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ROLLER CLOSING DIE ARRANGEMENT FOR USE IN STRANDING MACHINES

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Fig. 1.

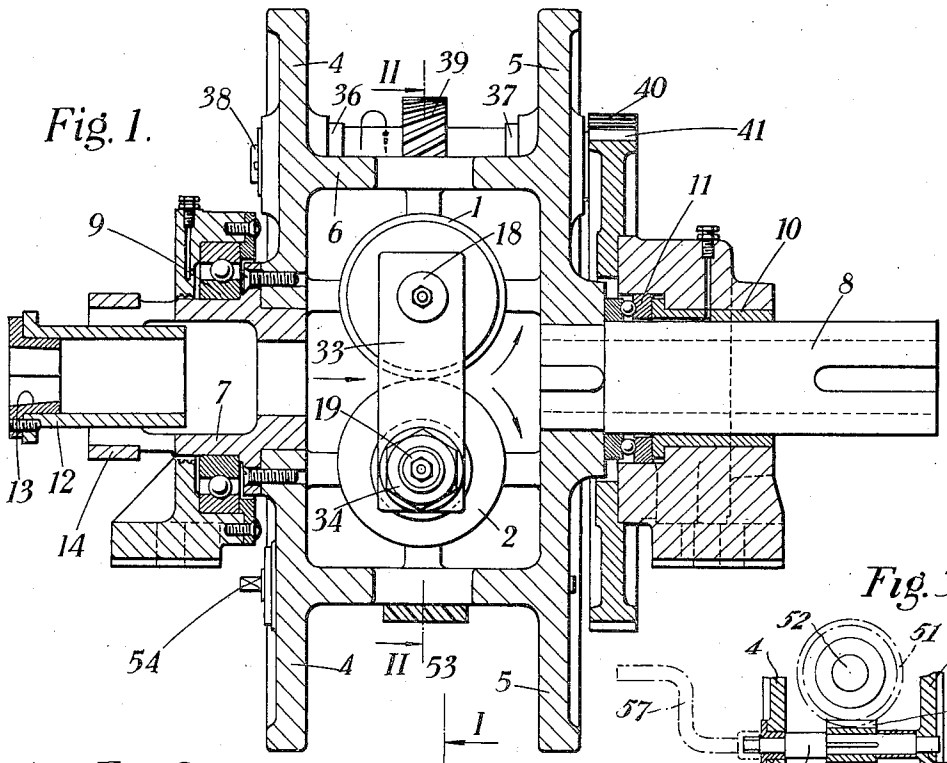
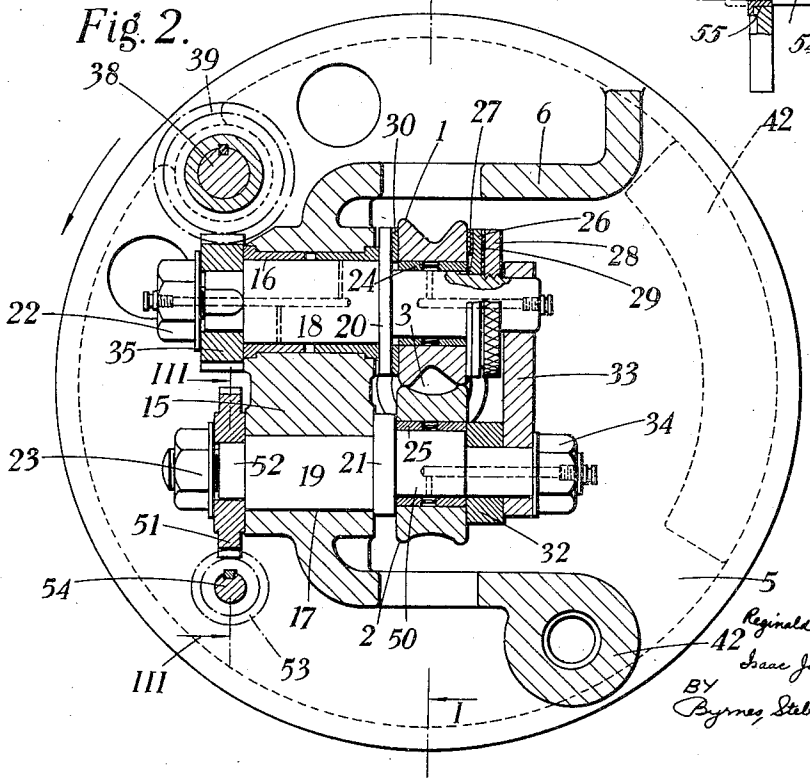


Fig. 3

Fig. 2.



