Oct. 9, 1934. C. FIELD 1,976,013

LUBRICATING APPARATUS FOR METAL CUTTING MACHINES

Original Filed June 18, 1927 2 Sheets-Sheet 1

Fig. 1.

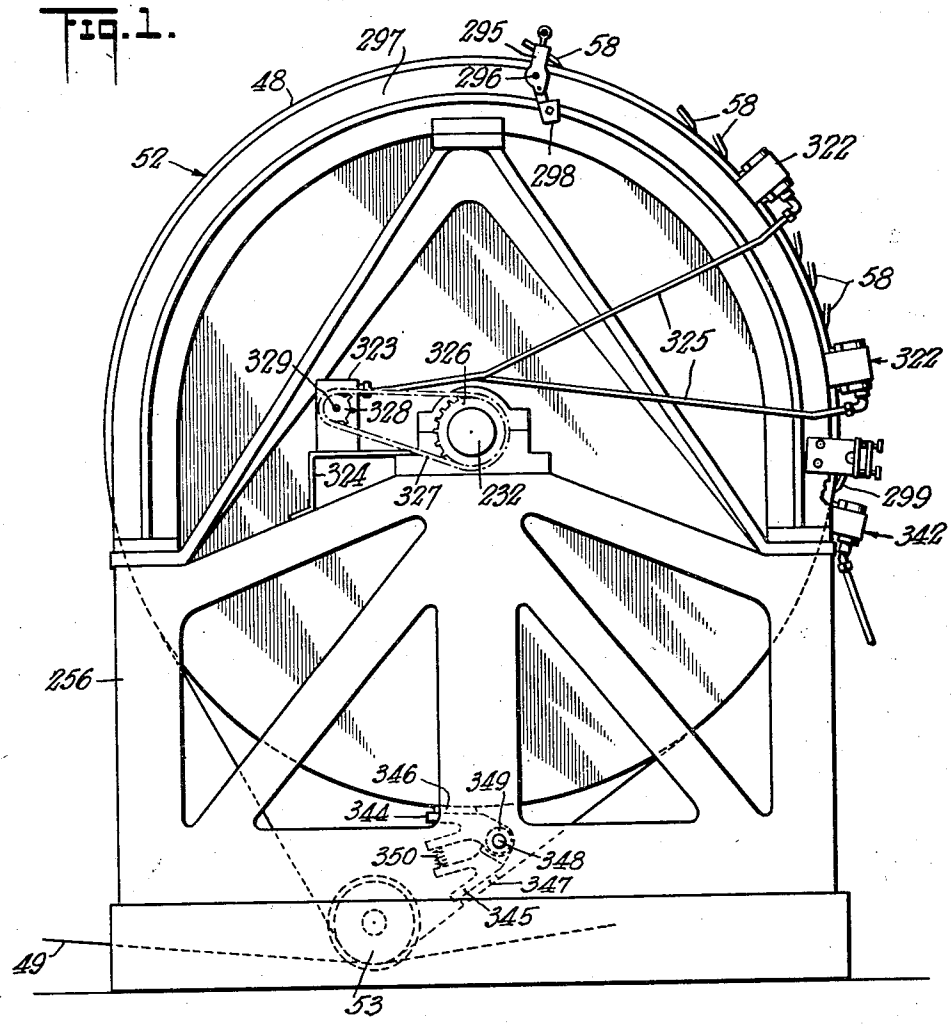
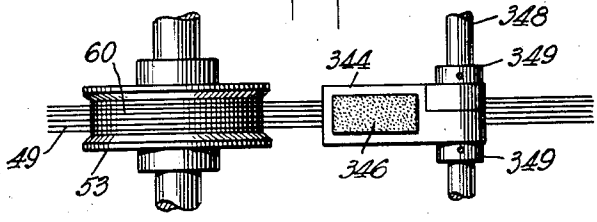


Fig. 2.



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Fig. 3.

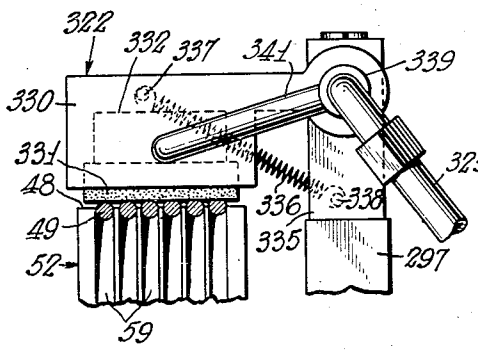


Fig. 4.

