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METHOD OF AND APPARATUS FOR SEPARATING MATERIALS

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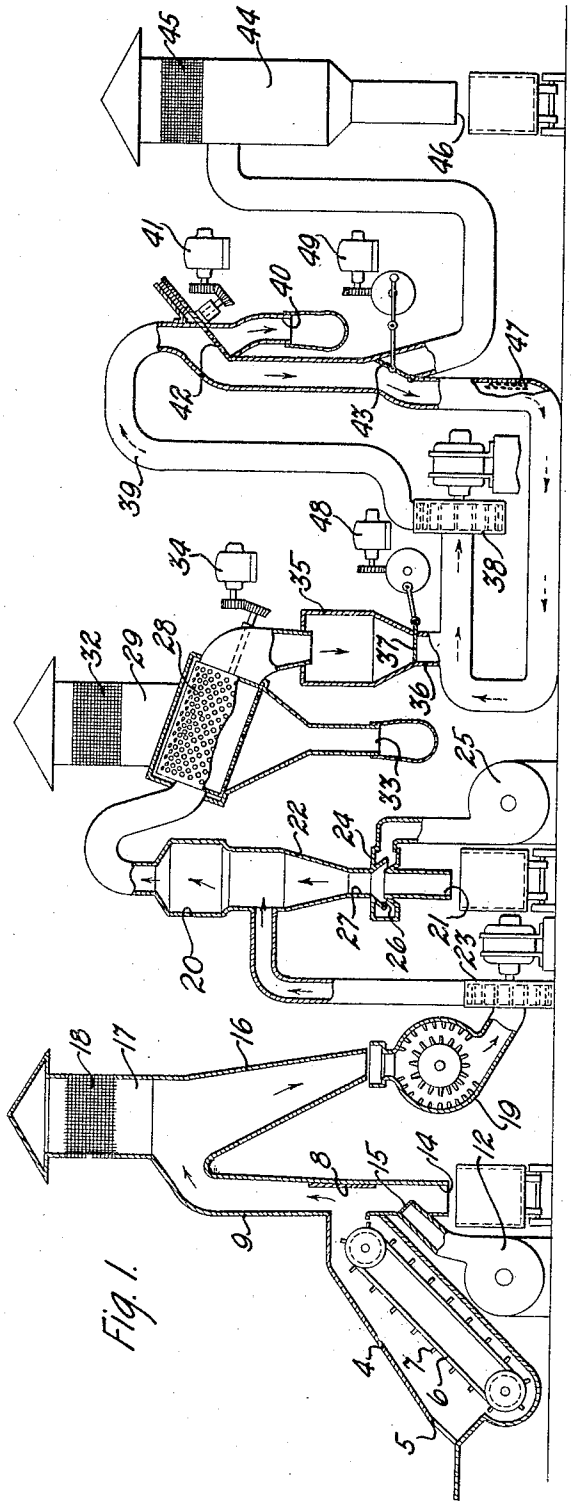


Fig. 1.

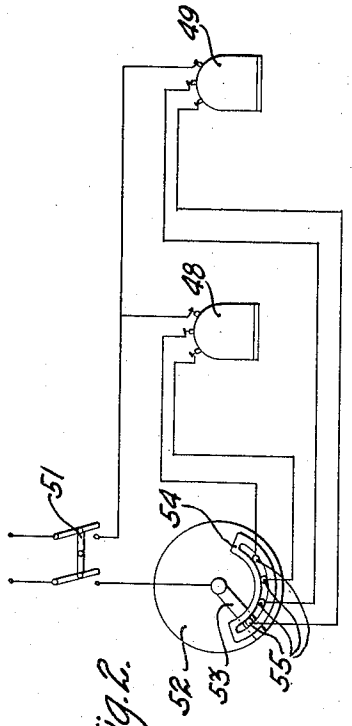


Fig. 2.

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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR SEPARATING MATERIALS

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This invention relates to a method of and apparatus for separating materials, and more particularly to a method of and apparatus for separating materials such as lead, copper and paper in the process of reclaiming telephone cables which have become unserviceable.

Objects of the invention are to provide an effective and efficient method of and apparatus for separating materials.

The invention contemplates a continuous process of separating different materials by taking advantage in the various steps of the different weights and sizes of individual units of the material to obtain complete separation. In accordance with one embodiment, the materials are first introduced into an air current of a progressively decreasing velocity through which the heaviest materials are discharged against the current by gravity. The remaining materials are then introduced into a second air current of a lower, progressively decreasing velocity through which materials are discharged which were too light to be discharged in the first step. After the larger particles have been separated in this manner the materials are subjected to several screening steps to effect further separation of the materials.

