

Jan. 14, 1941.

W. H. WILCOX

2,228,901

APPARATUS FOR TESTING AND SEGREGATING ARTICLES

Filed April 30, 1938

4 Sheets-Sheet 1

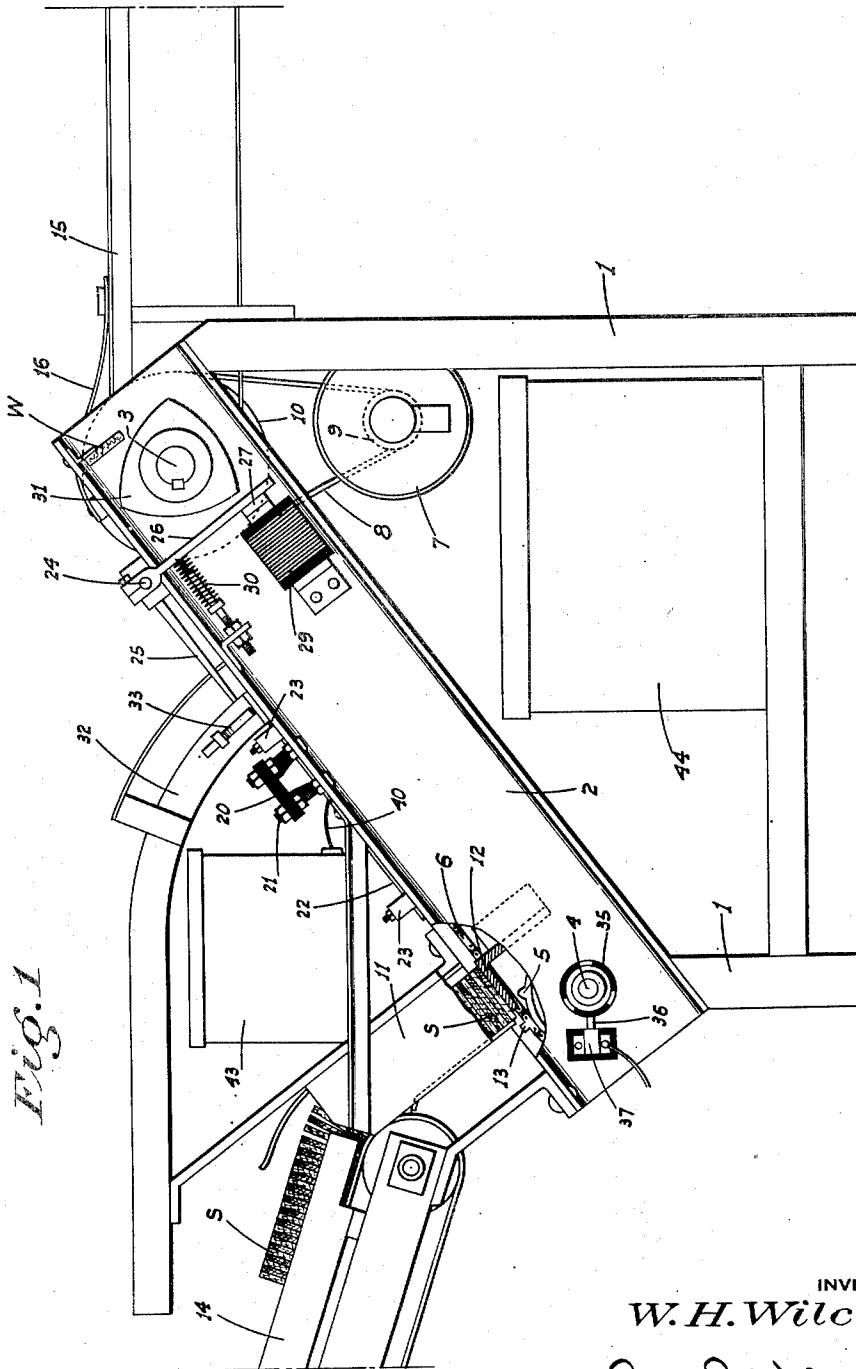


