Jan. 3, 1967 H. D. MITCHELL, JR., ETAL 3,295,661

APPARATUS FOR CONVEYING ELONGATED ARTICLES

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FIG. 1



FIG. 2

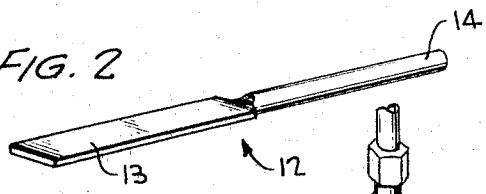


FIG. 3

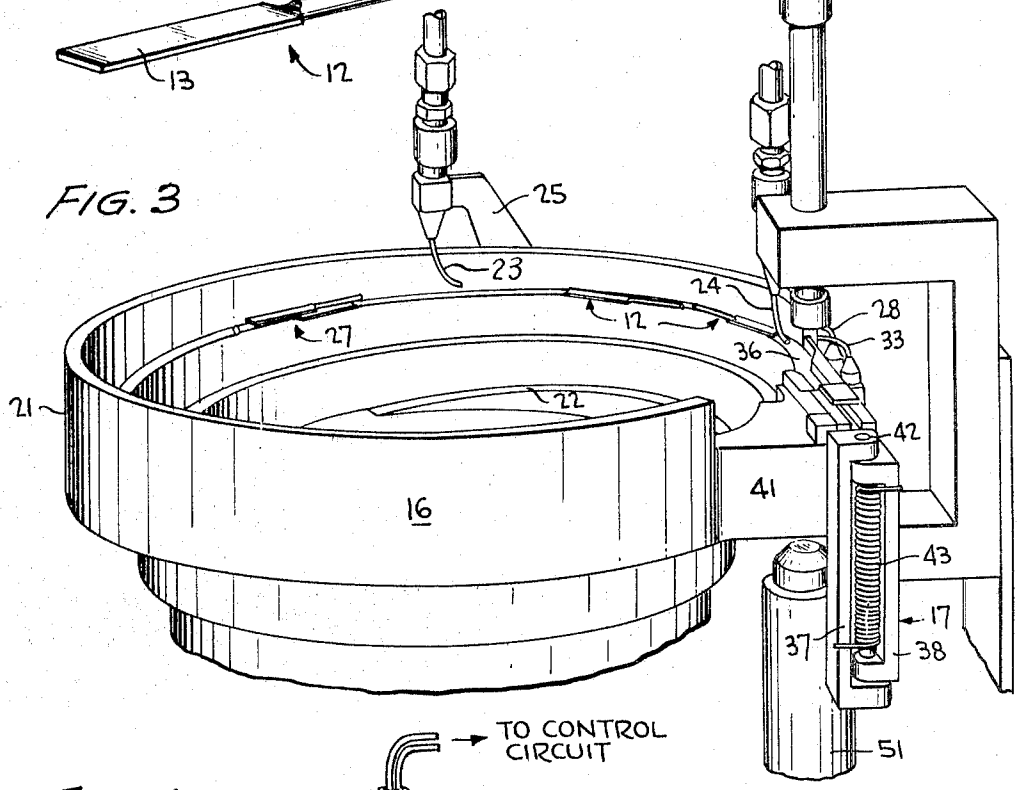
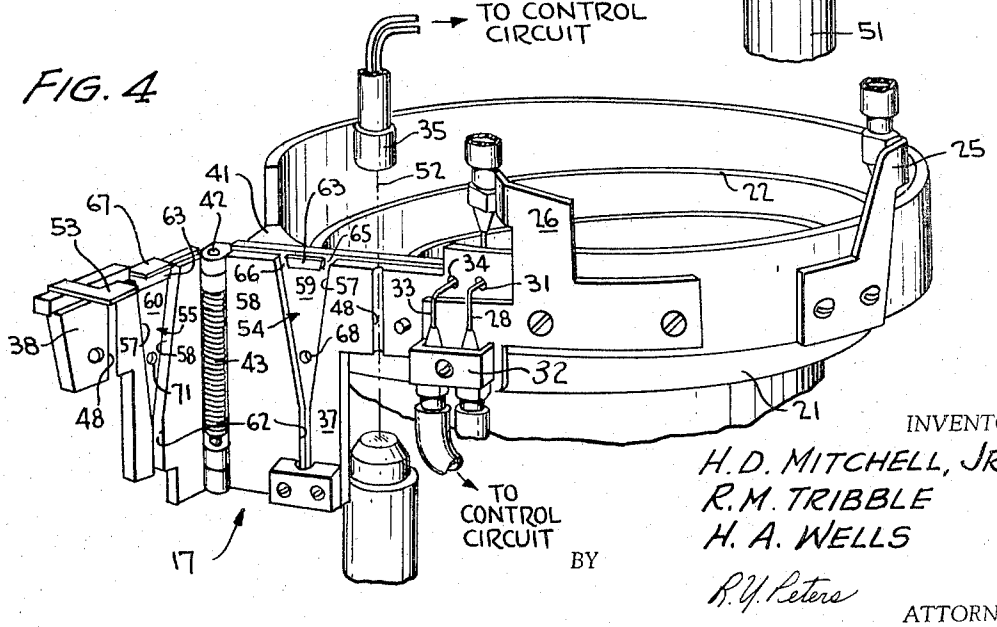


