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MACHINE FOR COVERING FLEXIBLE TUBING.

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982,249.

Fig. 1

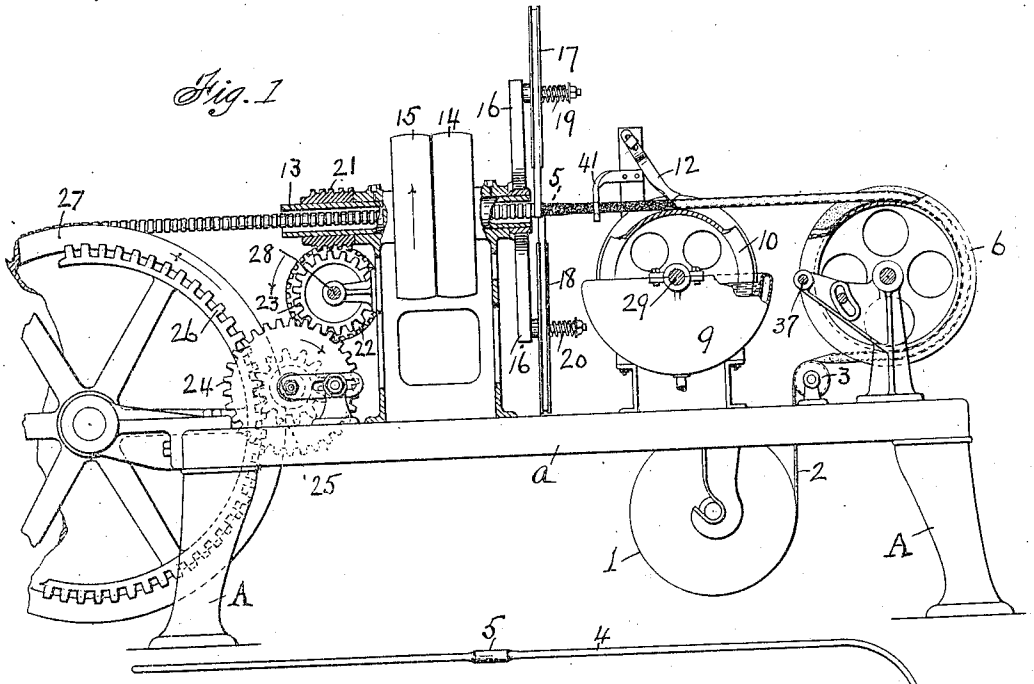

Fig. 3

Fig. 2

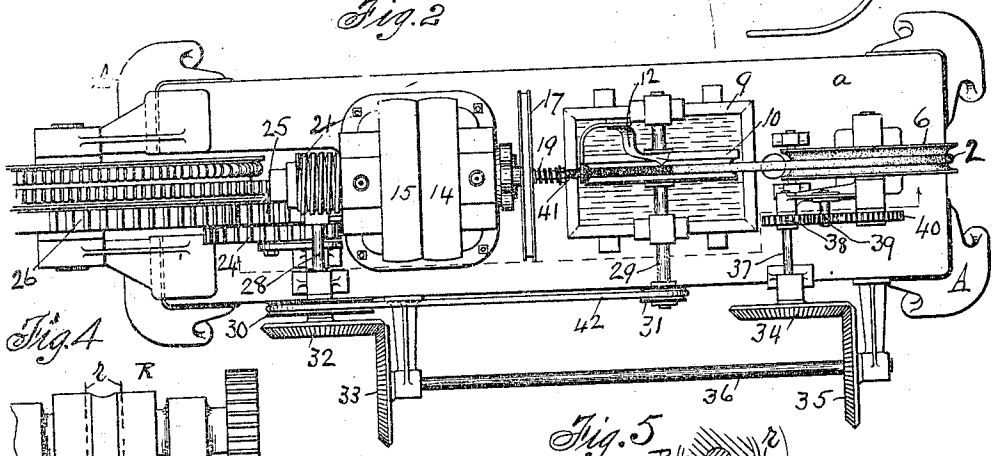

Fig. 4

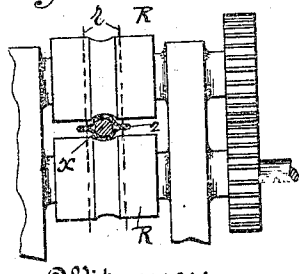

Fig. 5

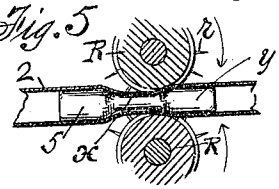

Fig. 6

Witnesses:

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MACHINE FOR COVERING FLEXIBLE TUBING.