Fig. 1

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4 Sheets-Sheet 2

Fig. 2

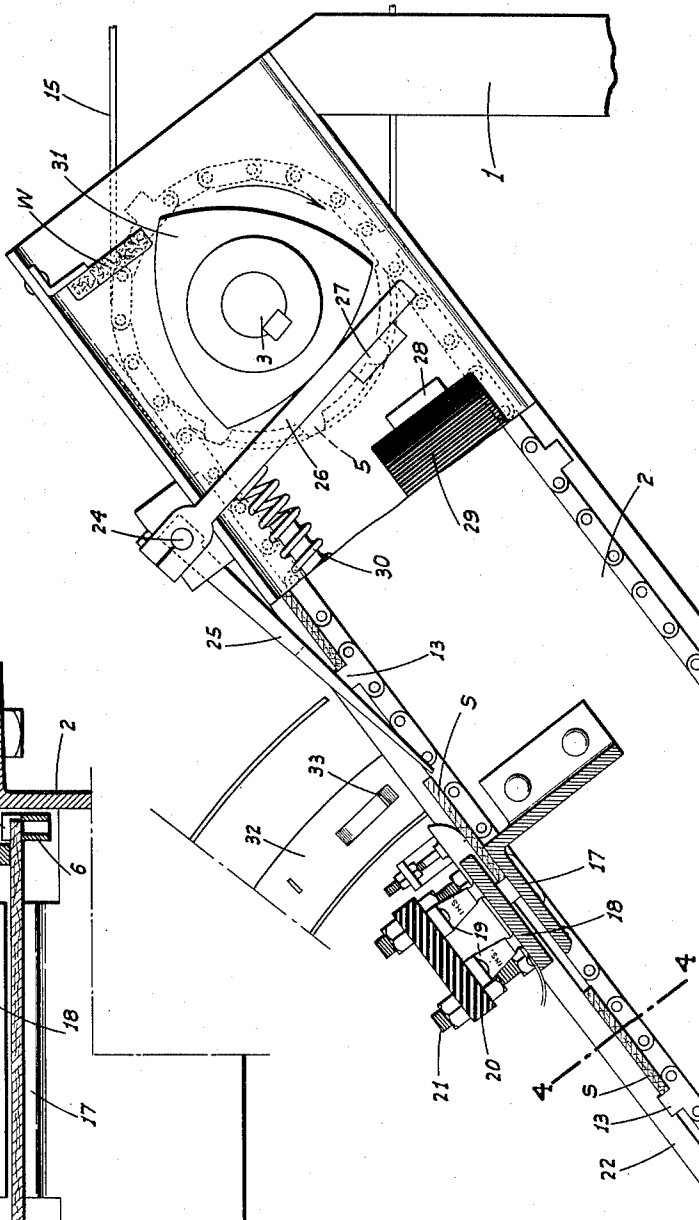
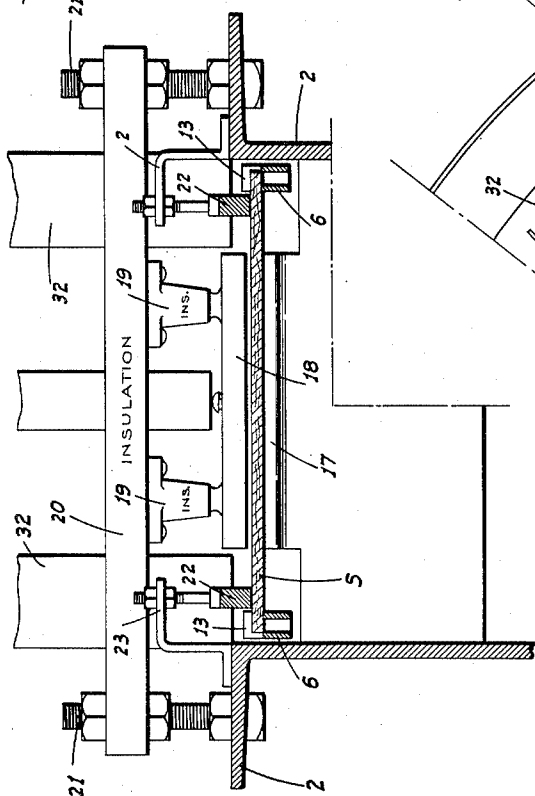


