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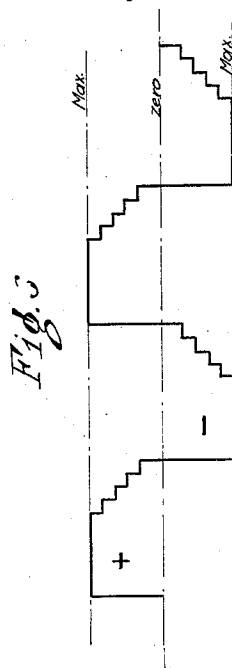
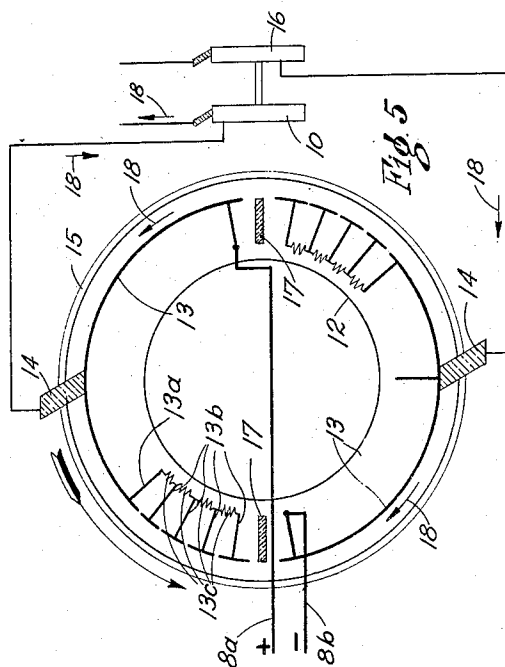
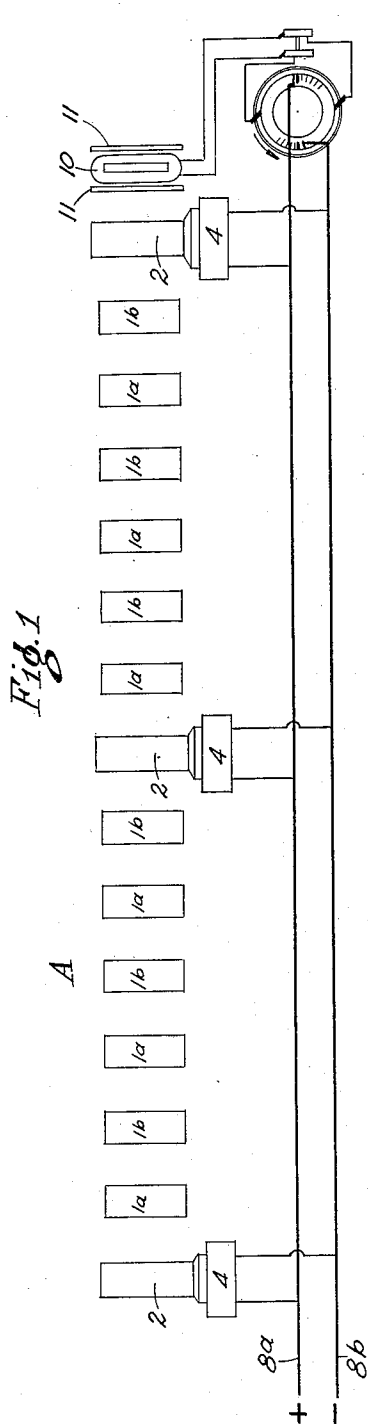
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APPARATUS FOR DEMAGNETIZING MAGNETICALLY CONVEYED MATERIAL

