meshes with and drives a gear 37 in the direction indicated by the arrow and which gear is supported by its shaft 38. This gear 37 serves to drive a pair of gears 39 which mesh therewith and are supported by their shafts 40 and rotate in the direction indicated by the arrows. These gears 39 mesh with and drive three larger gears 41 each of which is rigidly secured to and is rotatably supported by a hollow shaft 42. Each group of the three larger gears 41 are geared together by an idler gear 42'. The gears 41 are larger than the intermediate gears 34, 37 and 39 and are the same size as the fixed sun gear 31. As a result of this, each complete rotation of the head 22 in one direction will cause a complete rotation of the gears 41 in the opposite direction. Each gear 41 has rigidly secured to its outer face, as shown in Fig. 3, a reel-supporting frame 29 that supports a wire reel 30, and as a result of the operation of the gear just mentioned, the supporting axis for the reel 30 will remain parallel to the base 10 of the machine throughout the rotation of the head 22. This is desired to prevent the wires W from being twisted about their own axis as they are supplied to the cable-forming die 19. It will be understood that all twelve rear reel-frames 29 are operated from one of the four planetary gears 34, so that the axis of each reel is maintained parallel to the ground throughout the rotation of the head 22, as will be apparent from examining the reels 28 as shown in Fig. 4. The gears for operating most of the reel-frames 29 are not shown in Fig. 2 because they are covered by the disc-like gear guard plate 43 which is removably secured to the head 22 in spaced relation to the wall 24 of such head. As a wire W is unwound from a rear reel 30 it passes under a small roller 44 and then through the hollow shaft 42. It then passes through the opening 17'' in the wire guide disc 17 and extends in an inclined direction through one of the notches 18' in the lay plate 18 to the cable-forming die 19.

Having described the gears disposed at the rear face of the rotating head 22 and the manner in which they operate, the similar gears disposed at the front face of the rotating head and which rotate the reel-frames 27 will now be described. As above mentioned the forward end of each shaft 35 is provided with a gear 36 of the same size as the gear 34 so that the two gears 34 and 36 rotate together. Each front planetary gear 36 has meshing therewith a gear 45, which is rotatably supported by a shaft 46. Each gear 45 has meshing therewith two gears 47, each of which is rotatably supported by a shaft 48. Each gear 47 drives a pair of larger gears 49 secured to shafts 50. The arrangement is such that each front planetary gear 36 drives a group of three large outer gears 49 and each of these outer gears has rigidly secured thereto a reel-supporting frame 27. Each group of the three larger gears 49 are geared together by an idler gear 50'. All of the front gear's are protected by a removable cover plate 51 secured to the portion 25

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of the rotating head. The cover plate 51 is provided with openings 51' to permit the passage of the wires W from the rear reels 30.

All of the reel-supporting frames 27 and 29 are similar in construction, and the means for removably mounting a wire-supporting reel upon one of these frames is shown in Fig. 3, wherein it will be seen that the reel 30 has the reel-supporting shaft 52 extending centrally through this reel, and this shaft is threaded at one end as indicated at 53. It has the enlargement 54 near its other end to provide a shoulder that abuts against one end of the reel 30, and adjacent the portion 54 of this shaft is a further enlargement 55. The portion 53 of this shaft is threaded into the sleeve portion 56 that is rotatably supported by the bearing 57, and this portion 56 has the grooved brake wheel 58. The other end portion of the shaft 52 with the enlargements 54 and 55 fits in a sleeve 59 that is rotatably supported by the bearing 60. The reel 30 is non-rotatably attached to the brake member 58 by the pins 61 that enter holes in a flange of the reel, as shown, and the shoulder of the enlarged portion 54 of the shaft holds the flange of the reel against the brake member 58. The reel supporting shaft 52 is screwed into the sleeve 56 as shown and is locked in this position by tightening a bolt 62 that extends transversely through the split sleeve 59, so that when this bolt 62 is tightened it will cause the sleeve 59 to pinch the enlarged portions 54 and 55 of the shaft 52 and prevent the same from becoming unscrewed. In order to prevent the reel 30 from rotating too freely as the wire is pulled therefrom, its rotation is retarded by a brake strap 63 having one end anchored to the base of the reel-frame and the major portion of this strap is looped about the groove in the brake member 58, a spring 64 secured to the other end of this strap serves to tension the brake band about its brake disc.