Fig. 4



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4 Sheets-Sheet 3

Fig. 3

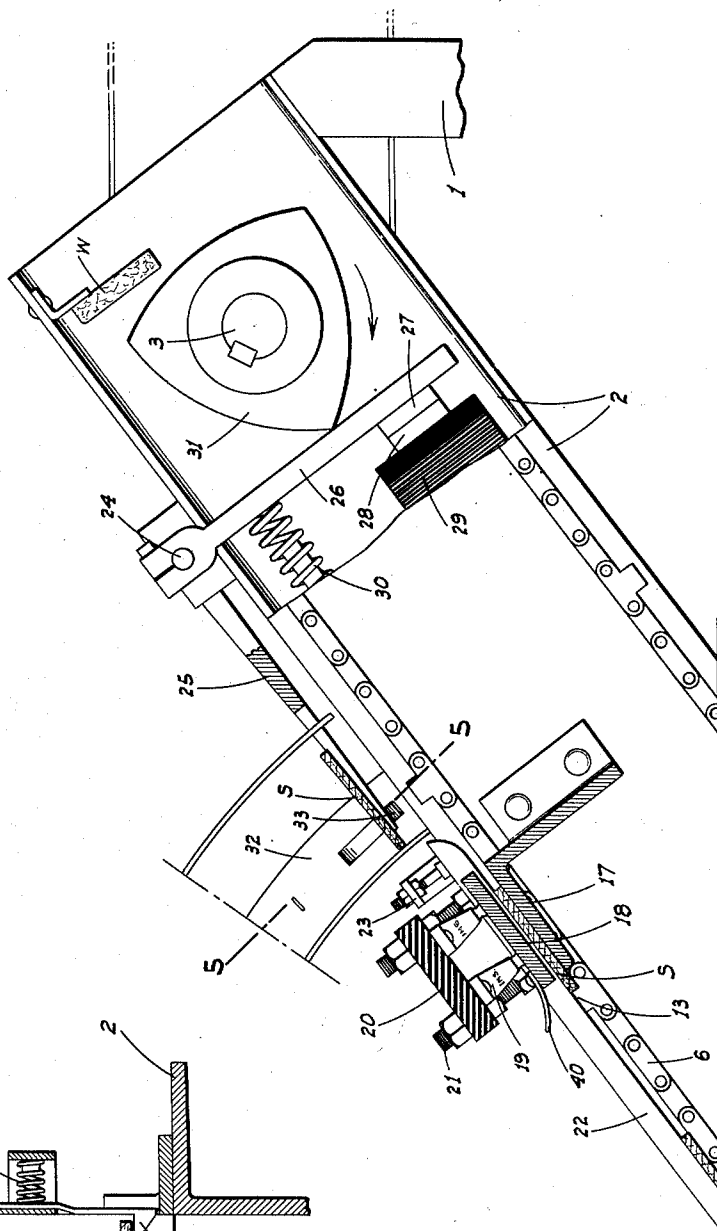
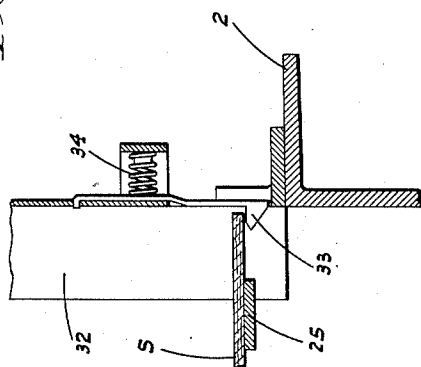