Filed June 11, 1930

2 Sheets-Sheet 1



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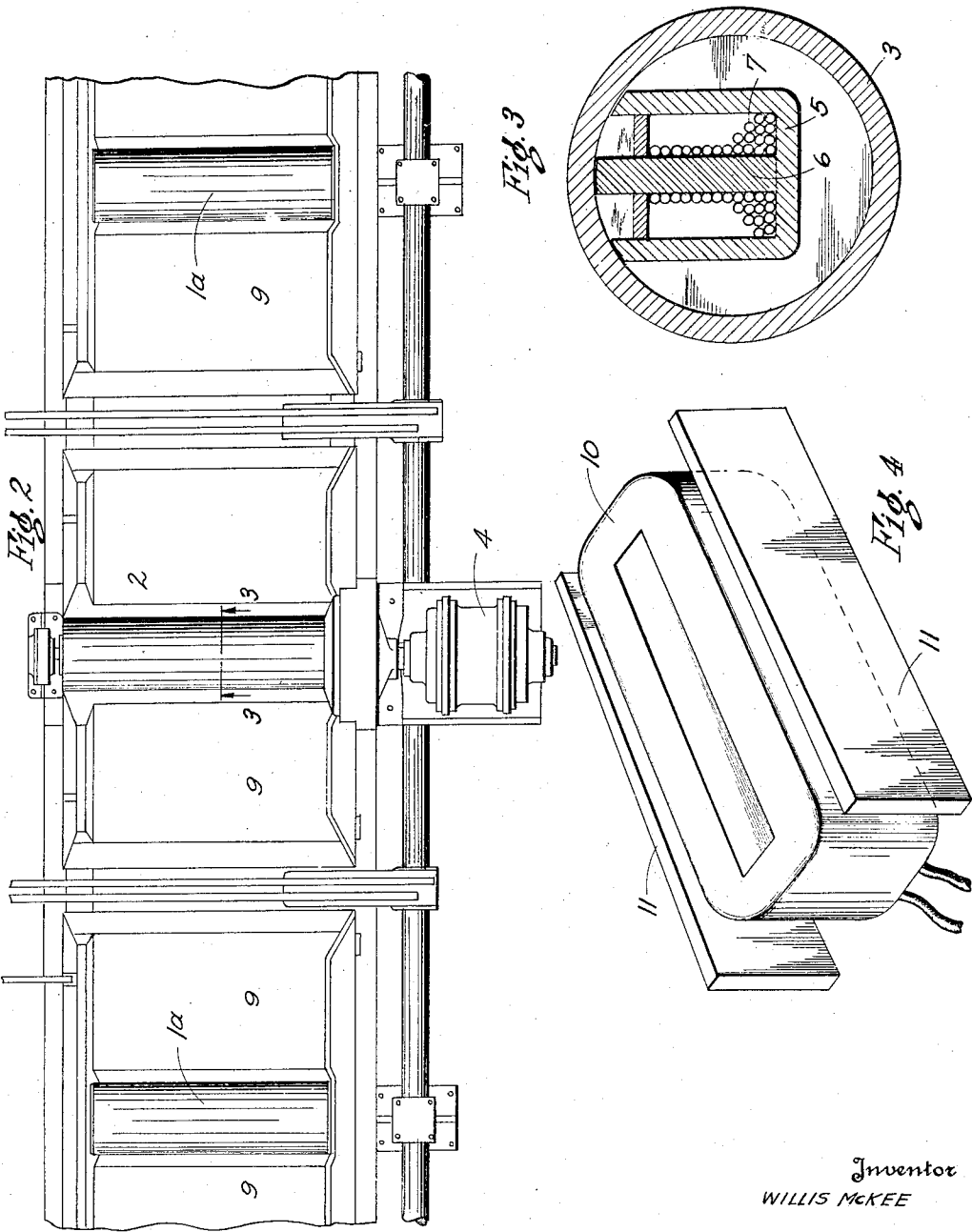
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UNITED STATES PATENT OFFICE

WILLIS McKEE, OF CLEVELAND, OHIO, ASSIGNOR TO THE CENTRAL UNITED NATIONAL BANK, A CORPORATION OF THE UNITED STATES

APPARATUS FOR DEMAGNETIZING MAGNETICALLY CONVEYED MATERIAL

Application filed June 11, 1930. Serial No. 460,513.

This invention relates to the art of handling elongated magnetic material and is more particularly concerned with a method of and apparatus for conveying and then demagnetizing magnetic articles by the use of direct current.

In my co-pending application, Serial No. 47,490, filed August 1st, 1925, now Patent No. 1,774,392, issued Aug. 26, 1930, is disclosed a magnetic roller (that is a roller whose traction is increased by magnetism) which is especially adapted for use in conveying elongated magnetic material, such for example as steel bars. In my co-pending application Serial No. 220,111, filed September 17, 1927, is disclosed a conveyor in which a plurality of idler rollers are employed with one or more magnetic rollers to convey elongated magnetic articles, and in which the magnetic rollers are driven by motors therewithin. The present invention contemplates the use of apparatus such as those applications disclose together with other apparatus.

