H. G. SAHLIN.

MACHINE FOR WINDING EDGEWISE AND SPACING METAL STRIPS.

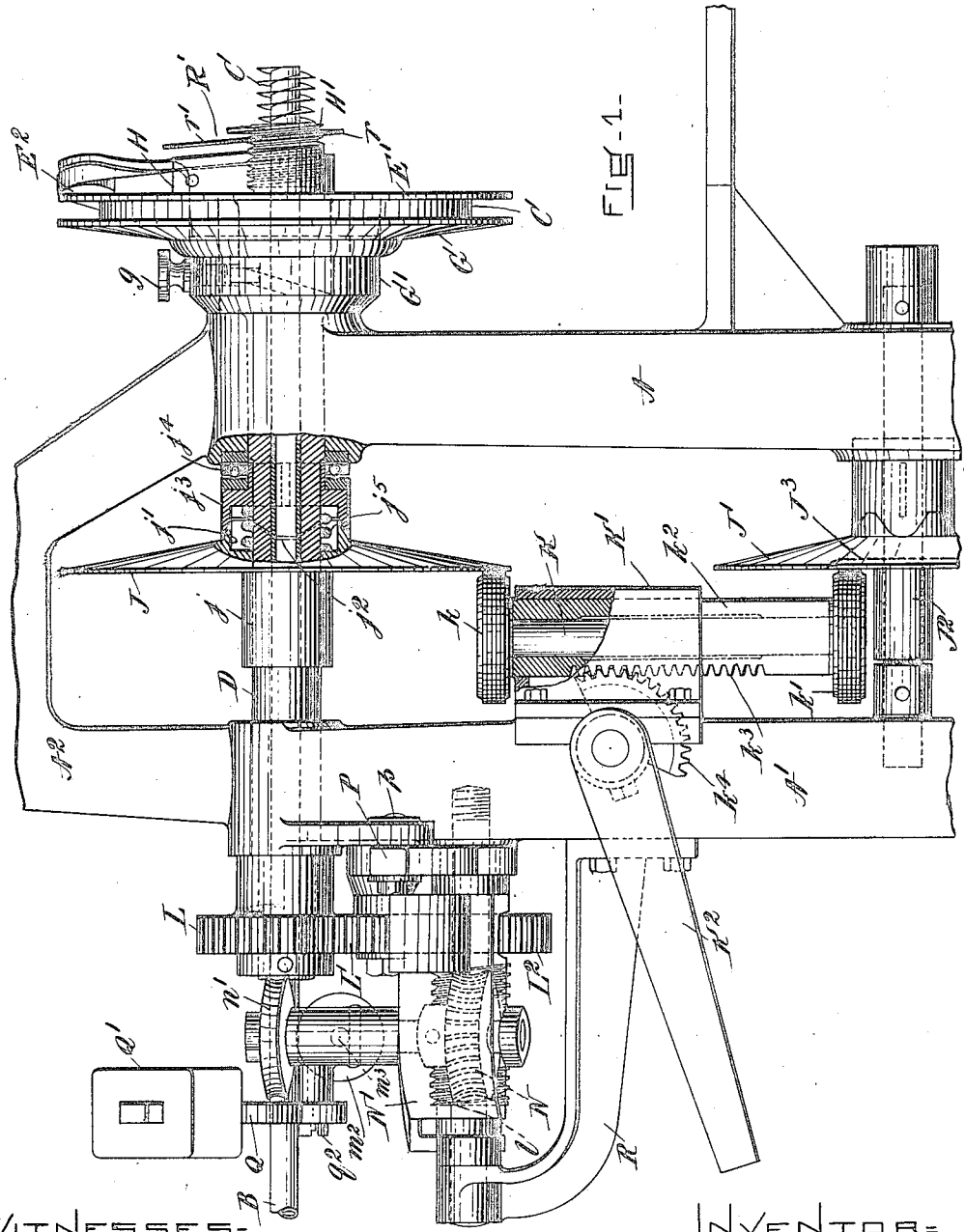
APPLICATION FILED OCT. 16, 1911.

1,151,721.

Patented Aug. 31, 1915.

4 SHEETS—SHEET 1.

FIG. 1.



