

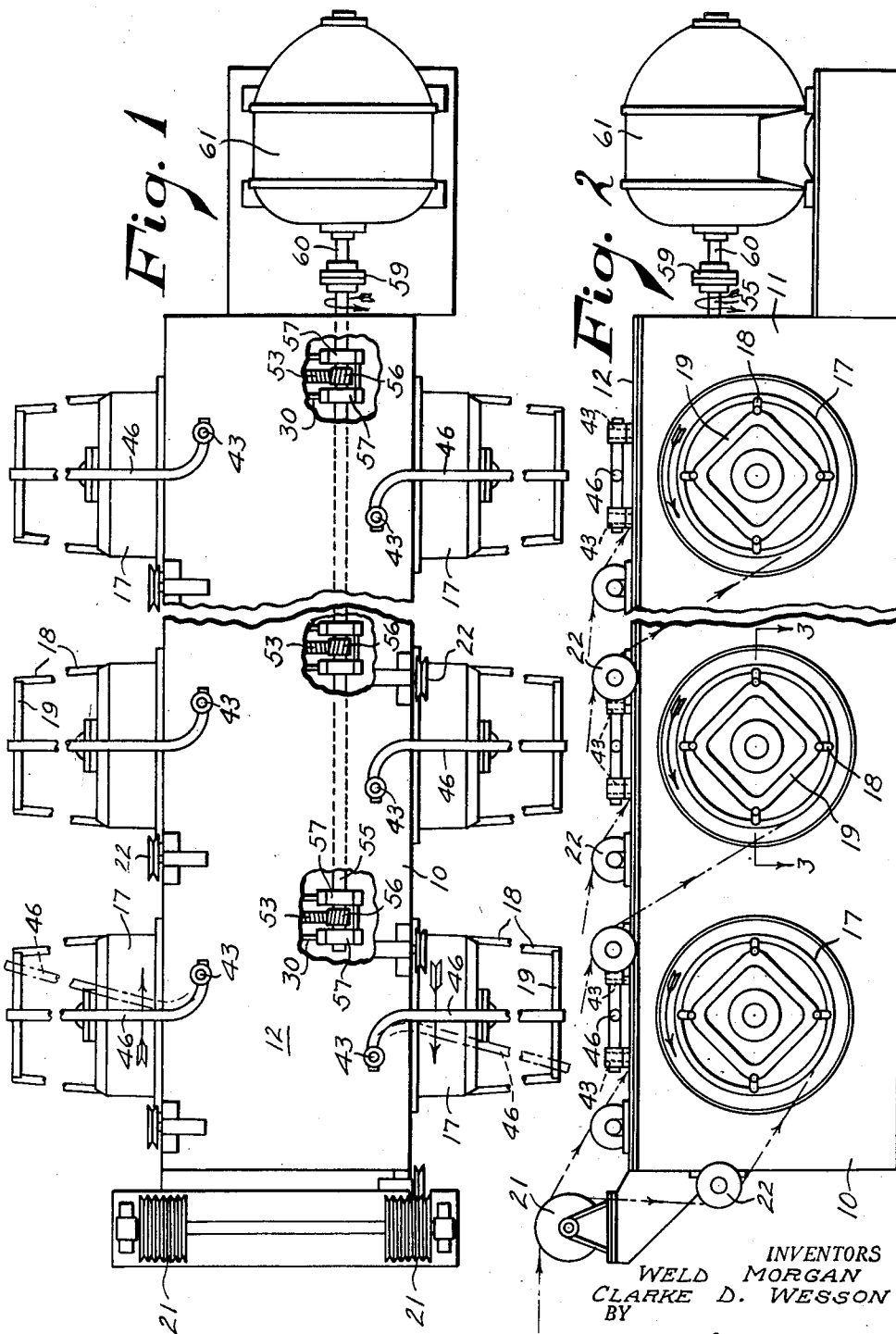
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W. MORGAN ET AL
WIRE COILING MACHINE