FIG. 4



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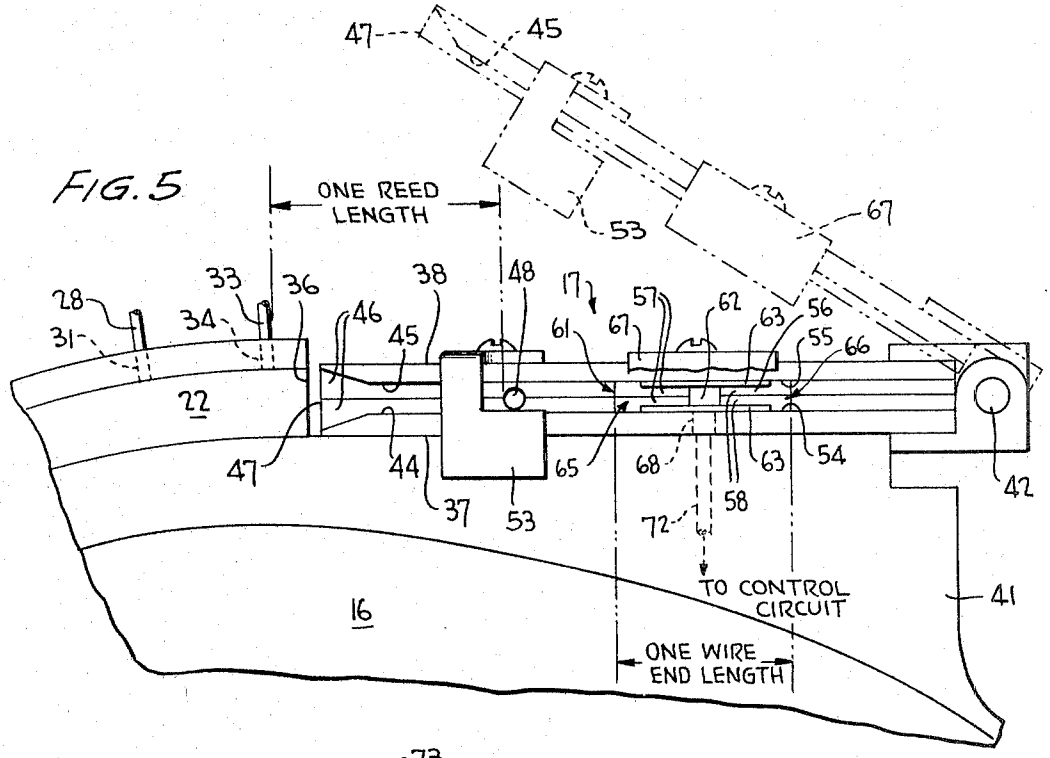
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APPARATUS FOR CONVEYING ELONGATED ARTICLES