Fig. 5



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4 Sheets-Sheet 4

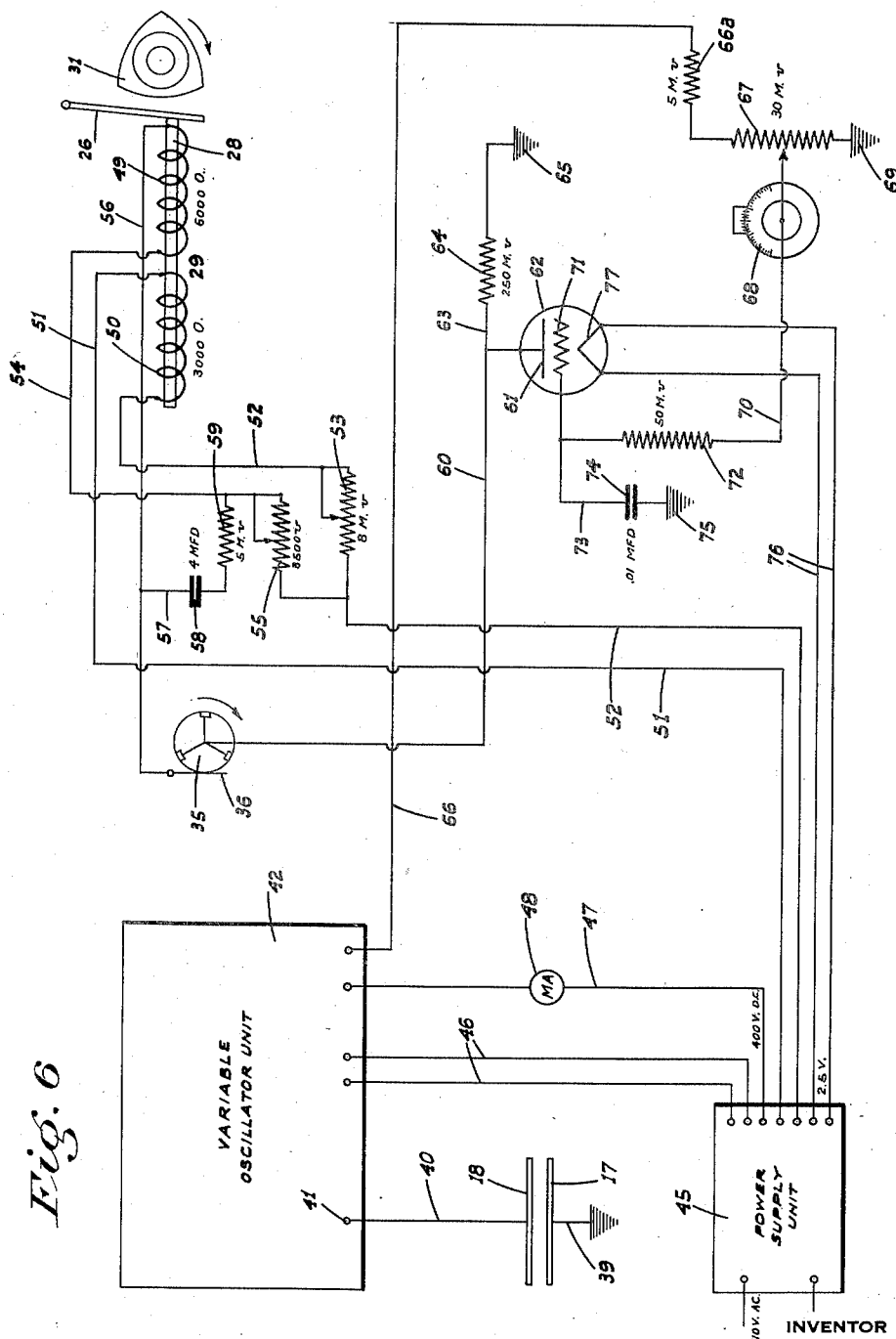


Fig. 6

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2,228,901

APPARATUS FOR TESTING AND
SEGREGATING ARTICLES

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Application April 30, 1938, Serial No. 205,286

6 Claims. (Cl. 209—81)

This invention relates generally to apparatus for testing and segregating articles, and in particular the invention is directed to apparatus for testing and segregating wooden pencil slats.

In the pencil slat manufacturing industry, the relatively thin and flat pencil slats are impregnated with certain materials such as paraffin, stain, etc. Thereafter the processed slats are placed in a drying kiln to remove as much moisture content as possible, and for the reason that such elimination of moisture content prevents undesirable warping of the slats, and facilitates milling of the same into pencils.

Heretofore in the industry no practical apparatus has been available for testing each and every one of the slats for moisture content prior to the actual manufacture of pencils therefrom. The practice has been to withdraw samples from the kiln, and to then subject such samples to laboratory tests. Such practice was not only inadequate, but impractical, due to its inefficiency.

It is therefore the principal object of this invention to provide a novel apparatus for segregating pencil slats according to the relative radio frequency conductivity or dielectric characteristics of such slats; the invention being mainly intended for the segregation of pencil slats having a moisture content in excess of a predetermined allowable amount, and which slats have a greater degree of conductivity than the relatively drier slats which meet the required standard.

However, it is also my intention that the invention may be used for segregating pencil slats according to constituent characteristics—other than moisture content—which affect the conductivity of the slats.

Another objective of the invention is to provide apparatus for the purpose described which is relatively high speed in operation, and which apparatus includes effective mechanical and electrical apparatus in unique combination, for the testing and selection of pencil slats and the segregation of those slats selected.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of the apparatus

embodying the present invention, and showing the slat deflecting plate in normal position.

Figure 2 is an enlarged fragmentary elevation, partly in section, of the device, and particularly illustrating the slat deflecting and lifting plate in lowered position to receive a slat.