It is believed that a complete understanding of the invention may be had by reference to the following description taken in conjunction with the accompanying drawing representing an embodiment of an apparatus by which the method may be practiced to separate the lead, copper, and paper in the reclamation of telephone cables, and in which

Fig. 1 is a side elevation partially schematic in which some of the parts are shown in section illustrating a separating apparatus, and

Fig. 2 is a circuit diagram of a device for timing the operation of charging and discharging motors of a circulatory separating device.

Referring to the drawing in which the same reference characters designate similar parts in the several views, a conveyor 4 is shown at the receiving end of the separating apparatus. Before the material is delivered to the separating apparatus, it is passed through a disintegrating device which may be of the type in which the lead sheath surrounding the cable core which is composed of a plurality of paper insulated copper wires is slit on two sides, dividing the sheath in two halves after which the sheath and the core are cut into lengths approximately six inches long. This material is fed through an aperture 5 of the conveyor 4 and dropped upon an endless conveyor belt 6 which is provided with a number of projections 7. The belt 6 travels at such a speed that the materials will be thrown against a reinforcing plate 8 located in an air pipe 9 with such impact as to separate and scatter the disintegrated parts in the pipe 9. A fan 12 is provided whose outlet extends into the lower end of the pipe 9, which serves to maintain an air current of such velocity in the pipe as to elevate the copper and paper of the material to be separated, but of insufficient velocity to elevate the lead parts of the sheath which are thus allowed to drop through an opening 14 by gravity into any suitable receptacle. A screen 15 is placed over the outlet of the fan 12 in order to prevent the lead parts from dropping into the fan. The pipe 9 is constructed so as to have a progressively increasing cross-section for the purpose of progressively reducing the velocity of the air current, whereby the smaller particles of lead which may be mixed with the paper and copper are given an opportunity to become liberated and permitted to drop back and escape through the outlet 14.

From the pipe 9, the paper and copper are carried into a hopper 16 and the air from the pipe is permitted to escape through a stack 17 provided with a screen 18. The hopper 16 discharges into a cutting mechanism 19 in which the remaining paper insulated copper wires are subjected to a thorough shredding, removing the paper from the copper wires and cutting the copper wires into lengths of approximately one inch.

The material thus treated is conveyed from the cutting mechanism to a separating chamber 22 by means of an air current produced by a fan 23. The lower end of the separating chamber 22 is provided with an annular drum

24 in which an air pressure is maintained by means of a fan 25 and which communicates with the separating chamber by means of an annular outlet 26. The annular outlet 26 of the drum 24 is frustrum-shaped with its apex directed upwardly so as to create an upward air current of a high velocity in the restricted lower portion 27 of the separating chamber which is, however, lower than the velocity in the restricted portion of pipe 9. The separating chamber 22 is so constructed that various velocities will be encountered in the different portions of the chamber. When the material enters the chamber, the lighter portions will be carried upwardly and the heavier portions will drop downwardly and through an exit 21 into any suitable receptacle. In the restricted portion 27 of the separating chamber, the velocity is such as to permit only the copper particles to drop downwardly and the velocity in an upper expanded portion 20 of the chamber is such as to be sufficient to raise only the paper particles. If any copper particles are present in the chamber to which paper is attached they will be suspended and agitated between the restricted and the expanded portions of the chamber until they are separated when the larger particles of copper will be dropped through the exit and the paper and smaller particles of copper or copper dust will be carried by an air current into a rotary cylindrical sieve or screen 28. The air from the separating chamber is permitted to pass into a stack 29 provided with a screen 32. Much of the copper dust which is present in the paper will be separated from the paper by the screen 28 which is rotated by a motor 34 and passed out of an exit 33 into any suitable receptacle. The paper is discharged from the screen 28 to a hopper 35.

The lower end of the hopper 35 is connected to a pipe 36 in which is located a periodically operated gate 37. When the gate 37 is opened, a fan 38 draws the material from the hopper into a circulatory system 39 whereupon the gate 37 is again closed. A rotary disk screen 42 operated by a motor 41 is located in the system against which the paper and dust are thrown. Some of the dust will pass through the screen and through an exit 40 into any suitable receptacle while the paper will be ricocheted from the screen and continue through the system to repeat the cycle. After the material has completed approximately forty-five cycles, requiring about as many seconds, all of the dust will be separated from the paper and a gate 43 will be operated to discharge the paper into a hopper 44 from which the air may pass through a screen 45 and the paper is permitted to drop thoroughly cleaned through an exit 46 into any suitable receptacle. A screen 47 is provided in the circulatory system to permit the fan 38 to draw air into the system and discharge the material when the gate 43 is in the proper position to discharge the material.