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ROLLER CLOSING DIE ARRANGEMENT FOR USE IN STRANDING MACHINES

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9 Claims. (Cl. 117—50)

The present invention relates to roller closing die arrangements or stranding heads for use in machines for the manufacture of stranded electric conductors, wire ropes, cables and the like. Such dies are formed of a number of rolls of which the peripheral surfaces are shaped to co-operate to form a closing die aperture of appropriate size and shape. In some instances it is desirable to vary slightly the size of the aperture by adjusting the distance between the rolls. In many cases it is necessary to make the closing die of non-circular shape and to rotate the head slowly about an axis passing through the die in order to impart to the strand a helical formation the pitch and diameter of which is such that the axis lies always within the strand. A strand of this form is usually referred to as a pre-spiralled strand. In British patent specification No. 354,927 there is described and claimed an arrangement in which, in order to avoid excessive tension on the finished strand between the roll die and the draw-off capstan, one (or more) of the rolls forming the die is driven by power transmitted to it through a slipping coupling. This coupling is used to proportion the value of the torque applied to the driven roll relative to that applied to the draw-off capstan. It is an object of the present invention to provide an improved form of construction and mounting of the rolls in a roller die stranding head and, in cases where the head is rotated and one or more of the rolls is driven through a slipping coupling, to furnish an improved form of drive to such roll or rolls.

In accordance with this invention, the adjustment of the rolls is provided for by constructing one of the rolls and its shaft as separate parts. The roll shaft is rotatably mounted in supporting means with one end thereof projecting beyond the supporting means. On this projecting end of the shaft is a part that is eccentric to the part of the shaft within the supporting means. The roll is in the form of a ring and is rotatably mounted on the eccentric part. Means are provided for locking this roll shaft in any desired angular position in its support. In the case of a driven roll rotating stranding head each driven roll and its shaft are formed as separate members and we rotatably mount the roll shaft in supporting means with one end thereof overhanging the supporting means. The roll is rotatably mounted on the overhanging end of the shaft and the slipping coupling, determining the value of torque to be applied to the driven roll is also mounted on the overhanging end of the roll shaft and interposed between the roll shaft and the driven roll. It will be appreciated that each of the above described methods of roll mounting facilitates changing of the rolls. In many cases changing of one roll will necessitate changing of the remaining roll or rolls forming the die. Consequently, in roll dies in which one of the rolls is not mounted in one or the other of the ways above described, it will be advantageous also to construct such roll as a ring shaped member and to mount it detachably on the overhanging end of its shaft in order not to reduce the facility with which a set of rolls forming a die may be replaced by another set.

The invention will be further described with reference to the accompanying drawing which shows, by way of example only, a roller closing die arrangement or stranding head for use in the manufacture of pre-spiralled non-circular strand.

In the drawing

Figure 1 is a view of the head, partly in section on the line I—I in Figure 2 and partly in, what will be termed for convenience of description, elevation,

Figure 2 is a cross-sectional view of the head taken on the line II—II in Figure 1, and

Figure 3 is a fragmental cross-sectional view of the head taken on the line III—III in Figure 2.

Referring now to the drawing, it will be seen that the stranding head comprises a pair of shaped die rolls 1, 2, which co-operate to form a closing die with a sector-shaped aperture 3. The rolls are mounted in a rotatable box or carrier formed of a pair of parallel discs 4 and 5 united by a single member 6 of channel section. The carrier is rotatably mounted on trunnions 7 and 8 projecting outwardly from the centre of the discs 4 and 5 respectively. The trunnion 7, which is apertured to permit the passage of wires converging to form the stranded conductor, is supported in a ball bearing 9, and the trunnion 8, which is apertured to permit the passage of the finished strand, is supported in a plain bearing 10 with which is associated a ball thrust washer 11 which takes up the axial thrust caused by tension present in the part of the finished strand between the roller die and the take-up mechanism. Axially and angularly slidable in the trunnion 7, on the entry side of the stranding head, is a die holder 12 carrying a preliminary shaping die 13 which may be clamped in any desired position by an embracing clamp 14 fitted on the split end of the trunnion. The web portion 15 of the channel member 6 carries the bearing 16 for the roll shaft 18 and forms a support 17 for the roll shaft 19. These shafts are respectively axially positioned

by collars 20 and 21 and locking nuts 22 and 23. The die rolls 1 and 2 are respectively rotatably mounted on those portions of the shafts 18 and 19, which respectively overhang the inside end of the bearing and support. Soft metal bushings 24 and 25 are inserted between the rolls and their respective shafts. The roll 1 is driven through a slipping coupling mounted on the roll shaft 18 between the roll 1 and the adjacent end of the shaft. This coupling comprises a disc 26 carrying a friction lining 27 which engages the adjacent side surface of the roll. The disc 26 is constrained to rotate with the roll shaft 18 but is capable of axial movement relative thereto. A nut 28 operating on a screw thread on the shaft controls, through a spring disc 29, the position of the disc 26 and consequently, also the pressure between the parts of the slipping coupling. A soft metal liner 30 is disposed between the roll and the collar 20 to avoid excessive wear of these parts. It will be appreciated that the above described location and construction of slipping coupling is particularly advantageous in that its adjusting means is clear of all gear wheels and in a most accessible position. Consequently, adjustments of the power supplied to the roll can be made while the head is in operation.