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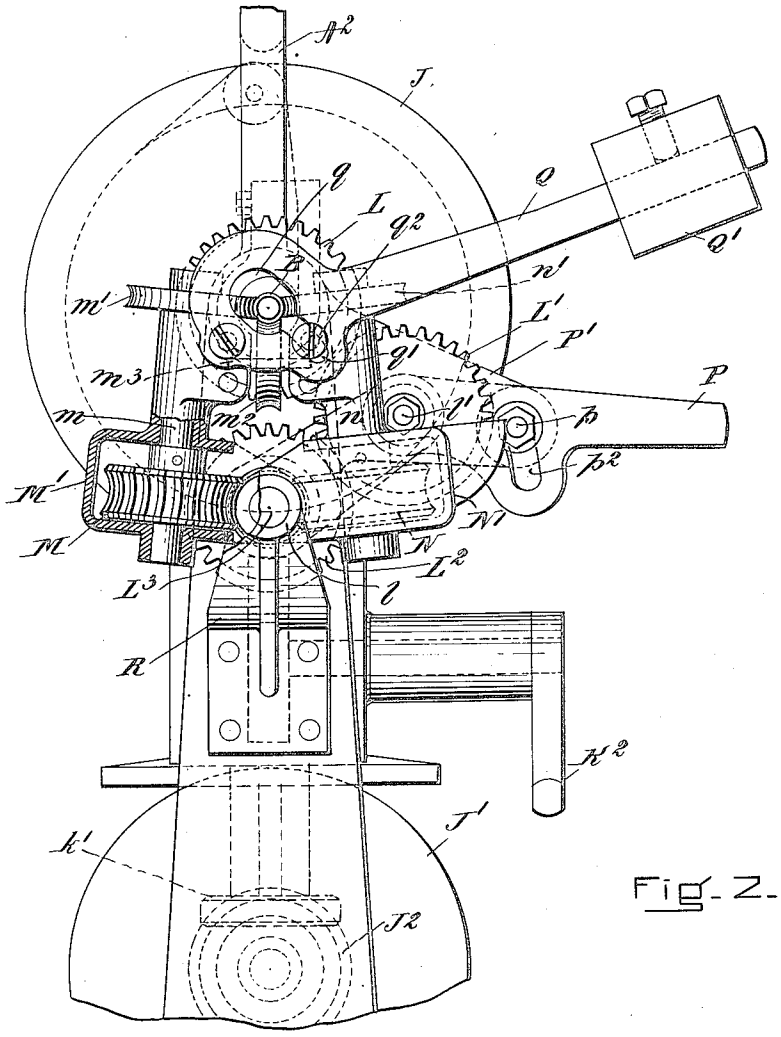


Fig. 2.

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4 SHEETS—SHEET 3.

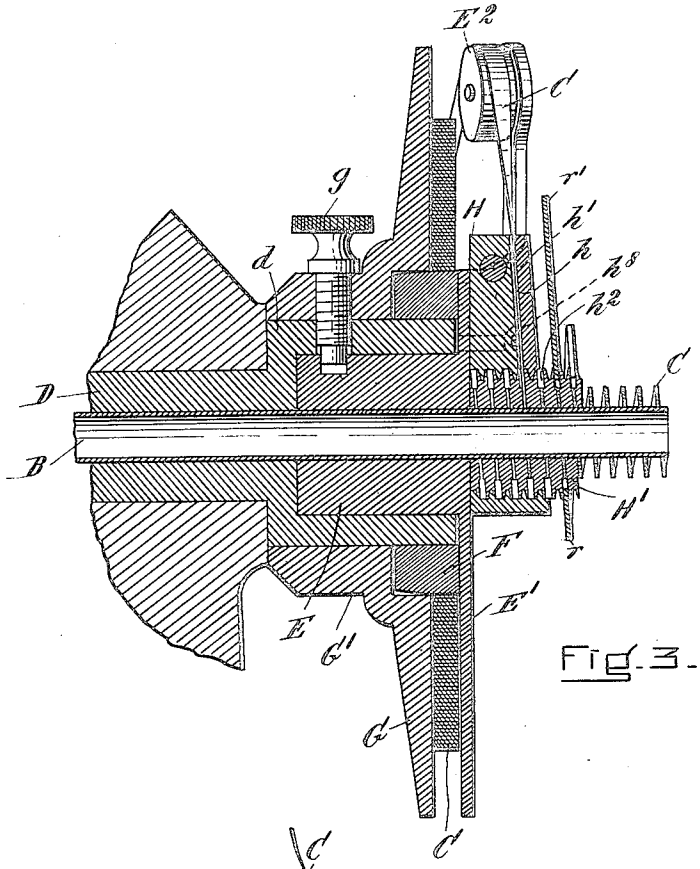


Fig. 3.