2,607,541

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3 Sheets-Sheet 1



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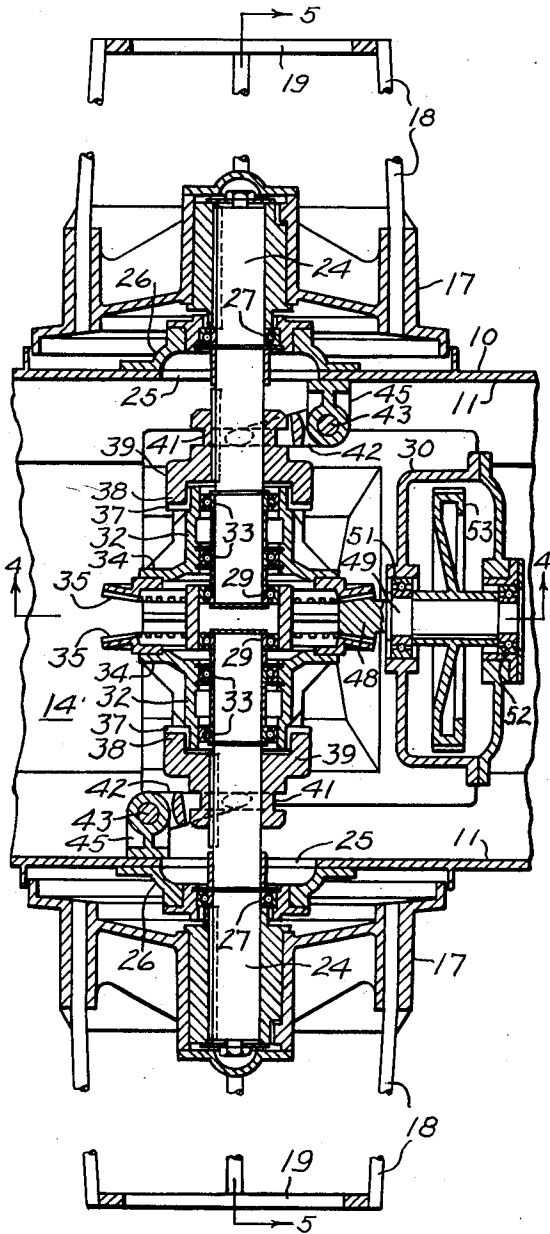


Fig. 3

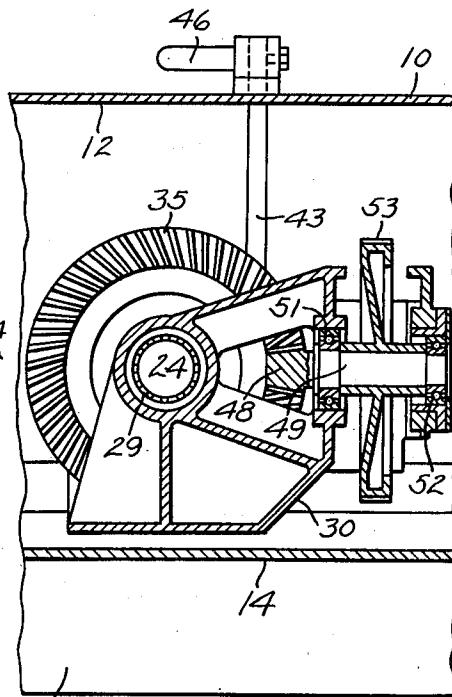


Fig. 4

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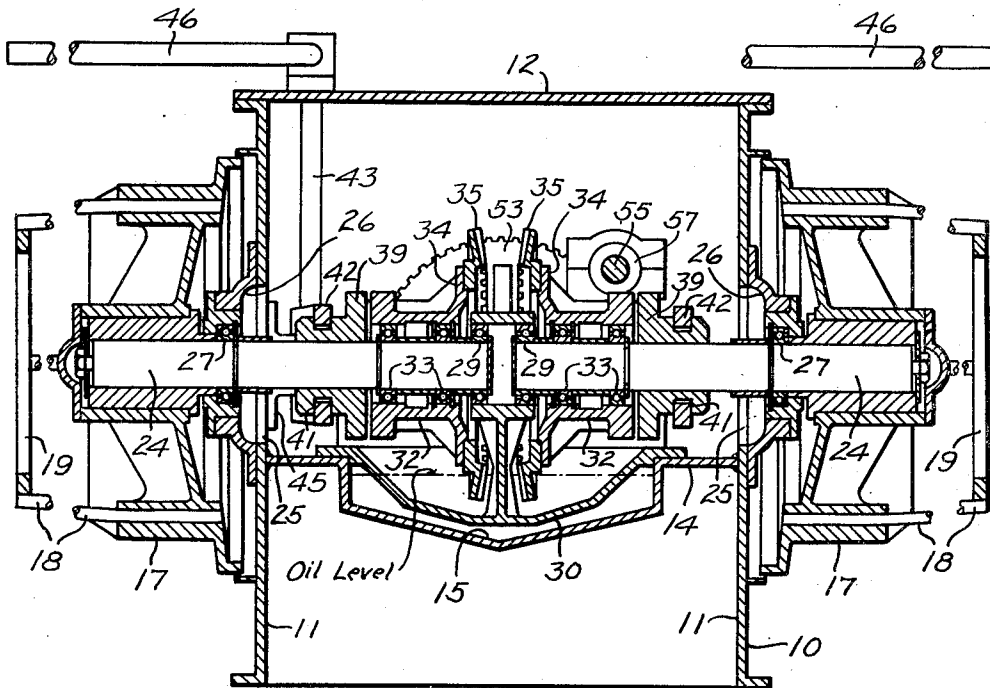