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FIG. 5



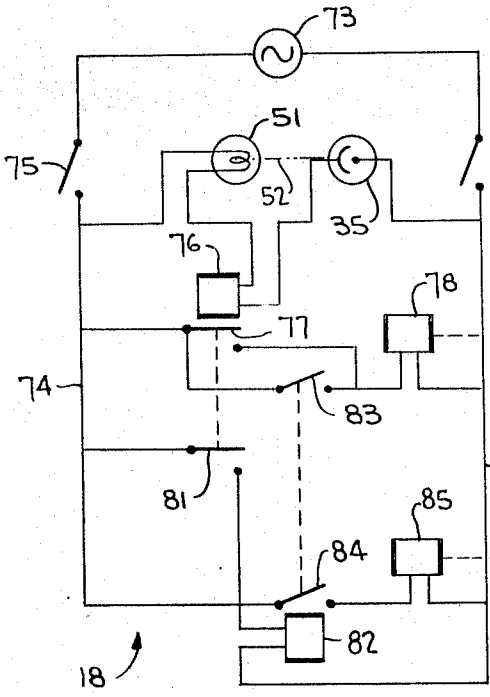
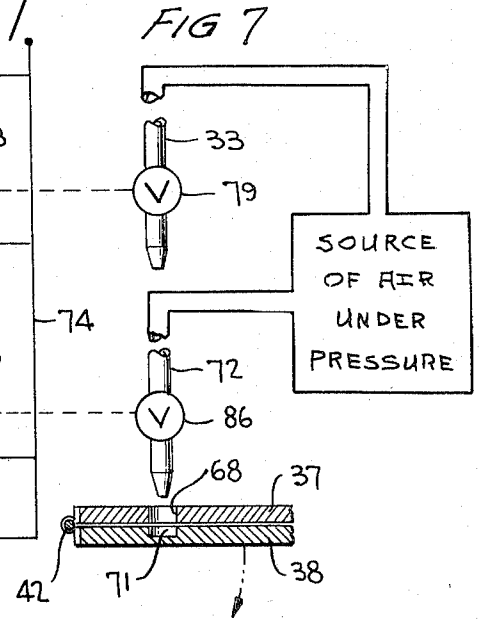


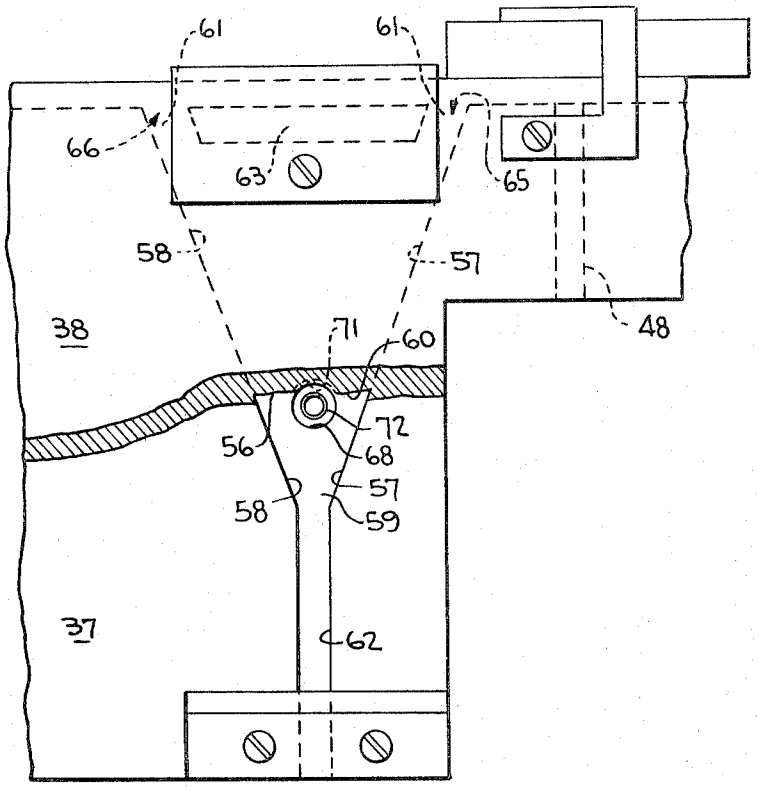
FIG 7



APPARATUS FOR CONVEYING ELONGATED ARTICLES

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FIG. 6



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APPARATUS FOR CONVEYING ELONGATED ARTICLES

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Filed May 24, 1965, Ser. No. 458,203
10 Claims. (Cl. 198—33)

This invention relates to apparatus for conveying elongated articles, and more particularly, to apparatus having facilities for feeding and spacing in a predetermined manner elongated articles to facilitate subsequent orienting of the articles and having other facilities for orienting the fed and spaced articles in a predetermined position.