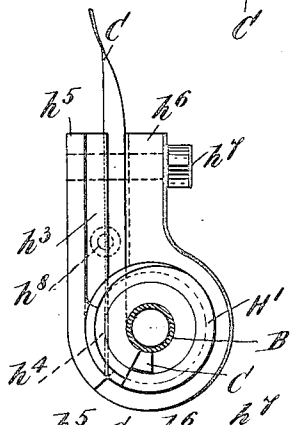


Fig. 4.

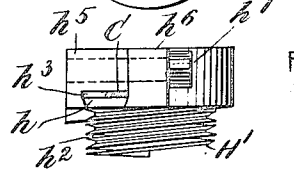


Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 6.

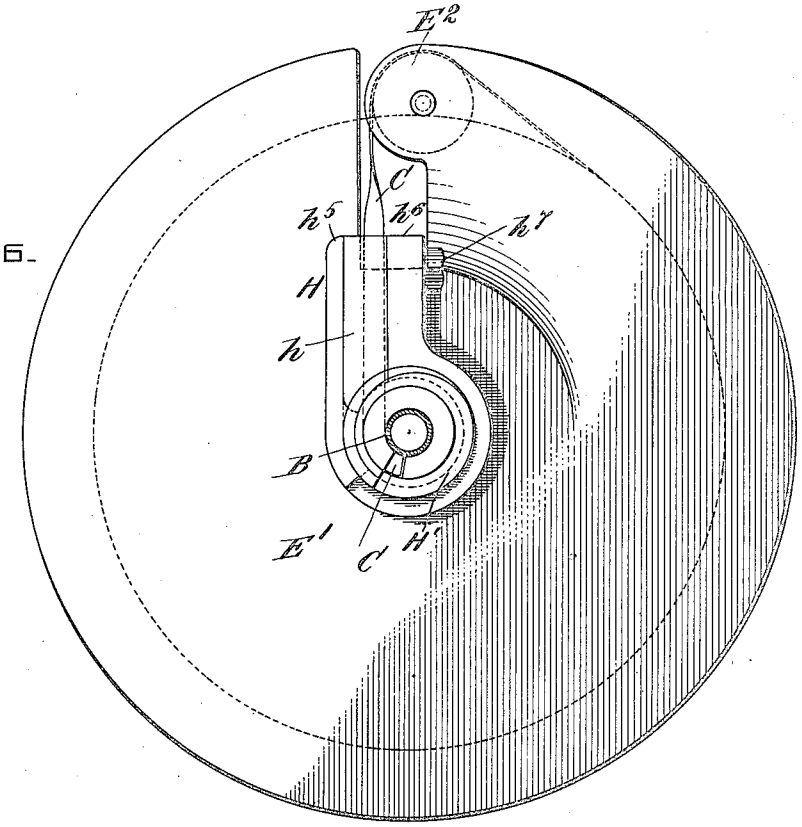


Fig. 9.

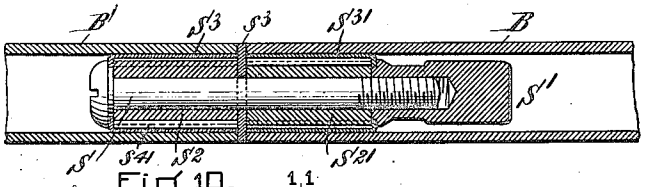


Fig. 10.

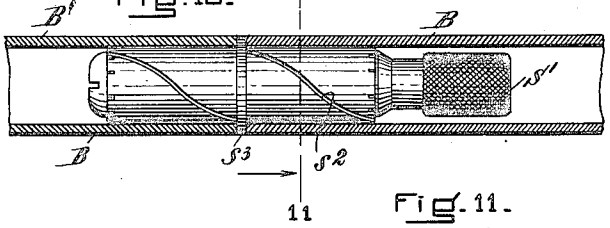
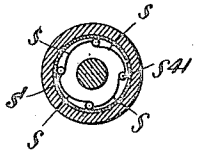


Fig. 11.