Fig. 5

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WIRE COILING MACHINE

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5 Claims. (Cl. 242—25)

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This invention relates to wire take-up frames, and more particularly to machines for pulling strands of wire through various apparatus and coiling these strands into annular bundles.

Wire take-up frames are commonly employed in connection with furnaces for heat treating wire, and with apparatus for galvanizing wire, for patenting wire, and for carrying on various other processes in the manufacture of wire. The usual take-up frame includes an elongated structure which supports a series of transverse horizontal shafts, each shaft having two coiling drums or blocks mounted on its opposite ends. A main shaft extends longitudinally of the machine and carries a series of worms which mesh with worm gears on the transverse shafts. The main shaft is driven by an electric motor which is connected thereto by a speed-reducing gear unit.

These prior take-up frames have several important disadvantages. The blocks on one side of the machine form clockwise bundles of wire, whereas the blocks on the other side of the machine form counterclockwise bundles. As a result difficulties are encountered in the subsequent handling of the wire. The worm gearing is relatively inefficient in the transmission of power, particularly if a high ratio of speed reduction is employed. Consequently the tendency is to provide a lower ratio in order to increase the efficiency, but this increases the torque on the main shaft and necessitates a considerable increase in its diameter and weight. Furthermore, it is because of the relatively low speed of the main shaft that the speed-reducing unit is required between the main shaft and the driving motor.

It is accordingly one object of the invention to provide a wire take-up frame of a comparatively simple and dependable construction arranged to form a plurality of wire bundles simultaneously on both sides of the machine, with all the bundles coiled in the same manner.

It is a further object of the invention to provide a wire take-up frame in which no worm gearing is required.

It is a further object of the invention to provide a wire take-up frame having a longitudinal main drive shaft arranged to rotate at relatively high speeds, this shaft being comparatively small in diameter and adapted for direct connection to an electric motor.

It is a further object of the invention to provide a wire take-up frame having improved means for lubricating the various driving gears and for protecting these gears from dust and dirt.

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It is a further object of the invention to provide a wire take-up frame having an improved arrangement of clutches associated with the respective blocks, and particularly to provide a construction such that each block will be stopped automatically in the event of accident.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a top plan view of a wire take-up frame, with certain parts broken away for clearness of illustration;

Fig. 2 is a side elevation of the machine;

Fig. 3 is a section on an enlarged scale, taken on the line 3—3 of Fig. 2;

Fig. 4 is a section taken on the line 4—4 of Fig. 3; and

Fig. 5 is a section taken on the line 5—5 of Fig. 3.

The embodiment illustrated comprises a horizontally elongated hollow rectangular structure in the form of a dust-tight casing 10 which includes two opposed upright side plates 11, a horizontal top plate 12 supported on the upper edges of the side plates, a bottom plate 14 extending between the lower portions of the side plates, and two upright end plates (not shown). The bottom plate 14 is preferably shaped to provide a longitudinally extending trough 15, as shown in Fig. 5, for the retention of lubricating oil at approximately the level indicated.