The other roll 2 is not driven, except by frictional engagement with the driven roll 1 and with the strand passing through the roll die, and rotates, between the fixed collar 21 and removable collar 32, on a portion 50 of the shaft 19, which is eccentric to the portion carried in the support 17. The shaft 19 is capable of being rotated in its support 17 but is normally locked in any desired angular position by a worm wheel 51 secured on the outer overhanging end 52 of the shaft and engaging a worm 53 carried on a shaft 54 supported in bearings 55 and 56 in the discs 4 and 5 respectively. By turning the shaft 54 by means of the key 57 the distance between the rolls may be adjusted. In Figures 1 and 2 of the drawing, the rolls are shown in contact with each other and with the axis of the driven roll and its shaft, of the idle roll and of that part of the roll shaft 19 which lies in the support 17, all lying in one plane. This arrangement provides that the rolls are moved apart very gradually at first and then more rapidly, thus ensuring extremely fine adjustment of the clearance when the rolls are in an operative position. In some cases, however, it may be advantageous to arrange that the axis of the portion (or portions) of the adjustable roll shaft in the support lies distant from the plane passing through the axes of the rolls when these are in contact with one another, by an amount approximately equal to the eccentricity of the eccentric portion on which the adjustable roll is rotatably mounted. This provides that the axis of the adjustable roll will, when being withdrawn from the other roll or rolls, move for some distance approximately in the said plane. This avoids to a great extent longitudinal displacement of the die aperture (that is displacement in the direction of the strand passing therethrough) when minor adjustments in the size of the die opening are made. It will be appreciated that the adjusting device may be applied to more than one of the roll shafts in the stranding head.

The extreme ends of the two roll shafts are linked by a bearing plate 33 to prevent the possibility of the roll shafts springing during the passage of the strand through the die. The plate 33 is normally retained in position by a single nut 34 on the screw-threaded end of the roll shaft 19. The driving wheel of the roll shaft 18 takes the form of a spiral gear wheel 35 mounted between the outer end face of the bearing 16 and the locking nut 22. In bearings 36 and 37 housed in bosses on the discs 4 and 5 respectively, is rotatably supported a shaft 38 having its axis parallel with the axis of rotation of the stranding head. On this shaft 38 are secured a spiral wheel 39 and a spur pinion 40. The former is disposed between the bearings 36 and 37 and engages the spiral driving wheel 35 on the driven roll shaft 18. The spur pinion 40 is disposed on the projecting end of the shaft 38 and engages a fixed spur wheel 41 mounted on the support carrying the bearing 10 and concentrically disposed with regard to the trunnions 7 and 8. Rotation of the head, for instance through a chain wheel keyed on the outer end of the trunnion 8, causes the pinion 40 and its shaft 38 to rotate about their axis. This rotary movement is transmitted to the driven roll shaft 18 through the spiral gears 39 and 35. It will be apparent that it will be desirable to balance the head, for instance, by means of balance weights 42.

This improved construction of stranding head possesses several advantages over the known forms of construction. Interchanging of the rolls is greatly facilitated. For instance in the case of the head shown in the drawing, to withdraw the rolls it is merely necessary to remove first of all the locking nut 34 and then withdraw the bearing plate 33 linking the ends of the roll shafts. After that the nut 28 positioning the friction disc and the disc itself are withdrawn. The rolls 1 and 2 can then both be withdrawn from their shafts and be replaced by other rolls. The rolls can therefore be interchangeable, are easily detached and cheap in manufacture. Moreover much less storage room is required for a complete set or roller dies constructed according to the present invention than with roller dies formed of rolls fixed on their shafts. The improved method of supporting the rolls also has the advantage of permitting full view of the rolls and strand during the stranding operation whereas in the known constructions the walls carrying the roll shaft bearings obstruct the view. When it is necessary to thread the wires through the die at the beginning of the stranding operation, the space between the rolls can be set to a maximum and afterwards the rolls may be readily adjusted to any pre-determined position. This is facilitated by the provision of a scale on the die box and a pointer on the worm spindle or vice versa.