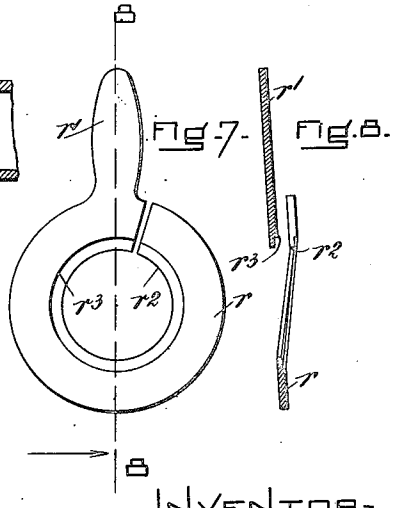


Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR WINDING EDGEWISE AND SPACING METAL STRIPS.

1,151,721. Specification of Letters Patent. Patented Aug. 31, 1915.

Application filed October 16, 1911. Serial No. 654,846.

To all whom it may concern:

Be it known that I, HENNING G. SAHLIN, of Rome, in the county of Oneida and State of New York, a citizen of the United States, have invented new and useful Improvements in Machines for Winding Edgewise and Spacing Metal Strips, of which the following is a specification.

My invention relates to machines for winding metal strips or ribbon edgewise and spacing the ribbons during the winding operation along the length of a cylinder. When the cylinder is a tube, such a product is useful in the construction of radiators for automobiles where a large cooling surface is required in a small compass and where therefore regularity of spacing is very desirable to use the space most economically.

In my specification I have for convenience referred to the cylinder as a tube and it is so shown in the drawings.

The preferred form of my invention is shown in the drawings, in which—

Figure 1 is a side view of a machine embodying my invention, Fig. 2 being a rear view. Fig. 3 is a section of the ribbon-forming head, Fig. 4 being a front view of the winding form and its holder, and Fig. 5 a top view thereof. Fig. 6 is a front view of the winding head. Fig. 7 is a face view of the spreader. Fig. 8 is a section on line 8—8 of Fig. 7. Fig. 9 is a sectional view of the tube coupler in action. Fig. 10 is an elevation of the tube coupler in action and Fig. 11 is a section on line 11—11 of Fig. 10.

A, A^1 are uprights partly shown and suitably supported and forming with the yoke piece A^2 (shown only in part) bearings and supports for the various parts.

B is the metal tube or core on which is wound the metallic ribbon C by which the radiating surface of the tube is increased. The tube is held from rotating, but is fed forward progressively at an even speed by means described below. The tube or core B passes through the center of the rotatable sleeve D. The sleeve D carries at its forward end an enlargement *d* which is recessed to receive a boss E extending rearward from the detachable disk E^1. The reel on which the metal ribbon is wound is lettered F and is mounted to turn on and independently of the enlargement *d* and between the disk E^1 and a disk G which carries a rearwardly-projecting hub G^1 attached to the enlargement *d* by the screw *g*. The screw *g* passing through the hub G^1 into a recess on the boss E also secures the detachable disk E^1 to the sleeve D while the machine is in operation. The disk E^1 must be taken off when a new supply of ribbon is to be put onto the reel F. The disks E^1 and G thus rotate with the sleeve D and between them is the roll of the metallic ribbon C wound on the reel F which is free to turn independently of the disks and sleeve as the ribbon is drawn off. On the face of the disk E^1 is a guide roll E^2 set on a stud at an angle to the face of the disk as shown and over which the ribbon is led to the holder H which is also mounted on the face of the disk E^1. The ribbon is thus given a partial turn on the way to the tube B on which it is to be wound edgewise.

H^1 is a winding form threaded on its periphery to screw into the threaded interior of the holder H. The holder H is provided with a guideway *h* leading to the winding form H^1 and having a cover h^1 to cover the guideway. The winding form H^1 has a central opening which registers with the opening in the sleeve D and is just large enough to allow the tube B to pass through it and be centered therein.