Electrical dry-reed or sealed-contact switches include, among other things, two minute and fragile electrical reeds or contacts encased within a glass tube. These reeds are formed by flattening one end of round wire stock to produce an elongated article or reed having a flattened or paddle end and an unflattened or wire end.

Prior to the time such reeds are assembled within the glass tube to produce a dry reed switch, it may be desirable to heat treat the reeds. Conveniently, this heat treatment is accomplished by heating simultaneously in an oven large numbers of reeds which are positioned and held in a rack. To facilitate simultaneous handling of the reeds for the heat treatment, a single reed is placed with its paddle end up in each of a plurality of holes in the rack.

Additionally, where the rack is also subsequently used as a supply container for the heat-treated reeds in the assembly of the dry-reed switches, it has been found that this assembly is greatly facilitated if all of the reeds are placed in the holes in the same endwise position, preferably with their paddle ends up.

However, due to the minuteness and fragility of the reeds, any manual handling and placement of the reeds in the holes of the rack is both time consuming and capable of damaging the reeds. Therefore, to prevent such time consumption and reed damage, mechanical conveying systems including, for example, feeding devices and orientors, have been used to feed and orient the reeds to dispense them into the holes of the rack with their paddle ends in an upward position.

Nevertheless, it has been found that reeds fed into the orientors often jam such orientors, interrupting the dispensing of the reeds into the holes of the rack. This jamming may be caused, for example, either by bent reeds or by several overlying reeds beginning to enter the orientor. Upon the jamming of the orientor it is necessary to discontinue the operation of the conveying system in order to remove the jammed reeds.

Additionally, it has been found that jamming of the orientor causes reeds to back up on the feeding device. Therefore, upon the jamming of the orientor it is necessary to remove this backup of reeds from the feeding device simultaneously with the removal of the jammed reeds from the orientor.

Accordingly, an object of the present invention is to provide new and improved apparatus for conveying elongated articles.

Another object of this invention resides in conveying apparatus for feeding and orienting elongated articles having unlike ends in a predetermined position to dispense the articles with a selected one of the ends in an upward position.

Further, another object of this invention is the provision of apparatus for feeding and orienting elongated articles to dispense the articles in a predetermined manner, having facilities to correct the jamming of the articles in the apparatus.

A further object of this invention is to provide apparatus for orienting and dispensing elongated articles having facilities for removing any articles that may jam in or back up on a track of the apparatus.

Another object of this invention is to provide conveying apparatus wherein elongated articles are oriented and then fed in such a manner that the articles may be quickly and continuously oriented in a predetermined manner, and wherein facilities are provided to maintain the apparatus continuously operating even though bent or overlying articles jam the apparatus.

With these and other objects in view, the present invention contemplates apparatus for conveying elongated articles. The apparatus includes an orientor which positions the articles in a predetermined endwise orientation. The orientor has a pair of normally adjacent plates which define a track, an inlet for receiving the articles from the track, a chamber, a pair of rails for orienting the articles, and an outlet for dispensing the oriented articles. A device feeds the articles to the inlet of the orientor in a column of random, endwise orientations. Another device responsive to the presence of the articles for a first predetermined time ejects every other article from the feeding device if the article to be ejected is less than the length of one article behind the article to which the ejecting device is responding. Such ejection of every other article from the feeding device spaces the articles apart at intervals at least equal to the length of the articles. Additionally, facilities responsive to the presence of the articles for a second time greater than the first predetermined time moves the plates of the orientor away from each other to open the chamber and to permit movement from such chamber of any articles therein and also to remove from the track at a position adjacent the inlet any articles thereon.