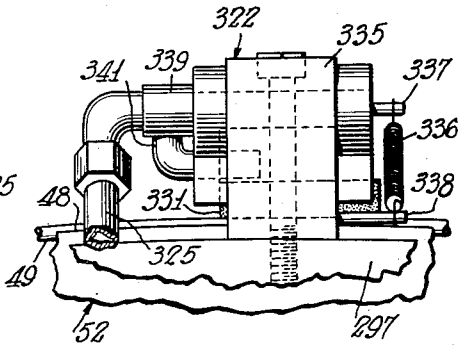
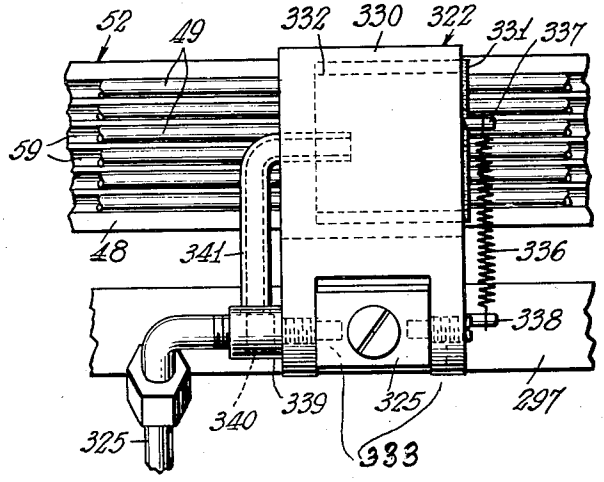


Fig. 5.



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UNITED STATES PATENT OFFICE

1,976,013

LUBRICATING APPARATUS FOR METAL CUTTING MACHINES

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Original application June 18, 1927, Serial No. 199,692. Divided and this application August 3, 1928, Serial No. 297,318

15 Claims. (Cl. 29—4.5)

My present invention relates to a sub-combination set forth in my copending application Ser. No. 297,315 filed August 3rd, 1928, and like it, is a division of parent application Ser. No. 199,692, filed June 18th, 1927, which is for a complete plant, including a combination of automatic machines for supplying wire and reducing it to metal wool and scrap by a single pass through the machine, together with auxiliary apparatus necessary for successful commercial performance of such a comprehensive operation. The combination of the wire feeding and wool cutter instrumentalities is claimed in my application, Ser. No. 297,314 filed August 3rd, 1928; the means for lubricating the bed cutters and the wires, in combination with wiper means for keeping the bed and wires free from excess lubricant and dirt, are claimed in my application Ser. No. 297,321 filed August 2rd, 1928; and the sub-combination of bed, wire and cutter lubricating means is claimed in this present application.

As set forth in each of these applications, wire is drawn from a suitable source and is conducted through a series of successively arranged cutting or shaving units which operate upon the wire to produce the metal wool. Each of the cutting units includes a power driven, rotary bed in the form of a disc wheel having a plurality of adjacent grooves, formed in its periphery, in which the wire is tensed and held by friction in a plurality of parallel loops or strands and is carried by the wheel in operative relation to a series of cutters arranged around the periphery of the bed.

The knives which produce the shavings or wool are pivotally mounted and yieldingly held against the wire, preferably by suitably arranged weights adapted to counterbalance the thrust of the wire against the grooving edge of the knife. In normal operation, the knife is self-gauging as to depth of cut, smoothly floating on the wire which it is cutting.

The knives are self gauging because, as more fully set forth in connection with Figs. 6 to 11 of my prior Patent 1,608,478, their edges are formed as V-shaped serrations, say, 50 to 200 per inch, and they are mounted in such manner that only the tips of the serrations engage the cut surfaces of the wire. Consequently, the upper non-cutting V-portions afford spaces between the cutting tips so that each knife cuts parallel, spaced-apart grooves, leaving intervening grooves that are untouched by the cutting tips of such knife.

I have discovered that grooved surfaces resulting from the action of successive knives tend to hold shreds and particles of steel as well as dust, dirt and lubricant, which the cutting tips tend to shift onto said intervening untouched surfaces which are to be cut by the succeeding knives; and that in this type of steel wool machine, regularity of operation and production of uniform long staple fibers is greatly promoted by interposing wipers of elastic material to wipe the cut surfaces, preferably lengthwise of the grooves, in advance of knives about to operate thereon; and still greater improvement results from carefully lubricating said cut surfaces; and in the preferred form of the invention herein disclosed, the wiping and lubricating function is combined by employing a wiper pad of elastic material in combination with means for keeping it moistened with lubricant.

