This invention relates to a continuous metal cleaning apparatus and in particular is directed to an apparatus designed for handling continuous lengths of wire-like products in an abrasive cleaning operation.

Installations for the continuous abrasive cleaning of wire or tape-like material are well-known. Such installations include means wherein the material to be cleaned is suspended by appropriate devices and carried in spiral fashion through a treatment area. An attempt is made to provide unimpeded access of the abrasives over the entire surface of the material to be cleaned.

In other devices, attempts have been made to clean entire bundles of wire or tape by suspending the bundles on a revolving arm. The suspended bundles are then exposed to streams of abrasives in an attempt to reach all surfaces to be cleaned.

Prior art installations have been somewhat unacceptable primarily due to inconsistent results which are achieved when an attempt is made to provide a rapid and efficient cleaning operation. The inconsistent results are attributed to the fact that the prior installations have not provided suitable means for controlling the spacing between coils which are to be cleaned, or have, for other reasons, prevented uniformity in the application of the abrasives. Where the installations provided for passage through a cleaning area in spiral fashion, contact between coils will result in insufficient exposure to the abrasives while undue space between coils will result in overexposure of certain portions. In installations where an attempt is made to clean entire bundles, it is virtually impossible to provide uniform distribution of the abrasives over interior and exterior coils.

It is an object of this invention to provide a unique continuous abrasive cleaning apparatus which enables highly uniform application of abrasives to all surfaces of wire and similar products whereby the above noted disadvantages of prior installations can be overcome.

It is a more specific object of this invention to provide an abrasive cleaning apparatus which is particularly designed for the handling of continuous lengths of metal such as wire and tape-like products, and which is characterized by means for passing the wire in a controllable pattern through a cleaning area whereby uniform and highly efficient application of abrasive can be accomplished. These and other objects of this invention will appear hereinafter and for purposes of illustration, but not of limitation, specific embodiments of this invention are shown in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, illustrating the continuous cleaning apparatus of this invention;

Figure 2 is a view of one end of the apparatus shown in Figure 1;

Figure 3 is a sectional view taken about the line 3—3 of Figure 1;

Figure 4 is an end view of a continuous cleaning apparatus of an alternative design;

Figure 5 is a detailed elevation view illustrating sealing means designed for confining the abrasives during operation of the apparatus;

Figure 6 is a side elevation of an additional alternative continuous cleaning structure; and

Figure 7 is an end view of a cleaning apparatus representing a still further alternative structure.

The apparatus of this invention generally comprises a main housing having an entrance end and an exit end and including within the housing means for directing abrasives onto objects passing therethrough. The apparatus is designed for handling continuous lengths of metallic wire tape and the like and means are provided at the entrance end for holding bundles of the lengths of wire or tape. The apparatus provides for unreeling of the bundles to form a plurality of spaced-apart coils which are then passed through the cleaning area. Means are provided for controlling the spacing between the coils and for maintaining a desired spacing as they pass through the cleaning area. The means for maintaining this spacing and the means for moving the coils through the cleaning area cooperate to provide maximum uniformity in the cleaning operation and to enable the attainment of a highly efficient cleaning procedure.

The means for controlling the spacing between coils can provide for equal spacing between coils throughout the cleaning area, or the coils may be spaced apart a greater distance when in the cleaning zone whereby maximum surface contact and maximum efficiency in handling the coils can be achieved. The controlling means preferably comprise rollers having radially extending circumferential ribs located thereon. These ribs are spaced apart a distance corresponding to the desired spacing between the coils, and by maintaining the coils between such ribs, the uniform spacing can be achieved.

In order to insure maintenance of the coils between the upstanding ribs, guide means are provided adjacent the peripheries of respective ribs. These guide means define with the ribs a plurality of openings and the coils are adapted to be threaded through these openings in the initial steps of the operation.

The invention also contemplates the provision of holding means disposed in the path of the coils passing through the housing. The holding means may include a plurality of members spaced apart a distance approximately equal to the spacing between the aforementioned upstanding ribs. These holding means cooperate with the ribs since the individual coils are associated with the holding means thus providing a second means for maintaining the desired spacing between coils.

In the preferred form of this invention, the ribs are located on a pair of conveyer rollers situated near the floor of the main housing. The holding means are located above these rollers in a manner such that the upper extent of each coil is engaged by a holding means while the lower extent thereof is engaged by one of the upstanding ribs. By supporting the upper and lower extents of the coils in this manner, the desired spacing between the coils is more effectively maintained.