A complete understanding of this invention may be had by referring to the following detailed description and accompanying drawings illustrating a preferred embodiment thereof, wherein:

FIG. 1 is a perspective view of a piece of round wire stock which is formed into an elongated article or reed;

FIG. 2 is a perspective view of a reed which has been produced by flattening one end of the piece of wire stock shown in FIG. 1 so that the reed has a paddle end and an unflattened or wire end:

FIG. 3 is a perspective view of an apparatus for feeding, orienting, and dispensing the reeds depicted in FIG. 2 with their paddle ends up;

FIG. 4 is a perspective view showing an orientor having a funnel-shaped chamber in an opened condition by the operation of a photocell and also showing a spacer operable by the photocell for spacing the reeds depicted in FIG. 2 fed by a feeding device by a distance at least equal to the length of one reed;

FIG. 5 is an enlarged, top view showing in detail certain parts of the orientor including orienting rails for dispensing the reeds with their paddle end up, a light aperture aligned with the photocell, a tab member for overlying the aperture when the chamber is in an open condition, and a hold-down member for preventing more than one reed from entering the chamber and also showing a portion of the feeding device which feeds spaced reeds to the orientor;

FIG. 6 is an enlarged, partially cutaway, front view showing in greater detail the parts of the orientor depicted in FIG. 5, including a pair of normally adjacent plates, the funnel-shaped chamber in a closed condition and having a pair of sloping walls and a pair of vertical walls, a pair of inlets defined by the orienting rails and

by the sloping chamber walls, and an outlet for dispensing oriented reeds; and

FIG. 7 is a schematic diagram of an electrical control circuit connected to the photocell shown in FIG. 4 for spacing the reeds on the feeding device by a distance at least equal to the length of one reed and for sensing faulty operation of the feeding device and of the orientor for opening the chamber by swinging apart the normally adjacent plates of the orientor to correct such faulty operation.

Attention is first directed to FIGS. 1 and 2 where there is shown a wire-like stock material. 11. By flattening one end of the material 11, an elongated article or reed 12 is formed having a flattened or paddle end 13 and an unflattened or wire-like end 14. Typically, the ratio of the length of the paddle end 13 to the length of the wire end 14 is about four to five, with the center of gravity of the reed 12 lying midway between the ends of such reed 12.

Referring now to FIGS. 3–7, there is shown the conveying apparatus of the present invention. The conveying apparatus includes a feeding device 16, an orientor 17, and a control circuit 18 (FIG. 7).

The feeding device 16 includes a bowl 21 having an upwardly directed, helical pathway 22 formed on the interior wall thereof. The bowl 21 may be made of cast epoxy resin having an aluminum oxide filler to reduce wear of the pathway 22 and is drivable by conventional rotary vibratory apparatus (not shown) for feeding the reeds 12 in a column along the pathway 22. Advantageously, the pathway 22 is less than double the width of the paddle ends 13 of the reeds 12 to prevent the reeds 12 from being fed up the pathway in side-by-side relationship, while providing a certain degree of freedom of lateral movement for the reeds 12 as they move up the pathway 22.

First and second needle-type air nozzles 23 and 24 are positioned within the bowl 21 by mounting brackets 25 and 26 attached to the outside wall of the bowl 21. The open ends of the nozzles 23 and 24 are positioned adjacent and above the pathway 22 by a distance slightly greater than the diameter of the wire end 14 of the reeds 12 to direct air continuously emitted by the nozzles 23 and 24 obliquely to and slightly above the pathway 22 toward the interior of the bowl 21. Such continuously emitted air accelerates the reeds 12 fed up the pathway 22 and assures that only a single column of the reeds 12 is fed up the pathway 22 by separating reeds 12 fed up the pathway 22, one on top of the other or overlying, as shown at 27 in FIG. 3.

Air also is continuously emitted from a third needle-type air nozzle 28 which extends partially through an aperture 31, FIGS. 4 and 5, in the wall of the feed bowl 16 to blow bent reeds 12 back into the bowl 21. A bracket 32 attached to the outside of the bowl 21 positions the open end of the nozzle 28 above and transverse to the pathway 22 by a distance slightly greater than the diameter of the wire end 14 of the reeds 12.