On each side of the casing 10 there is provided a series of outwardly facing single flanged drums or blocks 17 rotatable about horizontal axes, each block being axially aligned with the corresponding block on the opposite side of the casing. The axes of all the blocks are located in a common horizontal plane. Each block is provided with four outwardly extending rods 18 which are connected at their outer ends to a hollow square frame 19, these rods serving to support the bundles of wire which are formed on the blocks. Two multi-groove idler sheaves 21 are provided at the front end of the casing and adjacent the opposite sides thereof to guide the wire strands approaching the machine, and separate single-groove idler sheaves 22 are mounted on the casing to guide the individual strands to the respective blocks 17 in known manner.

Referring now particularly to Fig. 3, it will be

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seen that each of the blocks 17 is mounted on the outer end of a horizontal rotatable shaft 24 which extends through an opening 25 in the adjacent side plate 11. This opening is closed by an annular plate 26 which carries an antifriction bearing 27 arranged to support the shaft 24 at the inner side of the block 17. The adjacent inner ends of each pair of aligned shafts 24 are mounted in antifriction bearings 29 carried by a bracket 30 which is supported by the bottom plate 14. The inner portion of each shaft 24 is surrounded by a quill 32 which is rotatably mounted on two axially spaced antifriction bearings 33 carried by the shaft. The inner end of each quill is provided with a flange 34 to which an inwardly facing bevel gear 35 is secured. The outer end of each quill is formed with notches 37 to receive teeth 38 on the inner end of a clutch member 39 which is slidably keyed to the shaft. This clutch member is provided with a circumferential groove 41 which is engaged by a shifter fork 42 secured to a vertical shaft 43. Each shaft 43 is supported at its lower end in a bearing bracket 45 mounted on the adjacent side plate 11 and extends upwardly through the top plate 12. To the upper end of each shaft 43 there is attached an elongated horizontal bar 46 which extends outwardly above the corresponding block 17 and substantially in a common vertical plane with the axis of the block. The inner ends of the bars 46 are bent laterally, as best shown in Fig. 1, for connection with the shafts 43. Furthermore, the shafts 43 for each pair of aligned blocks are located on opposite sides of the common axis of the blocks, the construction being such that each clutch will be disengaged by movement of its bar 46 in the direction of travel of the upper surface of the block therebeneath. This provides an important safety feature, as will be explained in connection with the discussion of the operation of the machine.

Returning now to Fig. 3, it will be seen that the two bevel gears 35 are engaged by a bevel pinion 48 of relatively small diameter which is carried on the overhung end of a shaft 49. This shaft extends at right angles with the shafts 24 and lies in a common horizontal plane therewith. It is supported in two axially spaced antifriction bearings 51 and 52 which are mounted in the bracket 30. To each of the pinion shafts 49 there is keyed a gear 53 which is preferably of the helical type with a diameter approximately equal to that of the bevel gears 35, so that all of these gears will dip into the oil in the trough 15. The gear 53 is located between the bearings 51 and 52.

Means is provided to drive all of the gears 53 simultaneously at the same speed and in the same direction. For this purpose there is provided a main horizontal shaft 55 (Fig. 1) which extends longitudinally at a level above that of the transverse block shafts 24. On this main shaft 55 there are mounted helical pinions 56 which mesh with the respective gears 53 to drive the same. The main shaft and the pinions 56 are rotatably supported in bearings 57 carried by the brackets 30, there being a bearing at each side of each pinion 56. A coupling 59 connects this main shaft directly to the shaft 60 of an electric motor 61.

The operation of the invention will now be apparent from the above disclosure. The main shaft 55 will be rotated in the direction indicated by the arrow in Fig. 1 by means of the motor 61, thereby rotating the bevel pinion shafts 49 at a considerably reduced speed through the medium

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of the pinions 56 and gears 53. The bevel pinions 48 will drive the bevel gears 35 and the quills 32 at a further considerable reduction in speed. With the teeth 38 engaging the notches 37, the quills 32 will drive the clutch members 39, the shafts 24, and the blocks 17. The strands of wire to be coiled will travel over the sheaves 21 to the sheaves 22 and thence to the respective blocks, as indicated by the broken lines in Fig. 2. Because of the bevel gearing, the blocks at one side of the machine will all rotate in one direction, and the blocks at the other side of the machine will all rotate in the opposite direction. However, the two sets of blocks face outwardly in opposite directions from the casing 10, and they will all rotate in a counter-clockwise direction when viewed from their outer ends. Consequently the wire at both sides of the machine will be wound in a counter-clockwise direction and all the wire bundles will be alike. The bundles will be supported on the block pins 18. As each bundle reaches a sufficient size the operator will cut the wire, leaving several convolutions on the block, and immediately bend the new front end around one of the pins 18, whereupon he will pull the bundle outwardly from the pins and drop it on the floor, all without stopping the block.