Figure 3 is a similar view, but with the plate raised to normal position after deflection of a slat and placement of the same in the upwardly extending by-pass channel.

Figure 4 is a cross-section on line 4—4 of Fig. 3.

Figure 5 is a fragmentary cross-section on line 5—5 of Fig. 2.

Figure 6 is a diagram of the circuits employed in connection with the mechanical apparatus.

Referring now more particularly to the characters of reference on the drawings, the device comprises a rectangular upstanding frame including supporting legs 1 which support a pair of relatively large outwardly facing channel irons or side beams 2 disposed in transversely spaced relation, and at a relatively steep upward slope from one end to the other. Transversely extending shafts 3 and 4 are journaled between the side beams adjacent the upper and lower ends thereof respectively. Each shaft carries a pair of sprockets 5 fixed thereon in transversely spaced relation and closely adjacent the side beams. These sprockets are spaced apart less distance than the length of a pencil slat.

Endless link chains 6 engage with and extend between corresponding sprockets 5; the top reaches of the chains being disposed in a plane a short distance below the plane of the upper edges of the side beams 2. Motor 7 mounted on the frame drives these chains with the upwardly sloping top reaches moving toward shaft 3; such drive being accomplished through the medium of belt 8, which extends between the motor pulley 9 and a pulley 10 fixed on shaft 3 outwardly of one of the side beams.

A rectangular hopper 11 is mounted transversely on the side beams 2 adjacent the lower ends of the upper reaches of chains 6, and projects upwardly from said side beams at right angles; the hopper being of a size to receive a stack of pencil slats S in face to face relation and transversely of the pair of endless chains 6. The stack of slats in the hopper is supported with the lowermost slat in clearance relation above the pair of chains by means of a platform 12 mounted on the side beams and disposed between said chains and slightly above the plane thereof.

The chains are provided at equally spaced lon-

gitudinal intervals with outwardly projecting lugs 13, which engage the back edge of the lowermost slat in the hopper and shift such slat from the hopper with movement of the chains. The front and back of the hopper terminate at their lower ends above the plane of movement of the lugs to permit engagement of said lugs with the lowermost slat and escape of the slat from the hopper. Slat is fed to hopper 11 by means of a conventional endless belt conveyor shown generally at 14.

Unless selected and segregated or by-passed by means of the apparatus hereinafter described in detail, the slats 8 on conveyor chains 6 move along with said chains until they reach the upper sprockets 5. Thereupon the slats are discharged onto an endless carry-off or inspection belt, shown generally at 15; said belt being driven and extending horizontally away from shaft 3. A flexible and weighted hold-down unit 16 assures proper disposition of the slats as they transfer from chains 6 to conveyor 15.

Some distance beyond the hopper 11 and intermediate the ends of the upper reaches of chains 6 is a pair of parallel metallic plates 17 and 18 respectively which is disposed between the upper reaches of chains 6, and spaced apart so that the slats carried by the chains may pass therebetween without restriction. The lower plates 17 is mounted in fixed position in connection with the side beams by suitable means, while the upper plate 18 is mounted in fully insulated and adjustable relation on the frame, by means of a plurality of insulators 19 of high dielectric characteristics. Such insulators depend from a dielectric transversely extending cross member 20 adjustably supported by upstanding bolts 21 secured on the upper flanges of the side beams 2. Longitudinally extending and relatively long guide shoes 22 are supported by adjustable beam mounted bracket units 23, said shoes extending from a point adjacent the hopper 11 to a point beyond plates 17 and 18. Such shoes engage the slats on chains 6 inwardly of but immediately adjacent the chains and hold the slats in proper transverse position thereon.

A transverse shaft 24 is journaled on the side beams above the upper reaches of the chains, and is provided with a rearwardly projecting, radially disposed slat deflecting plate 25, which tapers to its outer end as shown. This deflector plate 25 is of a width to permit movement thereof from a position in a substantially parallel plane above the reaches of chains 6, as shown in Fig. 2, to a downwardly sloping position between the chains and in the path of slats thereon, as shown in Fig. 3. A radial arm 26 of metal is fixed on one end of shaft 24, and depends outside the adjacent side beam 2; the lower end of the arm being provided with a metallic armature head 27 mounted on the side thereof opposite shaft 3. Such a head is disposed for arm-holding engagement with the core 28 of an opposed winding electro-magnet 29 mounted on the side beam ahead of said arm. Arm 26 and head 27 are in effect an armature. An adjustable compression spring 30 is mounted on the side beam above the electro-magnet and cooperates with arm 26 urging the same away from the electro-magnet and into engagement—when free of said electro-magnet—with a three-point cam 31 fixed on the adjacent end of shaft 3.