The gates 37 and 43 are actuated by motors 48 and 49, respectively, which are operated in timed relation by a mechanism (Fig. 2) comprising a constantly rotated insulated disk 52 provided with a conducting strip 53 and a rack 54 which supports four carbon brushes 55 which successively contact with the conducting strip as the insulated disk is rotated. The conducting strip 53 is connected to one side of any suitable source of electric current (not shown), while two of the brushes 55 are connected to each of the motors. A switch 51 may be interposed between the source of current and the motor control circuit. The motors 48 and 49 may be of the type having double and oppositely wound fields so that contacting the conducting strip with one of the brushes would cause the motors to rotate in a forward direction and contacting with the other of the brushes connected to the motor would operate the motor in a reverse direction. If the insulating disk shown in Fig. 2 is rotated in a counter-clockwise direction, the conducting strip will first contact with a brush of the motor 49 and energize the motor 49 to operate the gate 43 in such a direction as to discharge the paper from the circulatory system. The conducting strip will then contact with the second brush of the motor 9, reversing its direction and closing the gate 43. Immediately thereafter the insulating strip will come in contact with the first brush of motor 48, energizing the motor 48 to open the gate 37 and allowing a new charge to enter the system. The conducting strip will then contact with the last brush of the motor 48, reversing its direction and causing it to again close the gate 37. The motors will then remain deenergized until the disk completes the revolution during which time the material is allowed to circulate through the system to remove all of the dust therefrom as described above.

It will be understood that the embodiment of the invention herein described and illustrated is merely a convenient and useful form of the invention which is capable of many other modifications without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of separating the lead, copper, and paper of disintegrated telephone cables, which consists of subjecting the disintegrated material to an upward current of such velocity as to elevate the copper and paper but of insufficient velocity to elevate the lead, further disintegrating the paper and copper to remove all of the paper from the copper, and subjecting the paper and copper to a second upward current of air of such velocity as to elevate the paper and drop the copper from the current.

2. A method of separating the lead, copper, and paper of disintegrated telephone cables, which consists of subjecting the disintegrated material to an upward current of air of a high, progressively decreasing velocity permitting the lead and lead particles to drop out, further disintegrating the copper and paper to remove all of the paper from the copper, and then subjecting the copper and paper to an air current of a lower, progressively decreasing velocity to permit the copper to drop out while the paper is elevated and separated therefrom.

3. A method of separating the lead, copper, and paper of disintegrated telephone cables, which consists of subjecting the disintegrated material to a high velocity air current to remove the paper covered copper wires from the lead, disintegrating the copper wires and removing all of the paper therefrom, subjecting the copper and paper to a high velocity air current to remove the paper and some of the copper dust from the copper wires, and separating the paper and copper dust by successive screening operations.

4. A method of separating the lead, copper, and paper of disintegrated telephone cables, which consists in subjecting the particles thereof to impact in the presence of an air current, subjecting the resulting material to a force which is capable of elevating all but the lead against gravity, subjecting the remaining material to a second force which is capable of elevating all but the larger copper particles against gravity, and separating the smaller copper particles from the remaining material by successive screening operations.

5. In an apparatus for separating the lead, copper, and paper of disintegrated telephone cables, an impact member, an upwardly inclined endless conveyor positioned and designed to discharge material against the impact member with sufficient velocity to subject the material to disintegrating impact, means for maintaining an upward air current adjacent the impact member of sufficient velocity to elevate all except the lead, and means for collecting the elevated material.

6. In a separating apparatus for strand material consisting of heavier and lighter particles, a separating pipe, a plate disposed in the pipe, an endless conveyor adapted to discharge material against the plate with sufficient velocity to subject the material to disintegrating impact, means for maintaining an air current in the pipe of sufficient velocity to elevate all but the free particles of the heavier material, a separating chamber having an upwardly increasing cross-section, and means for maintaining an upward air current in said chamber of sufficient strength to suspend and separate adhering particles of heavier and lighter material.

In witness whereof, we hereunto subscribe our names this 6th day of February, A. D. 1927.

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