When the cable is formed of a number of wires as herein contemplated and as indicated by W, these wires are usually wound spirally about a central core C which travels to the cable-forming position through a central hole formed in the rotating shaft 13 as shown. Referring to Fig. 1, the core C having the wires W wound helically therearound is pulled forward, by a conventional mechanism such as capstan B, in a well-known manner, to draw the wires W from the various supply reels 28 and 30 forward to form the desired cable X.

Referring to the upper portion of Fig. 2 it will be noted that the large gears 41 shown as disposed at the rear face of the rotating head, and which are shown in full lines, are spaced a short distance apart, and that each gear 49 disposed at the front face of the rotating head, and which are shown in dotted lines, is disposed half-way between a pair of gears 41. This arrangement is employed so that the wire W coming from a rear reel 30 will pass between and will not interfere with a pair of reels at the front face of the rotating head.

Since the rotating head 22 having twenty-four wire supply reels mounted thereon is relatively heavy, it will have considerable momentum when rotating. Therefore it is desirable to have a strong brake mechanism for quickly arresting the rotation of the head when it is desired to stop the machine. The rotating head is therefore preferably provided with the brake mechanism shown in Fig. 4, and which comprises the pivoted uprights 65 disposed at opposite sides of the supporting base 10 and pivotally secured to such base by the pivot pin 66 supported by brackets 67 bolted to the base plate 10. Each lever 65 has pivotally secured to the intermediate portion thereof a brake shoe 68. The arrangement is such that when a pull is exerted upon the upper ends of the levers 65 forcing them towards each other the brake shoes will be pressed against the surface 26 of the head 22 to arrest the rotation of such head. In the construction shown the upper ends of the levers 65 are continuously urged towards each other by the connecting rod 69 and coil spring 70 that encircles a projecting end of

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the rod 69. This spring is adjustably secured on the rod 69 by the nuts 71. The spring will apply the brakes with a predetermined braking action. When the machine is running the brakes are held in the off-position by the rod 72 which has one end pivotally connected to a lever 65, and the other end has secured thereto a piston 73 that slides within the compressed air cylinder 74 that is supplied with compressed air by the hose 75. This cylinder is pivotally connected to the other lever 65. The arrangement is such that as long as compressed air is supplied to the cylinder by a hose 75 the brakes will be held in the off-position.

It will be seen from the foregoing that the cable-making machine of the present invention has a very compact construction in that the wire-supplying reels are mounted relatively close to each other on both faces of the rotating head 22, and that all bearing support for the head 22 is at the rear of this head. It will also be seen that since the reel-frames which support these reels extend outwardly from flat clean faces of the rotating head, it is relatively easy to service the machine by oiling the same, and by supplying it with full reels and removing empty reels. It will further be noted that all gears are covered and well protected by the cover plates 43 and 51, and that the brake operating levers 65 serve not only to apply the brake shoes but also as guards to protect the workman from coming in accidental contact with the rotating head 22. Furthermore the wires from the rear reels 30 travel with very little friction through the rotating head and then to the die 19.

These features all contribute to form a compact and well designed machine that can be operated at high speed. The cable X is preferably provided with a textile cover, not shown, to protect the same and hold the wires in place.

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

1. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face, reels rotatably mounted on said reel-frames, each reel-frame on said rear face having a hollow supporting shaft extending through said head to provide a passage through which the strand from the reel on such reel-frame can pass through the head, means for driving said head to cable together the strands from the reels, and means for pulling the cabled strands forward from their reels.

2. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face, reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame through which a strand from the reel on such reel-frame can pass, means for rotating the head to cable the strands supplied by the reels on said reel-frames, mechanism for rotating the front and rear reel-frames in the reverse direction to that in which the head is rotated, and means for pulling the cabled strands forward from their reels.

3. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face and a gear secured to each reel-frame to rotate it, reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame and disposed at the rotational axis of said rear reel-frame to receive a strand from a reel thereon, means for rotating the head to cable the strands supplied by the reels of said reel-frames, planetary mechanism for operating said gears so as to turn the front and rear reel-frames in the opposite direction to the head rotation, and means for pulling the cabled strands forward from their reels.

4. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face,

reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame through which a strand from the reel of such reel-frame can pass, a shaft for supporting and rotating the head, said shaft being supported solely by a bearing at the rear of the head, and means for pulling the cabled strands forward from the reels.

5. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face and a gear secured to each reel-frame to rotate it, reels rotatably mounted on said reel-frames, each reel-frame on said rear face having a hollow supporting shaft that provides a passage through which the strand from the reel on such reel-frame can pass through the head, means for rotating the head to cable the strands supplied by the reels of said reel-frames, a fixed sun gear disposed adjacent to and concentric with said head, and trains of gears between the sun gear and the gears secured to said reel-frames and operable to control the rotation of such reel-frames as the head rotates, and means for pulling the cabled strands forward from their reels.

6. In a machine for making cables, the combination of a rotating cylindrical head having a front and rear face, a number of reel-frames rotatably mounted on each face, reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame through which a strand from the reel on such reel-frame can pass, means for turning said head to cable together the strands from the reels on said reel-frames, means for pulling the cabled strands forward from their reels, and a brake that acts upon the cylindrical surface of said head to stop its rotation.

7. In a machine for making cables, the combination of a rotating head having a front face and a rear face, a number of reel-frames rotatably mounted on each face, reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame through which a strand from the reel on said reel-frame can pass, a shaft for supporting said head, said shaft being supported solely by a bearing at the rear of said head, means for rotating the head to cable the strands supplied by the reels on said reel-frames, mechanism for rotating the front and rear reel-frames in the reverse direction to that in which the head is rotated, and means for pulling the cabled strands forward from said reels.

8. In a machine for making cables as in claim 7, a brake mechanism that acts upon said head to stop its rotation.

9. In a machine for making cables, the combination of a rotatable head having a front face and a rear face, a number of reel-frames rotatably mounted on each face so that the rear reel-frames are out of alignment with the front reel-frames, a gear secured to each reel-frame to rotate it, reels rotatably mounted on said reel-frames, said head having a passage therethrough adjacent each rear reel-frame and disposed at the rotational axis of said

rear reel-frame to receive a strand from a reel thereon, a shaft for supporting said head, said shaft being supported solely by a bearing at the rear of said head, means for rotating said shaft and head to cable the strands supplied by the reels of said reel-frames, planetary mechanism for operating said gears so as to turn the front and rear reel-frames in the opposite direction to the head rotation, means for pulling the cabled strands forward from said reels, and a brake mechanism comprising movable means engageable with said head, means for actuating said movable means to stop said head, and means for reversing said movable means to permit rotation of said head.

10. In a machine for making cables, the combination of a rotating cylindrical head having a front face and a rear face, a number of reel-frames rotatably mounted on each face so that all frames are disposed the same distance from the central axis of the head but the rear reel-frames are out of alignment with the front reel-frames, a gear secured to each reel-frame to rotate it, reels rotatably mounted on said reel-frames, each reel-frame on said rear face having a hollow supporting shaft extending through said head to provide a passage through which a strand from the reel on said reel-frame can pass through the head, guide means for guiding a strand from the reel of each reel-frame to a cabling point, a shaft for supporting said head, said shaft being supported solely by a bearing at the rear of said head, means for rotating said shaft and head to cable the strands supplied by the reels of said reel-frames, a fixed sun gear disposed around said shaft, adjacent to and concentric with said head, trains of gears between the sun gear and the gears secured to said reel-frames and operable to control the rotation of said reel-frames as said head rotates so that said reel-frames rotate in the opposite direction to the head rotation, means for pulling the cabled strands forward from said reels, and a brake mechanism comprising a pair of pivotal arms disposed on opposite sides of said head, brake shoes on said arms and engageable with the cylindrical surface of said head, resilient means for pivoting said arms and shoes towards said head to stop its rotation, and fluid-operated means for pivoting said arms and shoes away from said head to permit its rotation.

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