The winding form H^1 is preferably machined from a steel cylinder. A spiral passage h^2 forms it into a continuous spiral strip which may be of any desired pitch according to the pitch at which the ribbon is to be wound on the tube. The thread in the holder is cut to correspond so that the form will screw into the holder, a separate holder being used for each form. This passage serves as a die for the ribbon to lead it spirally to the tube and also to hold it in place while the form is turned so that said ribbon will be properly spaced upon the tube, and for this purpose the form preferably has a number of turns communicating with the central opening in the die which receives the tube or core, so that the ribbon shall not emerge from the form until it has firmly adjusted itself in place and also so that said form may be adjusted as below described when it has begun to wear.

The die by which the bending of the ribbon is accomplished comprises the following parts:—In the guideway *h* is a guidestrip h^3 which is curved at its lower end as at h^4 to conform to the curvature of the form H^1,

The guidestrip is about 1/64 of an inch thicker than the thickness of the ribbon and forms one side of the guideway, its edge against which the ribbon bears being slightly grooved to aid in its function as a guide. It is sufficiently long to lie within the spiral passage in the form and hold the ribbon against the tube, preventing its reaction. The guideway in the holder is at a slight angle to the axis of the tube so as to lead the ribbon to the passage in the form in a plane parallel to the side of the said passage. The plane of the ribbon is thus turned by the roll E^2 and the guideway approximately 90° in its delivery to the form.

The spiral is cut to any desired pitch and the sides of the passage are not flat, but are so cut that the inner portion of the passage bordering on the central opening for a width equal to the width of the ribbon is equal to the width of the ribbon, while the receiving outer portion of the passage is about 1/64 of an inch wider to enable it to receive the end of the guidestrip h^3 which sets into it to hold the ribbon against the tube as above referred to. Thus the ribbon at the point where it enters the winding form is closely confined between four walls of which the tube is one, and held firmly while it takes its said shape so that there is no tendency to wrinkling or crumpling.

I prefer to make the winding form somewhat longer than would otherwise be necessary in order that as it wears it may be screwed into or out from the holder to present new surfaces to the ribbon. I prefer to make the holder as shown in the form of a strap, the ends h^5 and h^6 of which are clamped together by the screw h^7. A screw h^8 attaches the holder to the face of the disk E^1.

In the machine shown the sleeve D is mounted in uprights A, A^1 and is rotated in the following manner: On the sleeve D is mounted a friction disk J provided with a hub j and is free to turn on the sleeve. On its opposite side the disk J has a recessed hub j^1 having a face cam j^2. A hollow hub j^3 is keyed to the sleeve D to slide thereon and turn therewith, and between the hub j^3 and the bearing in upright A are ball bearings j^4 suitably mounted to reduce friction. The hub j^3 also has a face cam like that on hub j^2, these cams taking up automatically the wear of the friction rolls k and k^1 below described. A spring j^5 in the chamber in hubs j^1, j^3 tends to throw the disk J against the friction roll k.

J^1 is a second friction disk which is mounted on a shaft J^2 preferably in the same way as disk J is mounted on the sleeve D, carried in the uprights A, A^1, and to which power may be applied in any suitable way, for example, by an electric motor either attached directly thereto or belted thereto as seems best. A vertical shaft K has keyed to each end a friction roll, one of which k engages the disk J and the other k^1 the disk J^1. The shaft K is mounted in a sleeve k^2 which slides in a bearing K^1 bolted to the upright A^1 and by means of it power is transmitted from disk J^1 to disk J. The relative speed of these disks is regulated by means of a rack k^3 on the sleeve k^2 with which a segment k^4 engages, this segment being mounted on the upright A^1 and operated by the handle K^2 so that the sleeve k^2 may be raised or lowered and so move the friction rolls k, k^1 and their shaft along radii of the friction disks. The friction disk J^1 has a recess J^3 near its center so that by moving the bearing K^1 sufficiently far downward the friction roll k^1 will be moved toward the center of the disk J^1 and opposite the recess and out of contact with the disk so that it will not be moved by the disk.