When magnetic rollers are used or when steel articles are brought within the field of any other magnets energized by a non-reversing current there is some residual magnetism left in the steel. In soft steel this is not enough to be objectionable but when steel of say 0.50 carbon is conveyed the residual magnetism is great and is quite objectionable especially when the material is to be machined without heat treating.

In my conveyor, I incorporate not only the necessary magnetic rollers but after the magnetic roller energized by direct current, I place a demagnetizing coil so that the material will leave the conveyor commercially free from residual magnetism.

When material like watch springs is to be demagnetized this coil can be energized by an alternating current of fairly high frequency, but when heavy bars are to be demagnetized it is necessary that the current should be reversed very slowly so that the demagnetizing magnetic lines will penetrate substantially as far as did the magnetizing lines. When a motor generator set is used to produce say $\frac{1}{2}$ cycle current

the generator will have to be many times as large as if an equal amount of 60 cycle power were required. Such an expensive unit would limit the use of magnetic rollers. I have supplied a simple, reliable, cheap and novel method to produce the very low frequency current required for the demagnetizing coil.

In practicing my invention I contemplate using direct current supply available in a steel mill for energizing the magnets in rollers of a conveyor, for driving the conveyor rollers and also for energizing the demagnetizing means. I further contemplate converting such direct current into alternating current of low frequency, such as from a fraction of one cycle to about ten cycles per second, by employing a simple device that will reverse the direction of direct current flow through the demagnetizing coil often enough to give the desired frequency. Preferably I employ resistances so disposed in the device as to be thrown into the circuit during each reversal to decrease arcing to a negligible amount, or alternately, I may use magnetic blowouts for a like purpose.

By my invention the direct current ordinarily available in a steel mill may be utilized for all these purposes without any need for an alternating current source, a motor generator set or any other expensive apparatus. Thus the invention makes available to many uses conveyors containing magnetic rollers and/or magnetic motor rollers and anticipates any objections as to current sources which might be met with in exploiting such conveyors.

My invention will be more fully set forth in the following detailed description of one form of apparatus which embodies my invention and with which my invention may be practiced. This apparatus is shown in the drawings in which—

Fig. 1 is a diagrammatic plan view of a conveyor embodying my invention.

Fig. 2 is a fragmentary top plan view of a portion of the conveyor of Fig. 1 showing one magnetic roller.

Fig. 3 is a sectional view of the magnetic roller taken on line 3—3 of Fig. 2.

Fig. 4 is a perspective view of one form of demagnetizing device.

Fig. 5 is a diagrammatic view of a switch for use with the demagnetizing device, and

Fig. 6 shows diagrammatically the wave form of the current flowing in the demagnetizing device when used with the switch of Fig. 5.

In the drawings, the conveyor A is composed of rollers and aprons with a demagnetizing device located at the discharging end. Certain of the rollers 1—*a* are driven while others 1—*b* are merely idlers. At intervals along the conveyor A magnetic rollers 2 are disposed. These rollers 2 are shown in detail in Figure 3 and serve the purpose of attracting the magnetic articles into close contact with the upper surface thereof. When the outer shell of the magnetic roller is driven as indicated herein the magnetic attraction afforded by the magnet within the shell causes the articles on the shell to be attracted to the shell with force sufficient to enable the shell to propel the pieces at the same speed as the rollers and to overcome the resistance due to the idlers.

The magnetic rollers 2 consist of an outer shell 3 which preferably is driven as by means of suitable gearing connected thereto and joined to a motor 4 and a magnet disposed within the shell. The magnet consists of a hollow metallic member 5 generally rectangular in longitudinal cross-section with a central upstanding integral partition 6. This hollow member is supported in any convenient manner. A coil of electrical conducting wire 7 is wound about partition 6 in the hollow member 5, the terminals being lead out therefrom and connected to leads 8*a* and 8*b* of a suitable source of direct current, (not shown). When current passes through the coil the sides of the hollow member 5 act as one pole of the magnet while the partition 6 acts as the other pole of the magnet. Since the shell 3 is of non-magnetic material, the lines of force from the poles of the magnet pass into any elongated magnetic metallic article, supported on the shell and attracts the article to the shell. Rotation of the shells 3 and driven rollers 1—*a* propel the articles along the conveyor, the idlers 1—*b* and the aprons 9 maintaining the articles at approximately the level of the top of the rollers. Some of the magnetism exerted by the magnet on the article is retained by the latter and should be removed, not only from the surface but from the inner portions of the article before certain subsequent operations are performed on the article, i. e., machining operations.