When arm 26 is held immovable by the electro-magnet and in engagement with the core thereof,

deflector plate 25 is clear of the passing slats, and when said arm is free of the electro-magnet, the spring 30 and rotating three-point cam 31 act to cause the plate 25 to recurrently and automatically raise and lower. The cam 31 is of such proportion relative to the remainder of the assembly that the deflector plate 25 will lower, deflect, and raise each passing slat, unless the electro-magnet holds the arm 26 clear of cam 31, and which it normally does, as will hereinafter appear.

The points of the cam clear arm 26 only a short distance when the arm is held immovable under the influence of the electro-magnet and in engagement with the core thereof. A lubricating wiper W is mounted on the side beam adjacent the cam, and lubricates the same.

A by-pass channel assembly 32, for the reception of the slats deflected and lifted by plate 25, is mounted in upstanding position on the side beams and with its open lower or receiving end disposed in position to receive slats from the plate 25, which when raised swings into said open lower end of the channel assembly. To prevent retraction of the slats from the channel, outwardly deflectible finger hooks 33 are mounted longitudinally on the exterior of the channel sides, and project through slots in the lower ends thereof; said hooks facing upwardly and engaging beneath the end positions of each slat as moved into the channel by deflector plate 25. A compression spring 34 engages the shank of each hook and urges such hook inward into the channel and into the path of slats lifted by plate 25. In the present instance, the outer portion of the channel levels off rearwardly to a substantially horizontal position, so as to relieve the slat weight which otherwise would bear on hooks 33, and also to facilitate removal of the by-passed or segregated slats.

A three-contact commutator 35 is fixed on one end of shaft 4 outwardly of the adjacent side beams. A carbon brush 36 mounted on a dielectric block 37 adjacent the commutator cooperates with the latter for the purpose hereinafter described. The commutator contacts are arranged relative to the cam 31 so that the brush 36 engages one of said contacts at substantially the same time that one of the points of cam 31 is in an arm-engaging position.

The electrical apparatus, which includes the electro-magnet 29 and commutator 35, and which apparatus is used in combination with the above described mechanism, and the circuits for such electrical apparatus are shown diagrammatically in Figure 6, which will now be described:

The plates 17 and 18 heretofore described may be termed the "selector" plates; the plate 17 being grounded to the frame as at 39, while the plate 18, insulated from the frame, is connected by a relatively short wire 40 to the grid input terminal 41 of a variable oscillator circuit shown diagrammatically at 42. This oscillator is disposed within a case 43 mounted on the frame as close to the selector plates as possible, so as to reduce the length of wire 40 and cut down radio frequency loss as much as possible. Another case 44 mounted below the side beams and on frame cross members encloses a power supply unit 45 of usual type, as well as other portions of the electrical apparatus, which must be enclosed for protection. As the power supply unit is shown diagrammatically, it is, of course, to be understood that its circuit is grounded where necessary to complete the illustrated circuits.

The pair of wires 46 supply filament current to the oscillator unit, while another wire 47 at approximately 400 volts D. C. carries an input or plate current for the oscillator. A milliammeter 5 48 is interposed in wire 47.

The electro-magnet 29 is provided with two windings 49 and 50 wound in opposition to each other; the winding 49 having 6000 ohms resistance, while winding 50 is of 3000 ohms resistance. 10 Winding 50 is energized at all times from the power supply unit through the medium of wires 51 and 52, the latter wire having a voltage dropping resistor 53 interposed therein, whereby to reduce the power supply unit voltage to approximately 200 volts. One end of winding 49 is connected with wire 52 by another wire 54, which 15 likewise has a voltage dropping resistor 55 interposed therein. The other end of winding 49 is connected by wire 56 to the carbon brush 36 20 which cooperates with commutator 35. The wire 57, including a fixed condenser 58 and a fixed resistor 59, connects between wires 54 and 56 and provides a spark quencher which prevents commutator sparking. A wire 60 extends from the 25 commutator and connects with the plate 61 of a grid glow tube 62. A wire 63 including a fixed resistor 64 is connected to wire 60 and grounded at 65 and maintains the plate 61 at ground potential.