I have also discovered that by lubricating the cut surfaces in accordance with my present invention, a minimum but effective supply of oil will creep around the periphery of the wire into the bed groove. It is important to have lubricant at this point because, as has been discovered, this permits the tensed wire loops to slip smoothly to or along the exact bottom of the concave bed grooves; also to twist under pressure of the knives so as to preserve constant level for the cut surfaces of adjacent loops; and maintain constant traction friction of the wire with the rotor. On the other hand, if too much lubricant is employed, it tends to cause accumulations of dirt, steel dust and hardened lubricant in the bed grooves, thereby preventing perfect bedding of the wire within the groove. Even the slightest differences of angle or level of the cut surfaces of adjacent loops of wire, with respect to each other and the knife operating on them, seriously impair uniformity of operation.

The above and other features of my invention will be more evident from the following description in connection with the accompanying drawings, in which

Fig. 1 is a front elevation of one of the shaving units, including the pivoted floating wool cutters, the gauge cutter, the rotating traction bed, the means for lubricating the bed and the wire; and the means for wiping the same;

Fig. 2 is a detail top plan view of a wiper;

Fig. 3 is an end view of one of the devices of the wire lubricating system;

Fig. 4 is a front elevation of Fig. 3; and

Fig. 5 is a top plan view of Fig. 4.

In the drawings, a single wire 49 tensioned and supplied by a reel or other means not shown, passes to a cylindrical bed 48 formed in the pe-

riphery of a traction wheel or disc 52, which is power driven in a manner set forth in said parent application. The wire is looped a number of times around the traction wheel 52 and a transfer guide roller 53, in successive parallel grooves 59, 59, etc., and passes from the last groove to suitable traction means which may be another similar unit or may be a power driven traction reel. Knives or cutters, 58, are arranged in series around the upper half of the periphery of the bed and extend transversely of the bed, so that each knife edge operates simultaneously on the adjacent loops or strands of the wire 49. The loops or strands lie in the bottoms of grooves, 59, formed in the periphery of the bed, as indicated in Fig. 3. These grooves are transversely concave so that the tensed wire is guided to and supported upon the bottoms of the concavities, so that the latter cutter beds supporting the wire in operative position for shaving by the knives. Lubrication facilitates the centering and truing of the wire, in the bottom of the groove. The bed wheel is rotated in a direction to carry the wire in one direction loops, without reverse bending, so that the upper halves of the loops advance against the edges of the knives while traveling toward the supply end of the machine. The knives being grooved, as in my above mentioned patents, present V-toothed edges to the wire and these operate to cut from the wire a series of separate fiber-like lengths constituting the metal wool product of the machine.

As the loop of wire passes down from groove 59 to the transfer guide roller 53, it slants over and enters a second groove of the series of grooves 60, in the transfer roller, said second groove of the transfer roller being in the same plane as the second groove 59 of the bed wheel, so that the wire in passing back to the wheel from the guide roller 53, is conducted in a plane registering with the second groove 59 of said wheel 52.

Each time the wire is looped around the wheel bed, it is exposed to the cutting edges of all the knives 58, say 40 to 60 or more in number, and accordingly the wire becomes thinner as it advances through the successive loop paths from the first or entrance groove toward the front or exit groove of the bed. In order to have each cutting edge operate simultaneously on the successively thinned strands, it is necessary to have the successive bed grooves and the cutting edge of the knife correspondingly nearer to each other.

I prefer to obtain the gradual decrease in space between the effective surfaces of the beds and the cutting edge of the knife by having the successive bed surfaces formed on circles of successively greater diameter, and if the wheel periphery is approximately cylindrical, this results in decreasing depths for the successive grooves 59. This permits having the cutting edge of each knife 58 arranged to operate substantially in the surface of a cylinder of appropriately larger diameter and, in most cases, approximately parallel with the axis of the bed shaft 232. With this arrangement of decreased depth for the grooves 59, the metal is removed across a cylindrical surface exactly transverse to the lengthwise curvature of the wire so that as the wire becomes flatter, it naturally continues to do all its bending and straightening in the same plane in which it was bent and set by the first groove of the machine, whereas an inclined cut surface would cause a twisting resultant for every change in curvature. As the wire 49 advances successively from one groove to another, the slight increases of diameter of the cutter beds tend to retighten the wire.

The grooving knives, 58, may be like those in my above mentioned patent. They are arranged in groups around the periphery of the bed wheel as indicated in Fig. 1, where the size of the knives is somewhat exaggerated for clearness of illustration. Each knife is supported in a holder or bracket, 295, mounted to swivel about a pivot 296 on a semi-circular frame 297 extending adjacent the upper or cutter bed portion of wheel 52 and supported on the main frame 256. Each knife holder has connected thereto a weight, 298, which tends to force the cutting edge of the knife toward the wire which is supported in peripheral bed grooves.