The accompanying drawings illustrate in detail typical examples of construction characterized by the features of this invention. Figures 1 through 3 illustrate a main housing 1 having two smaller housings 2 and 3 secured at its top. The smaller housings provide support for shafts 4 and 5 upon which are mounted centrifugal wheels 6 and 7. These wheels are adapted to direct streams 8 and 9 of abrasives into the housing 1. The wheels may be of any known type capable of propelling the abrasives in the manner shown and accordingly the structure of these wheels is not shown in detail.

Disposed adjacent the inlet end of the housing 1 is a standard 10 rotatably supporting a shaft 11. Bundles 14 of wire lengths 31 are located on the portion 37 of the shaft and the wire is shown as it is unwinding over the portion 37 of the shaft prior to entrance into the housing. Parallel circumferential ribs 13 located on the portion 37...
serve to maintain the unreeling coils in spaced-apart fashion at this end of the apparatus. A flange 13 at the opposite end of the shaft 11 holds the bundles in place. FIGURE 2 illustrates the drive means for the coil advancing mechanism of the apparatus. The drive means includes a motor 15 which drives chain 16. The chain 16 serves to drive the chain 17 which in turn drives the chain 18. Movement of the chain 16 serves to rotate chain 21 while the chain 17 rotates shaft 22. These shafts carry conveyor rollers 19 and 20 respectively. These rollers are supplied with circumferential ribs 23 and 24 and these ribs are spaced apart a distance sufficient to provide a desired spacing between adjacent coils in a length of wire. As indicated, the spacing is selected whereby contact with all surfaces of the coil by the abrasives can be accomplished. As suggested by the paths of the streams 8 and 9 and in view of the fact that the lengths of wire are rotating, it will be apparent that contact with all surfaces of the coils is achieved. As shown, a single coil is located between each adjacent pair of ribs. To maintain this condition, holding devices in the form of spirals 27 and 28 can be provided. These spirals are secured to elongate members 25 and 26 which extend along the housing and are fastened thereto. When a new bundle is to be cleaned, the leading end of the bundle is threaded through each of the loops in the spirals and the individual coils so formed are arranged between individual pairs of ribs on the conveyor rollers. The respective loops in the spirals are spaced apart a distance approximately equal to the spacing of the ribs so that the loops and ribs cooperate to maintain the desired space.

In order to further control the passage of the wire, coils through the housing thereon a pair of guide or restraining means 29 and 30. These means engage respectively the peripheries of the ribs 23 and 24 and each preferably comprises an elongated pipe or rod extending along the entrance of the housing and out the ends in approximately the same manner after the conveyor rollers. The guide means 29 and 30 are preferably journaled at either end to provide idlers driven through contact with the ribs and the idlers along with the associated ribs define a plurality of openings for confining the individual wire coils after they proceed through the apparatus. The leading end of a new coil is to be threaded through these openings when a new operation is to be initiated.

It will be noted in FIGURES 2 and 3 that small diameter coils are shown in dotted lines whereas larger diameter coils are shown in solid lines. The dotted and solid line representations of the coils illustrate respectively the smallest and largest diameter which the coils can assume in a particular stage in the operation. The dotted line illustration of FIGURE 2 illustrates that a bundle of relatively small diameter can be initially provided for treatment and FIGURE 3 illustrates that small diameter coils can be controlled by means of the loops and conveyor ribs as they pass through the apparatus. At the exit end of the housing 1 there is provided a means for collecting the continuous lengths of wire and for cleaning. These means comprise truncated cones 33 disposed on platforms 32. The cones are adapted to turn on shafts 34 which are connected to a central shaft 35 by means of arms 36. After coils are deposited about the cones, they may be wound as desired by rotation of the respective arms 36. When the capacity of a cone has been reached, rotation about the shaft 35 will permit disposition of an empty cone to receive additional coils and the previously formed bundle can then be removed.

FIGURE 5 illustrates a scaling device designed to avoid passage of the abrasive outside the housing 1. The device shown, one of which can be provided at each end of the housing 1, includes a top plate 38 attached to the housing and extending between about 1/5 and less than 1/4 the distance across the opening. A bottom plate 40 approximately the same size is also secured to the housing and an intermediate plate which may be secured at its sides to the housing covers the gap between the top and bottom plates. The intermediate plates overlap the other plates by an appreciable amount; however, the plates are spaced apart so that a coil can be fitted between these openings during its passage through the apparatus. Spacer elements 55 can be employed to maintain the necessary openings between the plates. The sealing means shown in FIGURE 5, are adapted for use at the entrance end of the housing and a mirror image of this device can be utilized for the exit end.