30 An output wire 66 from the grid of the oscillator unit 42 includes an interposed fixed resistor 66a, and is connected with one side of a variable resistor 67 including a calibrated dial 68. This resistor 67 is of 30,000 ohms resistance and is 35 grounded as at 69. The other side of such resistor is connected by wire 70 with the grid 71 of the grid glow tube 62; such wire 70 having an interposed resistor 72. A wire 73 including a condenser 74 is connected between wire 70 and 40 ground 75, and provides a radio frequency bypass. A pair of wires 76 supply current to the filament 77 of grid glow tube 62 from the power supply unit 45. The legends adjacent the resistances and condensers shown in Fig. 6 of the drawings indicate the capacity of each.

Operation

The operation of the above described mechanism and electrical apparatus, to effect a selection and segregation of pencil slats having excessive moisture content, is as follows:

The circuit of the variable oscillator unit 42 is balanced or biased before the mechanism is placed in operation. At the same time the grid 55 glow tube is biased by manipulation of calibrated dial 68, which effects adjustment of resistor 67; the tube being balanced to resist a predetermined potential charge, and when so balanced, no appreciable current passes from the tube plate 60 61 through wire 60. As a result, winding 49 of electro-magnet 29 is normally de-energized, and as winding 50 of the electro-magnet is always energized, arm 26 normally is held in contact with the core and plate 25 raised.

65 With the apparatus in such normal position, the motor 7 is started and slats S fed into hopper 11 from which said slats are individually carried along with the upper reaches of chains 6 transversely thereof and longitudinally spaced a 70 substantial distance by the chain lugs 13. Thus, each slat is passed separately between selector plates 17 and 18 and which plates are in effect an air gap condenser. As long as the slats passing between said plates are of normal moisture 75 content, the segregating mechanism remains in-

active for the reason that the radio frequency loss introduced into the circuit of the oscillator unit with the passage of such slat is not sufficient to produce a potential charge of great enough intensity to overcome the resistive capacity of resistor 67 as adjusted. 5

However, when a slat having a moisture content in excess of such predetermined normal amount passes between the selector plates 17 and 18, sufficient radio frequency loss is introduced to 10 unbalance the circuit of the oscillator unit 42 and produce a potential charge in wire 66, which will feed through resistor 67 and through wire 70 to the grid 71 of the grid glow tube 62. Thereupon the grid 71 loses its balance and the current 15 flows from plate 61 through wire 60 to the commutator. The grid glow tube and associated circuit functioning as above may be termed an electronic contactor. As the commutator 35 rotates and brush 36 engages one of the commutator contacts, winding 49 is energized through wires 54 and 56. As winding 49 is opposed to winding 50, energization of winding 49 counteracts the effect of winding 50 and de-magnetizes the core 28. 25

At such instant, one point of cam 31 has approached lever 26 as close as possible, and as the core has been simultaneously de-magnetized, the lever under the influence of spring 30 swings free of said core and engages the cam with a minimum of jar and noise. Thereupon, with continued 30 rotation of the cam, arm 26 follows the cam, and plate 25 lowers and deflects the moving slat which caused actuation of the selector apparatus in the manner above described. When the next 35 following cam point engages the lever, the deflector plate raises and lifts the deflected slat into by-pass channel 32, where it is engaged by the hooks 33 and held against rotation. Thereafter, until another slat having excessive moisture content 40 passes between the plates 17 and 18, the selector plate 25 will remain in normal raised position. This is due to the fact that an instant after the circuit for winding 49 is closed through said one commutator contact and the carbon 45 brush, such circuit opens due to continued rotation of the commutator. With such opening of said circuit, core 28 of the electro-magnet is again energized, and as lever 26 reapproaches the core 28 and comes within the magnetic field thereof, 50 it is held against further movement with the cam. When the circuit for winding 49 is opened as above, the balance of the grid glow tube is reestablished, and such balance will not be upset with resultant recurrence of the slat segregating 55 cycle when the next following commutator contact engages the carbon brush as no potential charge is being fed into wire 66 from the circuit of the oscillator unit.

The entire operation of the apparatus is carefully 60 synchronized, so that the chains 6 can be driven at relatively high speed and yet without disrupting the proper segregation of selected slats. The timing is such that when a slat with too great moisture content passes between the 65 selector plates, the selector apparatus will function and plate 25 lower into the path of and deflect such moving slat.