What we claim as our invention is:—

1. In a rotating stranding head for use in a machine for the manufacture of pre-spiralled non-circular strand, a bearing, a roll shaft rotatably mounted in said bearing with one end overhanging the bearing, a roll in the form of a ring rotatably mounted on the overhanging end of the said roll shaft, a slipping coupling interposed between the roll shaft and the roll, means for imparting rotation to the roll shaft, and at least one other roll rotatably mounted in the head and co-operating with the first said roll to form a closing die.

2. A stranding head for use with a machine for the manufacture of pre-spiralled strand, comprising a rotatable carrier formed of a pair of parallel discs united by a member of channel section, supporting means for said carrier, a pair of bearings located in the web portion of the

said channel member, a pair of shafts each rotatably supported in one of said bearings and having an end overhanging the bearing and lying within the channel, a pair of ring shaped rolls co-operating to form a roll die and detachably mounted, one on the overhanging end of each shaft, a slipping coupling disposed adjacent to one of said rolls and coupling it to its shaft, and means for imparting rotation to the shaft to which the roll is coupled.

3. In a stranding head comprising a plurality of rolls cooperating to form a closing die for use in a machine for the manufacture of wire rope or strand, a roll shaft rotatably mounted in supporting means with one end thereof projecting beyond said means, a ring shaped roll forming part of the closing die and rotatably mounted on the said projecting end on a part of the shaft that is eccentric to the part within the supporting means, and means for locking said shaft against rotation in any desired angular position in its supporting means.

4. A stranding head for use with a machine for the manufacture of pre-spiralled strand, comprising a rotatable carrier, a plurality of shafts mounted in supporting means in said carrier with one end of each shaft projecting beyond its supporting means, and a plurality of ring-shaped rolls cooperating to form a roll die and detachably mounted, one on the said projecting end of each shaft, one of said shafts being capable of angular movement in its supporting means but normally locked against such movement and having its roll rotatably mounted on a part that is eccentric to the part within said supporting means.

5. In a stranding head comprising a plurality of rolls cooperating to form a closing die for use in a machine for the manufacture of wire rope or strand, shaft supporting means, a roll shaft rotatably mounted in said means with one end thereof projecting beyond said means, a ring shaped roll forming part of the closing die and rotatably mounted on the said projecting end on a part of the shaft that is eccentric to the part within said supporting means, a worm wheel secured on said roll shaft, a rotatable spindle disposed transversely to said roll shaft, supporting means for said spindle, and a worm secured on said spindle and engaging said worm wheel.

6. A stranding head for use with a machine for the manufacture of pre-spiralled strand, comprising a rotatable carrier formed of a pair of parallel discs united by a member of channel section, supporting means for said carrier, a shaft mounted in shaft supporting means in the web portion of said channel member and having an end overhanging its supporting means and lying within the channel, a second shaft rotatably mounted in a second shaft supporting means in the web portion of said channel member and having an end which overhangs its supporting means and lies within the channel and comprises a part that is eccentric to the part within its supporting means, a pair of ring-shaped rolls cooperating to form a roll die, one detachably mounted on the overhanging end of first said shaft and the other detachably and rotatably mounted on the said eccentric part of the second said shaft, a worm wheel secured on the second said shaft, a rotatable spindle extending between said pair of discs, supporting means for said spindle comprising a pair of bearings, one in each disc, and a worm secured on said spindle and engaging said worm wheel.

7. In a rotating stranding head for use in a machine for the manufacture of pre-spiralled non-circular strand, a bearing, a roll shaft rotatably mounted in said bearing with one end overhanging the bearing, a roll in the form of a ring rotatably mounted on the overhanging end of the said roll shaft, a slipping coupling disposed adjacent to said roll and coupling it to its shaft, means for imparting rotation to the roll shaft, and at least one other roll rotatably mounted in the head and cooperating with the first said roll to form a closing die.

8. A stranding head for use with a machine for the manufacture of pre-spiralled strand, comprising a rotatable carrier, a plurality of shafts mounted in supporting means in said carrier with one end of each shaft projecting beyond its supporting means, a plurality of ring-shaped rolls cooperating to form a roll die and detachably mounted, one on the said projecting end of each shaft, one of said rolls being rotatably mounted on a shaft that is itself rotatably mounted in its supporting means, means for driving said rotatably mounted shaft, and a slipping coupling interposed between said rotatably mounted shaft and said rotatably mounted roll.

9. A stranding head comprising a carrier, a pair of shafts mounted in supporting means in said carrier with one end of each shaft overhanging its supporting means; a pair of ring shaped rolls cooperating to form a roll die and detachably mounted, one on the said overhanging end of each shaft, one of said shafts being capable of angular movement in its supporting means but normally locked against such movement and having its roll rotatably mounted on its overhanging end on a part, located between its extremity and its supporting means, that is eccentric to the part of the shaft within the said supporting means; and a readily removable member linking the said extremity of the shaft with the extremity of the overhanging end of the other shaft.

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