An important advantage of this friction drive lies in the fact that by moving the lever or handle K^2 the friction rolls k, k^1 are simultaneously moved along the surface of the disks J, J^1 so that the speed of rotation of the driven portion of the machine may be very readily and simply adjusted with great accuracy and the machine itself may be almost instantly stopped by so moving the parts that the roll k^1 will be opposite to the recess J^3 in the disk J^1 so that the rotation of the disk J^1 will not affect the friction roll k^1 and hence no power will be conveyed to the disk J.

The sleeve D carries at its rear end a gear L which meshes with an intermediate gear L^1 in mesh with a gear L^2 mounted on a stud L^3 secured to upright A^1 and supported by bracket R. The gear L^2 has an elongated hub on which is cut a worm l so that the rotation of gear L^2 by gears L and L^1 causes the rotation of this worm. Two worm gears M and N, mounted on shafts m and n carried in bearings in brackets M^1, N^1 mounted free on stud L^3, engage the worm l and are rotated by it. Each shaft m, n has at its upper end a grooved friction roll m^1 and n^1 which engages and feeds the tube B. A grooved idler roll m^2 supports the tube from below. It is mounted on a stud m^3 which is supported in the brackets M^1, N^1.

The brackets M^1, N^1 are held in place at their upper ends by the pressure lever Q. This lever is pivotally mounted on bracket M^1. It has an opening q through which the tube B passes and a slot-shaped extension q^1 of said opening receives a screw q^2 which screws onto the bracket N^1 thus loosely connecting the lever and bracket. A weight Q^1 on the lever Q tends to hold the upper ends of the brackets M^1 and N^1 together and thus the friction rolls m^1, n^1 are held against the tube B by a pressure which can be adjusted by moving the weight Q^1.

The stud L^3 carrying the gear L^2 carries a lever P free thereon upon which lever P the stud l^1 for the intermediate gear L^1 is mounted. P^1 is an arm projecting from the upright A^1 and carrying a set screw p at its outer end on which runs the slot p^2 in the lever P. The gear L on sleeve D is a change gear and when a different pitch is needed for the winding operation another gear is substituted for it, the screw p being first loosened so that the intermediate gear may be disengaged from it. After the new gear L is put in place the lever P is moved to remesh the intermediate gear L^1 with new gear L and gear L^2 and the screw p is again tightened.

When a considerable portion of the winding form extends from the holder so that there is chance for a good deal of friction to be developed between the wound ribbon and the walls of the spiral passage i usually use a spreader R^1 which is screwed into the passage so shown in Figs. 1 and 3. This spreader in its preferred form is shown in Figs. 7 and 8 and comprises an inclosing portion r which is nearly circular and is provided with a handle r^1. The portion r has a greater external diameter than the form and an opening through it larger in diameter than the diameter of the tube and ribbon combined but less than the diameter of the winding form. It is preferably thinned somewhat at its inner edge as at r^2 so that it will take in the spiral passage of the winding form, but it is left thick enough to spread the passage somewhat. The outer edge r^3 of the thinned portion is of about the diameter of the winding form so that as the spreader is screwed into place this edge will rest on the periphery of the winding form and so keep the spreader properly centered. The spreader is preferably made malleable to adjust itself to the pitch of the winding form.

It is very desirable that means shall be provided for coupling the ends of two tubes so that the winding operation will be continuous notwithstanding the fact that short lengths of tube are being wound. For this purpose I have shown in Figs. 9, 10 and 11 a coupling means. It comprises a bolt S having a head at one end and a knurled nut S^1 at the other. Upon the bolt S are two inner sleeves S^2, S^{21}, each having as shown four eccentric or inclined surfaces s ending in a radial surface which forms a shoulder s^1. Outside of these sleeves are two other sleeves S^3, S^{31} each having a spiral cut s^2 so that being made of spring steel they may be opened slightly (see Fig. 10) though normally their edges are in contact. A washer s^3 of substantially the diameter of the tubes B, B^1 separates these sleeves and other washers may be used under the head of the bolt as shown. Between the inner and outer sleeves are rolls s^{41} which are free to run on the eccentric surfaces s of the sleeves S^2—S^{21} and are caused so to do by the frictional contact with them of the outer sleeves S^3—S^{31} and in so doing as they run up the eccentric incline toward the periphery of the inner sleeve they cause the outer sleeve to spread thus increasing its diameter.