The milliammeter 48 indicates the amount of current passing to the oscillator unit and thus 70 such meter serves as a visible indicator of the dielectric characteristics of slats passing between the selector plates, there being a known relation between the dielectric characteristics of the slats and the indicated current flowing through the 75

meter. The meter is preferably mounted on the apparatus in a position readily visible to the operator.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A device for selecting and segregating articles according to their dielectric characteristics including an endless conveyor including a shaft at each end thereof, means to feed articles onto the conveyor in single file order, another shaft extending transversely across the conveyor above the same, a radial article deflector plate fixed on the shaft, a lever extending radially from one end of the shaft, a cam on the end of one of said first named shaft and arranged to actuate said lever and deflector plate, a bypass channel mounted above said plate to receive deflected articles, and electrical apparatus responsive to the dielectric characteristics of the articles and including spaced elements mounted ahead of said plate and between which elements the articles pass, and a normally energized electromagnet operative to hold said lever out of the path of the cam; said electrical apparatus being arranged to deenergize the electromagnet upon passage between the elements of an article having a dielectric variance in excess of a predetermined normal.

2. A device as in claim 1 in which said conveyor includes transversely spaced chains and article engaging lugs extending outwardly from said chains at equally spaced points in the length thereof; there being an article hold down shoe above the conveyor and extending from a point ahead of said elements to a termination therebeyond and at a point adjacent but ahead of the deflector plate.

3. In a device for testing and segregating articles according to the dielectric characteristics thereof including a conveyor to receive and move the articles in single file order, electrical apparatus mounted adjacent the conveyor and arranged to test each article for a dielectric characteristic, and normally inactive article segregating mechanism mounted adjacent the conveyor and beyond the electrical testing apparatus; said segregating mechanism including a driven rotary cam, a lever adapted for actuation from said cam, a deflector plate actuated by said lever, means normally holding the lever out of but immediately adjacent the path of the high point of the cam, the plate then being out of the path of articles on the conveyor, means actuated from the electrical testing apparatus to release the holding means, and other means to synchronize said release of the holding means with the nearest approach of the high spot of the cam to the lever whereby to minimize jar when the lever engages the cam.

4. In a device for testing and segregating articles according to the dielectric characteristics thereof including a conveyor to receive and move the articles in single file order, electrical apparatus mounted adjacent the conveyor and arranged to test each article for a dielectric characteristic, and normally inactive article segregating mechanism mounted adjacent the conveyor and beyond the electrical testing apparatus; said segregating mechanism including a driven rotary cam, a lever adapted for actuation from said cam, a deflector plate actuated by said lever, means normally holding the lever out of but immediately adjacent the path of the high point of the cam, the plate then being out of the path of articles on the conveyor, electrical means actuated from the electrical testing apparatus to release the holding means, and a driven commutator associated with the electrical releasing means and arranged to synchronize said release of the holding means with the nearest approach of the high spot of the cam to the lever whereby to minimize jar when the lever engages the cam.

5. In a device for testing and segregating articles according to the dielectric characteristics thereof including a conveyor to receive and move the articles in a row, electrical apparatus mounted adjacent the conveyor and arranged to test each article for a dielectric characteristic and normally inactive article segregating mechanism mounted adjacent the conveyor and beyond the electrical testing apparatus; said segregating mechanism including a normally inactive article deflecting element, an actuating lever associated with said element, a driven rotary cam adapted to actuate said lever, means normally holding the lever out of but immediately adjacent the path of the high point of the cam; means operative from the electrical testing apparatus to release the holding means, and other means to synchronize said release of the holding means with the nearest approach of the high spot of the cam to the lever whereby to minimize jar when the lever engages the cam.

6. In a device for testing and segregating articles according to the dielectric characteristics thereof including a conveyor to receive and move the articles in a row, electrical apparatus mounted adjacent the conveyor and arranged to test each article for a dielectric characteristic and normally inactive article segregating mechanism mounted adjacent the conveyor and beyond the electrical testing apparatus; said segregating mechanism including a normally inactive article deflecting element, an actuating lever associated with said element, a driven rotary cam adapted to actuate said lever, means normally holding the lever out of but immediately adjacent the path of the high point of the cam; electrical means operative from the electrical testing apparatus to release the holding means, and a driven commutator associated with the electrical releasing means and arranged to synchronize said release of the holding means with the nearest approach of the high spot of the cam to the lever whereby to minimize jar when the lever engages the cam.

WILLIAM H. WILCOX.