Also mounted to the bowl 21 by the mounting bracket 32 is a spacer or interval nozzle 33 of the needle-type. The open end of the interval nozzle 33 extends partially through an aperture 34 in the wall of the feed bowl 21 and is positioned adjacent and transverse to the pathway 22. Passage of air through the interval nozzle 33 is controlled by a photocell 35 connected to the electrical control circuit 18, FIG. 7. The nozzle 33 intermittently emits a jet of air from its open end transverse to the pathway 22 and toward the interior of the bowl 21 for as long as the photocell 35 receives no light. Such intermittent air emission spaces the reeds 12 fed up the pathway 22 by a distance at least equal to the length of one reed 12 by returning every other reed 12 into the feed bowl 21.

Positioned adjacent the termination point 36 of the pathway 22 is the reed orientor 17. The reed orientor 17 includes first and second vertical plates 37 and 38. The first plate 37 is stationary and is fixedly mounted to the feed bowl 21 by an extension 41 of the bowl 21 which also facilitates orienting of the reeds 12 by transmitting vibratory motion from the bowl 21 to the orientor 17. The second plate 38 is movably mounted to the first plate 37 by a hinge pin 42 so that such plate 38 is swingable with respect to the stationary plate 37.

A coil spring 43 surrounding the hinge pin 42 normally maintains the plate 38 in a position adjacent the stationary plate 37 (FIGS. 3, 5, and 6). The plates 37 and 38 substantially abut each other when the plate 38 is in its normal closed position.

With the plate 38 in its normal closed position, FIGS. 3, 5, and 6, cutaway portions 44 and 45, FIGS. 5 and 6, on the tops of the plates 37 and 38 define a horizontal track 46 for feeding the reeds 12 into the orientor 17 due to the vibratory motion imparted to the orientor 17 by the extension 41 of the bowl 21 and further due to the action of the nozzle 24. The reeds 12 are fed on the track 46 with their paddle ends in a horizontal position. The track 46 is an extension of the pathway 22, as can be seen in FIG. 5, but immediately narrows down from a width at its initial portion 47 equal to the width of the pathway 22 to a width slightly greater than the width of the paddle ends 13 of the reeds 12.

In addition, when the movable plate 38 is in its normal closed position, the plates 37 and 38 define a vertical aperture 48 through such plates. A light source 51 is positioned beneath the aperture 48 to direct a beam of light 52 through such aperture 48 onto the photocell 35 positioned above the aperture 48. The distance between the aperture 48 and the open end of the interval nozzle 33 is equal to the length of one reed 12.

A horizontal tab member 53 is attached to the front of the movable plate 38, which in its normal closed position, maintains the tab 53 behind the aperture 48. When the movable plate 38 is swung away from the stationary plate 37, the tab member overlies the aperture 48 and momentarily breaks the light beam 52. As the movable plate 38 is swung further away from the stationary plate 37, the tab 53 eventually no longer overlies the aperture 48 and, therefore, no longer breaks the light beam 52.

Cut into the plates 37 and 38 are funnel-shaped grooves 54 and 55. When the movable plate 38 is in its normal closed position, such grooves 54 and 55 match to form a chamber 56, FIGS. 5 and 6, having two sloping walls 57 and 58 and two vertical walls 59 and 60, which extend from a rectangular opening 61 at the lower surface of the track 46 downwardly. Advantageously, the length of the rectangular opening 61 is slightly greater than the length of the wire end 14 of the reeds 12. The chamber 56 terminates in an outlet 62, one half of which is formed in the lower ends of each of the plates 37 and 38.

Horizontal orienting rails 63 are mounted near the tops of the vertical walls 59 and 60, respectively, of the chamber 56. Advantageously, the upper horizontal surfaces of the orienting rails 63 lie in the same plane as the bottom of the track 46 and have longitudinal dimensions which are less than the length of the rectangular opening 61.

A pair of inlets 65 and 66 are defined by sloping end surfaces of the rails 63 and by the tops of the sloping walls 57 and 58 of the orienting chamber 56. The inlets 65 and 66 have longitudinal dimensions which are slightly greater than the diameter of the wire ends 14 of the reeds 12 and transverse dimensions which are slightly greater than the width of the paddle ends 13 of the reeds 12. The distance between the rails 63 transverse to the track 46 is less than the width of the paddle ends 13 of the reeds 12.