To couple a piece of tube B^1 to a piece B which is in the machine the coupling is thrust into the end of the tube B up to the washer s^3 and being of proper size to fit it closely upon giving the coupling a turn in the proper direction the outer sleeve S^{31} engaging the inner surface of the tube is held frictionally while its inner sleeve S^{21} in turning causes the rolls s^{41} to run up the inclines s on sleeve S^{21} and so clamps the coupling to the tube B. The end of another tube B^1 is slipped onto the other end of this coupling up to the central washer s^3 and by turning it carefully the outer sleeve S^3 engages the interior of tube B^1 and being turned with it causes the rolls s^{41} to run up the incline s on the inner sleeve S^2 thus clamping the coupling to tube B^1. Thus the two tubes are coupled and pass through the machines and are wound as a single length of tube. When the coupling passes out through the winding head, the ribbon is cut at the joint and thereafter the coupling operation is reversed and the tubes are separated, and the coupling removed.

I have described above a simple form of mechanism for accomplishing the desired object, but I do not mean to limit myself to the details herein described. It is obvious to any one skilled in the art that in the motion of winding one thing upon another either the part to be wound or the winding part may be rotated. As shown above the part to be wound is stationary while the winding mechanism rotates. It is also evident that other means of applying power than those described may be used. In fact in various details the elements of the machine may be changed and yet come within the limits of my invention.

As my machine is especially adapted for winding a ribbon on a radiator tube, I have referred to the part B as a tube. So far as the operation of the machine is concerned it should more properly be denominated a core as the machine will perform its operation as well upon a solid rod as upon a tube.

What I claim as my invention is:—

1. In a machine of the character described, the combination with means for feeding a core, of a ribbon reel mounted with its axis in parallel relation to said core and adapted to carry a ribbon flatwise, rotating means for feeding said ribbon edgewise to and winding upon said core, said

means comprising a rotary die located about said core and having a spiral guide passage therein comprising several turns for setting, holding and spacing said ribbon, and means for varying the speed of rotation of the ribbon winding means.

2. In a machine of the character described, means for feeding a core lengthwise, a ribbon reel mounted with its axis in parallel relation to said core and adapted to carry a ribbon flatwise, and means for turning said ribbon from a flatwise to an edgewise position with relation to said core, and means for feeding it edgewise about said core and spacing it thereon, said spacing means surrounding said core and engaging said ribbon for a plurality of turns about said core, whereby said ribbon will be wiped into shape.

3. In a machine of the character described, the combination with means for feeding a core longitudinally, of a ribbon reel having its axis concentric with the axis of said core, rotating means for turning said ribbon from a flatwise to an edgewise position with relation to said core during its passage from said reel to said core, means for winding said ribbon edgewise on said core, said means comprising a spiral die adapted to guide said ribbon to said core and having several turns through which said ribbon passes so that it will be set and held in edgewise position with relation to said core and spaced along the latter, and means for varying the speed of rotation of the ribbon-winding means.

4. In a machine of the character described, the combination with means for feeding a core longitudinally, of a ribbon reel having its axis concentric with the axis of said core, rotating means for turning said ribbon from a flatwise to an edgewise position with relation to said core during its passage thereto, means for winding said ribbon edgewise on said core, said means comprising a rotary die having a central opening surrounding said core and having also a spiral ribbon passage, comprising several turns, communicating with said central opening, said die being adapted to guide said ribbon to said core and hold it in edgewise position with relation thereto and space it along said core, and means for varying the speed of rotation of the ribbon-winding means.

5. In a machine of the character described, the combination with means for feeding a core lengthwise, of a ribbon reel arranged concentric with said core and adapted to carry a ribbon flatwise in parallel relation to said core, rotating means for feeding said ribbon from said reel and winding it edgewise on said core, said means comprising a winding form and means whereby said ribbon is engaged upon its two flat faces and its outer edge during the process of winding, and means for varying the speed of rotation of the ribbon-winding means.

6. In a machine of the character described, the combination with means for feeding a core lengthwise, of a ribbon reel arranged concentric with said core and adapted to carry a ribbon flatwise in parallel relation to said core, rotating means for feeding said ribbon from said reel and winding it edgewise on said core, said means comprising a winding form and means whereby said ribbon is engaged upon its two flat faces and its outer edge, said winding form being adapted to guide said ribbon for a plurality of turns during the process of winding, and connected means for varying the feed of said core and the speed of rotation of ribbon winding means.