982,249. Specification of Letters Patent. Patented Jan. 24, 1911.

Application filed April 4, 1910. Serial No. 553,427.

To all whom it may concern:

Be it known that I, ABRAHAM E. CHERNACK, a subject of the Emperor of Russia, residing in the city of Boston, in the county of Suffolk, in the State of Massachusetts, have invented a certain new and useful Improvement in Machines for Covering Flexible Tubing, of which the following is a specification.

My invention relates to machines of various types adapted to cover flexible tubing or conduits, and one of the main objects of my invention is to provide simple and efficient means for maintaining the tubing open or expanded to its full diameter while it is being covered or wrapped.

My invention also comprises various other novel features as will more fully appear from the drawings and subjoined description.

In the accompanying drawings, Figure 1 is a broken side elevation of a machine in which my invention is embodied in one form; Fig. 2 is a plan of the same; Fig. 3 is an elevation of my improved mandrel; Fig. 4 is a broken transverse vertical section of a modified detail: Fig. 5 is a vertical section at right angles thereto; and Fig. 6 is a transverse section on a larger scale of a portion of Fig. 4.

In machines for covering collapsible tubing or conduits it is at present the customary practice in order to maintain the tubing expanded to shape while being wrapped, to provide a core throughout the length of the tubing to be covered and feed both together through the covering machine, afterward withdrawing the core. This practice is attended with many difficulties and inconveniences and no considerable continuous length of tubing can be so made by reason of the friction between the core and tubing, which makes the withdrawal of the core practically impossible.

One of the principal features of the present invention is the provision of means for maintaining a stationary mandrel within the tubing, over which the latter is passed during the process of wrapping or covering. As embodied in the machine shown in Figs. 1 to 3 this mandrel is given the form shown in Fig. 3 and comprises the mandrel proper 5 and the mandrel rod 4 of much smaller diameter and hooked at one end, the whole being highly polished to afford as smooth a surface as possible. The hooked end of the mandrel rod is shaped to the curve of the feed wheel 6 and lies in the groove of the latter, while the body of the rod extends through the hollow spindle 13, the mandrel proper 5 being located at the point at which the tubing is wrapped by the tape reels 17 and 18.

The tubing 2, coming from any suitable source of supply, for instance the reel 1 carried below the table *a* of the frame A, is passed up and over the idler 3 to the mandrel rod, over the hooked end of which it is slipped. A suitable gripping surface is provided for the groove of the feed wheel, (for instance, by lining it with emery cloth) so that the tubing, being held firmly against the feed wheel by the tension from the take-up, referred to later, is easily slipped over the mandrel rod by reason of the greater friction between the surface of the feed wheel and the tubing than exists between the inner face of the tubing and the mandrel rod. The hooked end of the rod being held to the feed wheel by the tension of the take-up thus serves as an abutment or shoulder to bear against the wheel through the seamless tubing itself and thereby hold the mandrel against longitudinal movement and the tubing is continuously slipped over the latter without displacing the same. While passing from the feed wheel 6 to the tape reels 17 and 18, the tubing may be coated with any desired compound, for instance an insulating compound maintained fluid in a steam-jacketed kettle 9. A grooved disk 10 revolving in this kettle takes up the compound and coats the lower portion of the tubing, which rests in the groove, while from the broad periphery of the disk sufficient compound is removed by the scraper 12 to cover the upper surface of the tubing. The wiper 41 removes any excess compound and returns the same to the kettle 9. It will be noted that the disk 10 serves also as a support for the mandrel rod and tubing, and helps to maintain them in proper position with relation to the covering mechanism and the hollow spindle.