In the operation of the device shown in FIGURES 1, 2, and 3, a bundle to be cleaned can be located on the feed roller 37 by means of a socket lift or the like. The leading end is then adapted to be threaded through the apparatus with special attention being given to maintaining a single coil between the ribs 13 on the feed roller, between the ribs 23 and 24 on the conveyor rollers and within the loops 27 and 28. The drive mechanism may be operated at a low speed to provide slow turning of the bundle as the threading operation takes place. The rotating speed of the motor can be increased and the operation of the centrifugal wheels commenced once the leading end of the coil length has passed beyond the exit end of the apparatus. A new bundle can be placed on the feed roller 37 at any time, and the leading end thereof can be secured as by welding to the trailing end of the previous bundle so that uninterupted operation can be accomplished.

The coils will fall by gravity onto the collecting cones at the exit end of the apparatus. It will be appreciated that the coils can be severed at any time depending on the amount desired in the finished product or depending upon the capacity of the collecting cones.

FIGURE 4 illustrates a somewhat modified construction wherein the same numerals are employed for identical parts. In this construction the centrifugal wheel housings 42 and 43 are arranged at oblique angles on the longitudinal walls of the housing 41. The wheels 44 and 45 are adapted to direct streams as indicated at 48 and 49. FIGURE 4 also illustrates a single coil holding means 50 which is comprised of small loops connected to a centrally located supporting member 51. The threading operation therefore necessitates passage through a smaller number of loops, however, as indicated by the solid and dotted line representations of the coils, the possible variation in coil diameter is the same.

In FIGURE 6 is a structure similar to that shown in FIGURE 1 is shown, however, the spacing between coils is increased when the coils reach the zone of major contact with the abrasives. This arrangement provides for a more thorough impingement of abrasives at a time when the coils are exposed to a maximum amount of this abrasive. To accomplish this three sets of ribs 23, 23a and 23b are located in closely spaced relationship at the center of the conveyor roller 19. Similar closely spaced ribs will be provided on the conveyor roller 20 and the loops in the spirals 27 and 28 will also be extended at this point in order to maintain the necessary spacing of the coils from top to bottom.

The apparatus shown in FIGURE 7 is substantially the same in all respects as the foregoing devices with the exception of rods 53 and 54. These rods are provided in lieu of spiral-like guide means and each of the rods extends inwardly from supporting means 57 and 58. The extent of the rods is sufficient to provide contact with the upper ends of coils in the lengths passing through the apparatus. By maintaining several rods on the supporting means 57 and 58 and by spacing these rods in accordance with the spacing of the ribs on the conveyor rollers, the desired spacing between coils can be maintained.

The illustrations described provide many advantages
when compared with prior art devices. When components of these installations which are worn, such as the guide spirals or rods and the conveyor rollers, they can be easily replaced. Furthermore, the individual coils in the lengths to be threaded are passed through the apparatus without any material amount of tension, and there is, therefore, no deformation taking place during the operation.

Many alternatives will be apparent when considering the structural elements illustrated. Thus, any one of conveyor rollers of the type shown at 19 and 20 could be employed and it will be apparent various feed and take-up mechanisms could be utilized in combination with the disclosed cleaning structures.

It will be understood that various other modifications can be made in the described structure which provide the characteristics of this invention. Without departing from the spirit thereof particularly as defined in the following claims.