Means are provided, preferably at the end

of the conveyor shown in Figure 1, and after the elongated articles have passed the last magnetic roller 2 in conveyor A for sufficiently demagnetizing the article to prevent interference by residual magnetism with subsequent operations performed on the article. As shown herein, this means is in the form of a coil 10 of electrically conducting material, such as wire through which alternating current is caused to flow and is disposed in proximity, for example, close to the underside of the metallic article being discharged from the conveyor A. The coil 10 is disposed sufficiently close to the magnetized articles so that the flux produced by alternating current flowing in the coil will penetrate the article to a sufficient distance beneath the surface to accomplish the desired purpose. If desired, suitable flux-directing apparatus may be employed in conjunction with the coil, as for example, steel bars 11 located on opposite sides thereof, but not between the coil and the magnetized articles. Alternating current of a frequency range of from a fraction of one cycle to about ten cycles is passed through the coil. Alternately I may use a magnetic roller 2 as the demagnetizing means, the winding of the roller being supplied with current from the switching device, presently to be described. In such case the roller may be idle or driven.

Since the cost of equipment necessary to produce alternating current of this low frequency is quite high, I contemplate the use of inexpensive means for changing direct current into alternating current. To accomplish this, I contemplate employing a switching device between the direct current source and the alternating current coil and either to employ therewith any suitable well known magnetic blow-out device to decrease the arcing incident to the switching or alternatively to throw resistance into the circuit before each reversal.

Apparatus for accomplishing this latter and preferred operation is shown in Figure 5 in which 8*a* and 8*b* indicate the leads from a source of direct current connected to semi-circular conductors 13 carried by a circular member 12. Brushes 14 are carried by a circular member 15 and are connected to collector rings 16 which are connected in turn to the coil 10. These members comprise the switching device and serve to conduct current from the direct current leads 8*a* and 8*b* to the coil 10.

The conductors 13 carried by the member 12 are made up of separate members 13*a* and 13*b* connected together within the circumference of the member by resistances 13*c*. The members 13*a* are connected to leads 8*a* and 8*b*. The members 13 are insulated from each other as at 17,

The switching device operates as follows—

The member 15 which carries the brushes 14 is rotated while the other member 12 is stationary. At the position shown for the brushes 14 and members 13a in Figure 5, current will flow in the direction indicated by the arrows 18 through the brushes and thence into the demagnetizing coil 10, without any of the resistances 13c being included in the circuit. As the brushes rotate they progressively contact with members 13b about the stationary member 12 and the current progressively travels through the resistances which intervene between the respective members and the conductor members 13a and is cut down. When the brushes pass from the ends of their respective conductors across insulation 7 and onto the next conductor, the current is reversed without arcing and all the resistances of each conductor are cut out of the circuit. By suitably controlling the speed of relative rotation of the brush carrying member and conductor carrying member the number of reversals per second of the current flowing in the demagnetizing coil may be controlled and the low frequency desired for this invention may be obtained. The curve of current flow in the output terminals of the switching device is shown in Figure 6. By varying the number of resistances 13c or the relative position of such resistances the curve may be varied.

The operation of the switching device is substantially the same as just described when the brush carrying ring 15 is held stationary and the conductor carrying member 12 is rotated.

Certain obvious changes in lead connections must be made from those shown when the member 12 is to rotate.

Having thus described my invention so that others skilled in the art may be able to understand and practice the same, what I desire to define in the Letters Patent is defined in what is claimed, it being understood that various alterations and changes may be made in the detailed disclosure hereof within the scope of which is claimed.

What is claimed is—

1. A conveyor for magnetic metallic material including magnetic roller energized by direct current for supporting and conveying such material, a coil energized by alternating current adjacent to the path of said material after it passes the magnetic roller, and means associated with said coil for converting direct current into alternating current of low frequency for energizing said coil.

2. A conveyor for magnetic metallic material including magnetic rollers energized by direct current for supporting and conveying such material, a coil energized by

alternating current and disposed adjacent to the path of said material and beyond the last magnetic roller, a source of direct current connected to the coil and means in the circuit between the said source and the coil for reversing the direction of direct current flow in the coil.

In testimony whereof I hereunto affix my signature this 9th day of June, 1930.

WILLIS McKEE. 75

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