When particularly hard spots in the wire reach the knives 58, said knives tend to rise or jump, with the result that they do not produce the desired quality of shavings and, in fact, do not do enough cutting of any kind to be at all effective in removing said hard spots. To remove local excess thickness of the wire, resulting from this, or any other cause, I provide for each bed a special cutter or planing knife, 299 (Fig. 1), located preferably in advance of the grooving knives and arranged to operate as a gauge cutter for removing any undue thickness of metal from each loop of wire, before it again passes to said grooving knives.

A lubricating or cooling agent, such as mineral oil, is supplied to the wire, bed and cutters, by a lubricating system which may include a plurality of lubricating devices, 322 (Fig. 1), one in advance of each group of cutters 58. A pump 323 of any suitable construction is supported on a bracket 324 on the main frame 256 and operates to force the lubricating agent through supply pipes 325 to said lubricating device 322. Preferably, pump 323 operates only when the bed 58 is rotating. Its driving means includes a sprocket 326 on the wheel supporting shaft 232. This sprocket drives a chain 327 connected with a sprocket 328 which rotates the pump shaft 329 and thus operates the pump to force the lubricant through the supply pipe 325 to said lubricating devices.

Each lubricating device, 322 (Figs. 3, 4 and 5) may include a cup-like element, 330, having secured therein a pad 331, which may be of felt, and to which the lubricant is supplied from a chamber 332 in said cup-like element. The lubricating device is held resiliently against the lengths of wire 49 so that as they advance past said lubricating device, they are wiped by the pad 331, which is saturated with the lubricant. To resiliently hold said device against the wire, the cup-like element is pivotally supported as by pivot studs 333 on a fixed bracket 335 which may be secured to the knife carrying frame 297, and a spring 336 is connected to a pin 337 of the cup-like element 330 and to a pin 338 of the bracket 335 to hold the pad against the strand of wire. The arrangement is such that when the cup is swung upward to vertical, the spring 336 passes dead center and retains the cup in non-operative position. To conduct the lubricant from the supply pipes 325 to the chamber 332, one of the pivot studs 333 may be provided with a head 339 having an aperture in which the end of the supply pipe 325 is received. A tube 341 conducts the lubricant or liquid from the apertures 340 of the pivot stud to the chamber 332. Thus with this arrangement, the cup-like element may be swung about its pivot without disturbing the lubricant supply connection.

A lubricating device 342 which may be constructed like the lubricating devices 322 is provided for the planing knife 299, and may be secured to the knife carrying frame 297.

The combination of the lubricating means with the wipers for removing excess lubricant, dirt, etc., is not claimed herein, but it may be explained that two wipers 344 and 345 (Figs. 1 and 2), are provided at each bed. The wiper 344 is provided with a pad 346 which lies against the periphery of the bed; said pad may be of comparatively soft material, such as felt, so as to embed itself in the grooves. The wiper 345 is also provided with a pad 347, of comparatively soft material, and the loops being spaced considerable distances from each other, the pads engage a considerable portion of the circumference of the wire. The wipers are pivotally supported on a rod 348 extending between the frames 256, 256. The wipers may be held in position lengthwise of said rod, in alignment with the bed and the loops of wire, by suitable collars 349. A spring 350 may be located between the wipers to separate them and force the wiper 344 against the periphery of the bed and the wiper 345 against the loops of the wire. It will be understood that the loops of wire extend from the bed at one side, downwardly towards and around the guide roller 53 and then upwardly back to the bed, and it is in this portion of the loops where the wipers are preferably located, so that the one may conveniently engage the periphery of the bed, while the other engages the surfaces of the wire that contact with the bed grooves. Thus, the grooves and the wires are kept clean from excess lubricant, shavings, dust, etc., which are wiped from each of them between every passage under the grooving knives.

I claim:—

1. In a machine including a circular rotating bed around which a wire extends to be fed thereby, a serrated grooving knife to act on the wire while the bed is rotating and liquid-applying, elastic wiping means to wipe the cut surface of the wire in advance of the knife.

2. In a machine for making metal wool from wire, including a grooving knife, and a circular rotating traction bed around which a wire extends, a liquid applying elastic wiper engaging the cut surface of the wire in advance of the knife, a pump and supply conduit to the device, and means to operate said pump when the bed is rotating and to discontinue operation when the bed stops.