7. In a machine of the character described, in combination means for feeding a core lengthwise, of a ribbon reel arranged concentric with said core and adapted to carry a ribbon flatwise in parallel relation to the axis of the core, ribbon-winding means comprising a rotating holder having a guideway for said ribbon, a rotating winding form concentric with said core and provided with a spiral passage adapted to receive several turns of said ribbon and wind it edgewise on said core, means for rotating said holder and said winding form, and connected means for varying the feed of said core and the speed of rotation of ribbon-winding means.

8. In a machine of the character described, means for feeding a core and ribbon-winding means comprising a holder having a guideway for said ribbon, a winding form concentric with said core and having a spiral passage, said spiral passage registering with said guideway and a guidestrip forming one side of said guideway and extending into said passage and adapted to coöperate with said core to hold said ribbon as it engages said tube in a predetermined position.

9. In a machine of the character described, a rotating head comprising a reel to receive a coil of flat ribbon, a guide roll on said head adapted to give a partial turn to said ribbon, the axis of said roll being at an angle to the axis of said reel, in combination with a rotary winding device attached to said head and provided with an opening therethrough for a core, means for feeding said core, means for rotating said head, and connected means for varying the feed of said core and the speed of rotation of said winding device.

10. In a machine of the character described, a ribbon-winding mechanism comprising a holdler and a winding form hav-

ing a spiral passage therein and an opening therethrough, said winding form being adjustable in said holder lengthwise the axis thereof and said holder being provided with means whereby said winding form may be clamped therein.

11. In a machine of the character described, a rotating head comprising a reel to receive a coil of flat ribbon, a guide roll on said reel adapted to give a partial turn to said ribbon, the axis of said roll being at an angle to the axis of said reel in combination with a winding mechanism attached to said reel and provided with an opening therethrough for a core and means for feeding said core and means for rotating said reel.

12. In a machine of the character described, a ribbon-winding mechanism comprising a holder and a winding form having a spiral passage therein for a plurality of turns the walls of said passage being adapted to yield axially and means for holding said passage open as set forth.

13. In a machine of the kind described, in combination with a ribbon-winding mechanism, a core feeding mechanism comprising two positively-driven rolls adapted to bear on the sides of the core and means for rotating them, and means for supporting the under surface of said core.

14. In a machine of the kind described, in combination with a ribbon-winding mechanism, a core-feeding mechanism comprising two positively-driven rolls adapted to bear on the sides of the core and means for rotating them, and an idler roll located to support the under surface of the core.

15. In a machine of the character described, in combination with a ribbon-winding mechanism, a core-feeding mechanism comprising pivoted brackets, shafts located therein, means for rotating said shafts located at the pivoted end of said brackets and friction rolls located at the swinging ends of said shafts and means for causing the free ends of said brackets to approach and for holding them in proximity whereby said friction rolls will engage said core.

16. In a machine of the character described, a ribbon-winding mechanism and means for rotating it, comprising a sleeve, a reel and a winding form carried thereby, said reel being mounted on said sleeve, said sleeve carrying a cam, a friction disk also mounted on said sleeve free to turn thereon, said friction disk also carrying a cam to engage the cam on said sleeve whereby said friction disk may move said sleeve and a friction roll engaging said friction disk, and means for rotating said friction roll.

17. In a machine of the character described, a ribbon-winding mechanism and means for rotating it, comprising a sleeve, a reel and a winding form carried thereby, said reel being mounted on said sleeve, said sleeve carrying a cam, a friction disk also mounted on said sleeve free to turn thereon, said friction disk also carrying a cam to engage the cam on said sleeve whereby it may move said sleeve, and means for rotating said friction disk comprising a second friction disk having an axis parallel with said sleeve and recessed at its center, a shaft having a friction roll at each end, each engaging one of said friction disks, said shaft being supported radially to both friction disks, and means for moving said shaft lengthwise whereby said friction rolls will be moved with relation to the centers of said friction disks to adjust the speed of said first-named disk or to stop it, as described.

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