Reaching the covering mechanism, here shown as tape reels 17 and 18, the tubing is opened to its full size by the mandrel proper 5 which is made substantially the full internal diameter of the tubing. The tape wheels 17 and 18 serve to cover the tubing

with a double layer of paper cemented together and to the tubing by the compound from kettle 9, thereby converting the collapsible tubing into a relatively stiff tubing of the required internal diameter. The tape reels or bobbing 17 and 18 are mounted on spindles carried by the arm 16 secured to the hollow spindle 13 the latter being driven in suitable bearings, by the pulley 15 (with the usual idler 14 adjacent). The tension of the tape reels may be regulated by the friction springs 19 and 20.

The covered tubing passes through the hollow spindle 13 to the take-up wheel 27, for which may be substituted an ordinary reel if desired. The speed of both take-up wheel 27 and feed wheel 6 may be made uniform, in any suitable way. A simple arrangement of gearing for this purpose is shown. The worm 21 mounted on the end of the hollow spindle 13 engages with a worm gear 22 on the shaft 28, on which is fixed a gear 23 which meshes with a change gear wheel 24, fast on the spindle of which is mounted the gear 25 which in turn meshes with gear 26 of the take-up wheel 27. On the shaft 28 of the worm wheel 22 is fixed a bevel gear 32 which through bevel gears 33 and 35 at opposite ends of the longitudinal spindle 36 drives bevel pinion 34 on the end of the transverse spindle 37. The change speed gear 38 at the inner end of this spindle drives the wheel 6 through pinions 39 and 40. By suitably proportioning the elements of this transmission gearing the speed of the take-up may be made to exactly equal the speed of the feed wheel 6, a desirable condition for the best operation of the machine. The disk 10 in the kettle 9 may also be driven by the worm 21 through a belt 42 extending between pulleys 30 and 31 mounted on the shafts 28 and 29 respectively.

The operation of the machine is readily understood. The tension maintained by take-up wheel 27 insures a sufficient frictional engagement of the tubing by the feed wheel 6 to secure a positive delivery by the latter. The tubing is thus constantly slipped over the thin, polished and practically frictionless mandrel rod, while the latter remains stationary, hooked over the feed pulley 6. Passing over disk 10 the tubing is coated with a suitable insulating compound, although obviously this may not be desired in some instances and may accordingly be omitted. The mandrel 5 expands the tubing to its full diameter and while so expanded it is wrapped by the tape reels which are revolved around the tubing by the arm 16 mounted on the rotary sleeve 13. The tubing now wound and relatively stiff, is readily drawn off by the take-up wheel 27, being maintained out of contact with the sleeve 13 by the extension of the mandrel rod and thus avoiding any undesirable twist which might be imparted thereto were it allowed to contact with the revolving sleeve.

The machine described is particularly adapted to the manufacture of flexible conduits for electric wires, but it can readily be adapted to any conduit manufacture in which a solid core is required to maintain a collapsible tube in shape during covering, for instance for double or multiple hose, the tape reels of the present machine being replaced by looms, and the kettle 9 being filled with a suitable cementing and waterproofing compound. Obviously furthermore the mandrel rod may be given other forms than that shown in Figs. 1 to 3. Thus in Figs. 4 and 5 the mandrel 5 is connected by a short and thin neck portion x to an enlarged portion or shoulder y and a pair of grooved rollers R arranged to embrace the neck portion x, the rollers approaching each other so closely that the shoulder y cannot pass between the rolls. On each side of the groove the rollers are provided with gripping means, for instance needle teeth r which engage the flattened slack of the tubing and serve to feed the latter to the mandrel. Assuming the wheel 6 of Figs. 1 to 3 to be a plain pulley, the mandrel of Figs. 4–5 would be arranged between the kettle 9 and the tape reels 17–18 and so placed that the mandrel proper 5 is located at the point where the tape reels wind the covering on the conduit.

The details of construction shown may be variously modified without departing from my invention and I do not limit myself thereto.

I claim as my invention:

1. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, and means serving both to maintain the mandrel against longitudinal movement while the tubing is passing thereover and at the same time to feed the tubing along the mandrel.

2. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, and means serving both to hold the mandrel against longitudinal movement during the covering operation and to feed the tubing along the mandrel.

3. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation and means having the two-fold function of holding the mandrel against longitudinal displacement while the tubing is passing over the mandrel, and for directly engaging and progressively feeding the tubing along said mandrel.

4. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, and means

serving both to hold the mandrel against longitudinal displacement during the covering operation and to feed the tubing along the mandrel, said means including a feed roller partially encircled by the mandrel and a portion of the tubing thereon.

5. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation and means serving both to hold the mandrel against longitudinal displacement, during the covering operation, and to feed the tubing along the mandrel, said means including a roller circumferentially embraced by a portion of the mandrel and acting on the tubing to feed the same progressively over the mandrel.

6. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, a mandrel rod of less diameter than the mandrel, and a feeding member embraced by and supporting the initial end of the mandrel rod and holding said rod stationary during the forward feed of the tubing.

7. In a machine for covering flexible tubing, the combination of a mandrel and a feeding member, said feeding member supporting the mandrel in engagement with it, and against lengthwise displacement, said mandrel adapted to receive a seamless tube and to maintain the same in feeding engagement with said member.

8. In a machine for covering flexible tubing, the combination of a mandrel having two diameters and a feeding means supporting the portion of the mandrel of lesser diameter, said feeding means holding the mandrel against longitudinal displacement while the tubing is passing over the mandrel.

9. In a machine for covering flexible tubing, a mandrel which has a retaining shoulder and over which the tubing passes during the covering operation, in combination with a feed wheel against which the shoulder of the mandrel may bear through the tubing as the latter is fed over the mandrel.

10. In a machine for covering flexible tubing, a mandrel which has a part of a diameter of the desired internal diameter of the tubing and another part of smaller diameter and also having a retaining shoulder, in combination with a wheel against which the shoulder of the mandrel bears through the tubing to hold the mandrel against longitudinal movement while the tubing is passing thereover, means for covering the tubing at the point of larger diameter of the mandrel, and a take-up for the covered tube.

11. In a machine for covering flexible tubing, a mandrel having an enlarged part and a retaining shoulder in combination with a part of the machine against which said shoulder bears through the tubing to hold the mandrel against longitudinal movement while the tubing is passing thereover and means for spirally winding covering on the tubing at the point where the latter is passing over the enlarged part of the mandrel.

12. In a machine for covering flexible tubing, a mandrel having an enlarged part and a retaining shoulder in combination with a wheel against which said shoulder bears through the tubing to hold the mandrel against longitudinal movement while the tubing is passing thereover, and means for spirally winding covering on the tubing at the point where the latter is passing over the enlarged part of the mandrel.

13. In a machine for covering flexible tubing, a mandrel having an enlarged part and a retaining shoulder in combination with a part of the machine against which said shoulder bears through the tubing to hold the mandrel against longitudinal movement while the tubing is passing thereover, means for spirally winding covering on the tubing at the point where the latter is passing over the enlarged part of the mandrel and take-up means for the covered tube.

14. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, a hooked mandrel rod of less diameter than the mandrel and a supporting member for said hook adapted to maintain said mandrel stationary while the tubing is passing over the same.

15. In a machine for covering flexible tubing, a mandrel over which the tubing passes during the covering operation, a hooked mandrel rod of less diameter than the mandrel and a feed pulley over which said hook is caught and means for maintaining the tubing in frictional engagement with said pulley, whereby a positive feed of the tubing is secured while said mandrel remains stationary.

16. In a machine for covering flexible tubing, a hollow rotary spindle through which the covered tubing passes, a mandrel for maintaining said tubing expanded during the covering operation and a rod extending from said mandrel through said hollow spindle to maintain said tubing out of contact with the inner face of said hollow spindle.

17. In a machine for covering flexible tubing, a wheel over which the tubing passes; a hooked mandrel rod within said tubing and fitted over said feed wheel and means for maintaining said tubing taut over said wheel, whereby said mandrel rod is maintained in engagement with said wheel and is retained thereby while the tubing is slipped over the same.

18. In a machine for covering flexible tubing, a feed wheel over which said tubing passes, a mandrel within said tubing and a

mandrel rod shaped to engage said wheel together with a take-up wheel to maintain said tubing taut on said feed wheel whereby said mandrel rod is maintained in engagement therewith and is retained thereby while the tubing is slipped over the same, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

ABRAHAM E. CHERNACK.

Witnesses:
M. G. LUNDGREN,
SIMON COHEN.