3. In a machine for making metal wool from wire, including a grooving knife, and a circular rotating traction bed around which a wire extends, a liquid applying elastic wiper engaging the cut surface of the wire in advance of the knife, a pump and supply conduit to the device, and means to operate said pump when the bed is rotating and to discontinue operation when the bed stops; means whereby said device may be thrown out of liquid delivering position without stopping the pump, together with reservoir means to store liquid pumped in excess of the amount delivered.

4. In a machine for making metal wool from wire, including a grooving knife, a circular rotating traction bed around which a wire extends, a liquid applying device engaging the cut surfaces of the wire in advance of the knife, a pump to supply a liquid to the device, and means driven interdependently with the bed to operate said pump.

5. In a machine for making metal wool from wire, including a circular rotating traction bed around which the wire extends, a plurality of sets of grooving knives arranged along the periphery of the bed, a series of lubricating devices one in advance of each set of cutters engaging the cut surfaces to lubricate the wire, a pump connected to all of said lubricating devices to supply a lubricant to said devices, a rotating shaft to which said bed is connected and means connecting said pump with said shaft to operate the pump only while the bed is rotating.

6. In a machine for making metal wool from wire, including a grooving knife, and a circular rotating traction bed around which the wire extends, a lubricating device including a wiper bearing on the grooved cut surfaces of wire in advance of the knife engaging the cut surfaces of the wire, a pump to supply a lubricant to the device, support means including a pivot to mount said device, said pivot having an axial opening, a supply pipe extending axially into the opening and a tube extending therefrom and carried by said device to conduct the lubricant thereto from said pivot, the engagement of the supply pipe, tube and pivot enabling said device to be swung away from the wire about said pivot without disturbing the connection of the supply pipe.

7. In a machine for making metal wool from wire, including a grooving knife, and a circular rotating traction bed around which the wire extends, a lubricating device including a wiper bearing on the grooved cut surfaces of wire in advance of the knife, means supplying lubricant to the wiper including a pivot to mount said device, a supply conduit including a pipe extending to said pivot, and a tube extending from the pivot to said device with an intermediate rotatable connection coaxial with the pivot.

8. In a machine for making metal wool from wire, including a grooving knife, and a circular rotating traction bed around which the wire extends, a device including a wiper bearing on the grooved cut surfaces of wire to apply lubricant to the wire on the bed and means for supplying lubricant to the wiper including, a stationary source of supply for the liquid, means to pivotally support said device so that it may be swung away from the wire, and a conduit including swivel elements coaxial with the pivot connecting the source of supply with said device.

9. In a machine for making metal wool from wire, including a circular rotating traction bed around which the wire extends, a plurality of sets of grooving knives along the periphery of the bed, a series of elastic wipers for the wire, one in advance of each set of cutters, and a common source of supply of lubricant for all of said wipers.

10. In a machine for making metal wool from wire, including a circular rotating traction bed around which the wire extends, a plurality of sets of grooving knives along the periphery of the bed, a series of devices each including a wiper for applying liquid to the wire, one in advance of each set of cutters, and a common source of supply for all of said devices, including a pump and driving connections whereby the pump operates only when the traction beds are rotated.

11. In a machine for making metal wool from wire, including grooving knives, and a circular rotating traction bed around which the wire extends in parallel loops in such relation that all loops are grooved by each knife, and a device to apply liquid to the wire, said device having a chamber to which the liquid is supplied and a pad

of resilient absorbent material, having one surface in absorbent relation to said chamber and another surface engaging the cut surfaces of said loops.

12. In a machine for making metal wool from wire, including grooving knives, and a circular rotating traction bed around which the wire extends in a multiplicity of parallel loops, and a device to apply liquid to the wire, said device having a chamber to which the liquid is supplied and a pad of absorbent material having one surface in absorbent relation to said chamber and another surface engaging the cut surfaces of said loops; and a pivotal support about which the device may be swung away from the wire, and a spring tending to hold said device against the wire.

13. In a machine for making metal wool, including a rotating circular traction bed around the periphery of which a wire extends, a set of grooving knives to operate on the wire to produce metal wool, a planing cutter to remove undesirable material from the wire, a device in advance of the grooving cutters for supplying liquid to the wire from one source, and a device in advance of the planing cutter for supplying a different kind of liquid from another source.

14. In a machine including a circular rotating bed around which the wire extends to be fed thereby, a knife to act on the wire while the bed is rotating and wiping means independent of said knife to apply a liquid to the cut surface of the wire in advance of the knife.

15. In a machine for making metal wool from wire including a circular rotating bed over which the wire is conducted to present a multiplicity of adjacent lengths of the same wire, a knife to act on the wire and wiping means independent of said knife to apply a liquid to the cut surfaces of the wire in advance of the knife.

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