7. Which is claimed is:
1. An abrasive cleaning apparatus for continuous lengths of metallic tape, wire, and the like comprising a main housing, means for directing abrasives into said housing, means for disposing said lengths adjacent an entrance for said housing, means adapted to unroll said lengths to the lengths into a plurality of spaced-apart coils, and means for conveying said spaced-apart coils through said housing and for controlling the spacing therebetween while bringing the coils into contact with said abrasives.
2. An apparatus in accordance with claim 1 wherein said coils are maintained equally spaced apart when brought into contact with said abrasives.
3. An apparatus in accordance with claim 1 wherein said controlling means are adapted to spread said coils a greater distance apart when they are in the cleaning zone and are then adapted to return the coils to a more compactly spaced relationship before removal from said housing.
4. An apparatus in accordance with claim 1 wherein said controlling means comprise roller means having radially extending, circumferential ribs thereon, guide means located adjacent the peripheries of said ribs and defining a plurality of openings therewithal the length of said roller means, the axes of said roller means extending from the entry to the exit end of said housing means for rotating said lengths and the coils thereof, and means for rotating said roller means whereby said coils can be passed through said housing in controlled spaced-apart relation by threading the leading ends of said lengths through each of said openings and by rotating said lengths and roller means.
5. An apparatus in accordance with claim 4 wherein said roller means comprise a pair of conveyor rollers rotatably mounted near the floor of said housing and extending beyond the entrance and exit ends thereof, and including holding means formed of spiral lengths having axes parallel to the axes of said roller means and located above said roller means, the loops of said spiral lengths being spaced apart a distance approximately equal to the spacing of said ribs whereby said coils can be threaded through said spiral and through said openings.
6. An apparatus in accordance with claim 4 wherein said roller means comprise a pair of conveyor rollers rotatably mounted near the floor of said housing and extending beyond the entrance and exit ends thereof, and including holding means formed of a plurality of rods extending inwardly from the top of said housing, said rods being spaced apart a distance approximately equal to the spacing of said ribs whereby said coils can be threaded between said rods as well as through said openings.
7. An apparatus in accordance with claim 1 including means for sealing the entrance and exit ends of said housing comprising a plurality of vertically disposed plates covering the openings defined by said housing at said ends, said plates overlapping and being spaced apart a distance sufficient to permit passage of said coils therebetween.
8. An abrasive cleaning apparatus for continuous lengths of metallic wire tape and the like comprising a main housing having an entrance and an exit end, means for directing abrasives into said housing, means for holding bundles of said lengths adjacent said entrance end, means adapted to unroll said bundles to form said lengths into a plurality of spaced-apart coils, means for conveying said spaced-apart coils through said housing and for controlling the spacing therebetween while bringing them into contact with said abrasives and means adjacent the exit end of said housing for forming the cleaned lengths into bundles.
9. An apparatus in accordance with claim 8 wherein said controlling means comprise roller means having radially extending, circumferential ribs thereon, guide means located adjacent the peripheries of said ribs and defining a plurality of openings therewithal the length of said roller means, holding means disposed in the path of the coils passing through the housing, said holding means including a plurality of members spaced apart a distance equal to the spacing of said ribs and adapted to retain individual coils therebetween, the axes of said roller means extending from the entry to the exit end of said housing, means for rotating said lengths and the coils thereof, and means for rotating said roller means whereby said coils can be passed through said housing in controlled spaced-apart relation by threading the leading ends of said lengths through each of said openings and between the members of said holding means and by rotating said lengths and roller means.
10. An apparatus in accordance with claim 9 wherein said holding means comprise spiral lengths having axes parallel to the axes of said roller means and located above said roller means, the loops of said spiral lengths being spaced apart a distance approximately equal to the spacing of said ribs whereby said coils can be threaded through said spars as well as through said openings.
11. An apparatus in accordance with claim 9 wherein said roller means comprise a pair of rollers disposed near the bottom of said housing and said holding means include a pair of spiral means, one of said spiral means having disposed above each of said conveyor rollers.
12. An apparatus in accordance with claim 9 wherein said roller means comprise a pair of rollers disposed near the bottom of said housing and said holding means comprise a single spiral means disposed above said conveyor rollers.
13. An apparatus in accordance with claim 9 wherein said holding means include a plurality of rods extending inwardly from the top of said housing, said rods being spaced apart a distance approximately equal to the spacing of said ribs whereby said coils can be threaded between said rods as well as through said openings.
14. An apparatus in accordance with claim 8 including means for sealing the entrance and exit ends of said housing comprising a plurality of vertically disposed plates having the opening defined by said housing at said ends, said plates overlapping and being spaced apart a distance sufficient to permit passage of said coils therebetween, said plates including an upper plate and a lower plate each extending less than half the distance across said openings and a third plate covering the space defined between the upper and lower plates.
15. An apparatus in accordance with claim 8 wherein the means at the exit end of the housing for forming the cleaned lengths into bundles comprises cone means rotatable about a vertical axis, said cone means being disposed to receive coils passing out of said exit end, and means for moving one cone means from a position adjacent said exit end and for introducing a new cone means to said position.
16. An apparatus in accordance with claim 1 wherein
the means for unreeling the bundles include a shaft, radially extending peripheral ribs formed on said shaft, said ribs being spaced apart whereby single coil on said shaft can be maintained therebetween.

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