An expert operator can strip bundles in this manner from blocks 16 inches in diameter at speeds exceeding 40 revolutions per minute. If by any chance the operator should become caught by the block or bundle, he would immediately be carried into contact with the associated bar 46 and move the same in a generally lateral or broadside direction, as indicated by the broken lines in Fig. 1. Such movement of the handle 46 will turn the vertical shaft 43 and swing the clutch fork 42 to slide the clutch member 39 outwardly and withdraw the clutch teeth 38 from the notches 37. This will instantly stop the rotation of the block 17 and its shaft 24, while the quill 32 continues to revolve on its bearings 33.

Since there is a double speed reduction between the main shaft 55 and the blocks 17, the main shaft can rotate at a fairly high speed and in most cases it can be directly connected to the motor shaft 60, as illustrated, without the necessity for a separate speed-reducing unit. Thus if a reduction ratio of say 8 to 1 is provided in each helical gear set 53-56 and in each bevel gear set 35-48, there will be an over-all reduction ratio of 64 to 1. With this ratio, a block speed of say 20 R. P. M. would require a main shaft speed of 1280 R. P. M. At such a speed a main shaft of relatively small diameter will transmit considerable power without excessive torque. The gearing is of an efficient type, and it will be continuously lubricated by oil which is carried upwardly to the meshing point by the gears 35 and 53, the lower portions of these gears being immersed in the oil in the trough 15. The driving gears, clutches, and bearings are entirely enclosed within the casing 10 and are completely protected against dust, water, and other foreign matter.

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

1. A wire take-up frame comprising a horizontally elongated structure, two series of rotatable single-flanged wire-coiling blocks on opposite sides of the structure and facing outwardly therefrom, the axis of each block being aligned with the axis of the corresponding opposite block and each block being constructed for outward strip-

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ping of wire bundles therefrom while the block is rotating, a horizontal drive shaft for each block, an inwardly facing bevel gear adjacent the inner end of each drive shaft, means connecting the bevel gears to the corresponding shafts, a bevel pinion meshing with each pair of adjacent bevel gears, a supporting shaft for each pinion, a horizontal main shaft extending longitudinally within the said structure, and speed-reducing gearing connecting the main shaft to the pinion shafts.

2. A wire take-up frame comprising a horizontally elongated structure, two series of rotatable single-flanged wire-coiling blocks on opposite sides of the structure and facing outwardly therefrom, the axis of each block being aligned with the axis of the corresponding opposite block and each block being constructed for outward stripping of wire bundles therefrom while the block is rotating, a horizontal drive shaft for each block, an inwardly facing bevel gear adjacent the inner end of each drive shaft, means connecting the bevel gears to the corresponding shafts, a bevel pinion meshing with each pair of adjacent bevel gears, a horizontal supporting shaft for each pinion, a gear on each pinion shaft, a horizontal main shaft extending longitudinally within the said structure, and a series of pinions on the main shaft and each meshing with one of the pinion shaft gears.

3. A wire take-up frame comprising a horizontally elongated hollow casing including two upright side plates, two series of horizontal rotatable shafts extending through the respective side plates, an outwardly facing single-flanged wire-coiling block mounted on the outer end of each shaft, each block being constructed for outward stripping of wire bundles therefrom while the

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block is rotating, an inner bearing for the inner end of each shaft, an outer bearing for each shaft mounted on the adjacent side plate, a hollow quill surrounding each shaft, two axially spaced bearings mounted on each shaft and rotatably supporting the quill, an inwardly facing bevel gear on each quill, a rotatably supported bevel pinion meshing with each pair of adjacent bevel gears, means to drive all the bevel pinions in unison, a clutch member slidably keyed to each shaft outwardly of the quill, the clutch member and the quill having interfitted parts, and means to slide each clutch member outwardly to disengage it from the adjacent quill.

4. A wire take-up frame as set forth in claim 2, in which the elongated structure includes means providing a longitudinally extending trough arranged to retain a body of oil in which the lower portions of the bevel gears and of the pinion shaft gears are immersed.

5. A wire take-up frame as set forth in claim 2, in which the main shaft is located above the plane of the block shafts.

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