Mounted to the movable plate 38 is a hold-down member 67 which overlies the rectangular opening 61 and the inlets 65 and 66 when the plate 38 is in its normal closed position. The hold-down member 67 is positioned above

and spaced from the lower surface of the track 46 by a distance slightly greater than the diameter of the wire ends 14 of the reeds 12 to assure that the paddle ends 13 of the reeds 12 fed on the track 46 are maintained in a horizontal position.

Further, the spacing between the hold-down member 67 and the lower surface of the track 46 prevents two overlying reeds 12, as shown at 27, FIG. 3, or a bent reed 12 from entering the chamber 56. If a bent reed 12 or two or more overlying reeds 27 reach the hold-down member 67, such reeds 12 being unable to pass beneath the hold-down member 67, the orientor 17 jams and the reeds 12 back up on the track 46 and on the pathway 22.

An orifice 68 passes through the vertical wall 59 of the chamber 56 immediately above the uppermost portion of the outlet 62. Directly opposite the orifice 68, when the plate 38 is in its normal closed position, is a recess 71 (FIGS. 4 and 6) formed in the vertical wall 60 of the groove 55 of the movable plate 38. A tubular member 72, FIG. 5, through which a blast of air may be selectively emitted, is positioned within the orifice 68 to direct such air blast against the recess 71. Emission of an air blast is initiated by the photocell 35 and by the control circuit 18.

Operation

In operation, a plurality of randomly disposed reeds 12 having paddle ends 13 and wire ends 14 are dumped into the bowl 21.

The control circuit 18 is energized by a voltage source 73 upon the closing of a pair of switches 75 in conductors 74, FIG. 6, and the rotary vibratory apparatus (not shown) is also energized to feed the reeds 12 up the pathway 22, FIG. 3.

Such reeds 12 have various straight and bent conditions and have various relationships to each other. First, the reeds 12 may be bent and unacceptable or may be straight and acceptable. Second, the reeds 12 may be in a column of (i) single reeds, (ii) groups of reeds having side-by-side relationships, (iii) groups of reeds having overlying relationships, or (iv) a combination of the single reeds and the groups of reeds. Third, the single reeds 12 and groups of reeds may be in abutting relationships or may be separated from each other in the direction of feeding on the pathway 22.

The air nozzles 23, 24, and 28 remove most of the bent reeds from the pathway 22 by blowing such bent reeds back into the bowl 21. These nozzles 23, 24, and 28 also remove most of the groups 27 of overlying reeds 12 from the pathway 22 and return such removed reeds to the bowl 21. All but one of the reeds in the groups of side-by-side reeds are removed from the pathway 22 either by the vibrating pathway 22, which is less than twice the width of the paddle ends 14, or by the narrowed, initial portion 47 of the track 46.

Assuming that a single column of unbent and non-overlying reeds 12 with their ends abutting are fed on the pathway 22 to the track 46, the first reed 12 of the column passes over the vertical aperture 48 and breaks the light beam 52. Breaking of the light beam 52 triggers the photocell 35 to operate a relay 76. Such operation of the relay 76 closes a normally opened contact 77 to connect a solenoid 78 to the source 73 through the lines 74. Connecting the solenoid 78 to the source 73 opens a valve 79 to permit a blast of air to emit from the open end of the interval nozzle 33. Such blast of air blows the reed 12 following the first reed 12 from the pathway 22 back into the bowl 16. The interval nozzle 33 is operated for as long as the first reed 12 travels over the aperture 48 and interrupts the light beam 52 to assure that the distance between successively fed reeds is at least equal to the length of a single reed 12. All of the successively fed reeds 12 on the pathway 22 are spaced in this same fashion.

Assuming now that the first reed 12 is fed onto the track 46 with its wire end 14 first, as this reed 12 passes over the inlet 65 of the orienting chamber 56, the center of gravity of such reed 12 becomes unsupported by the track 46. The unsupported center of gravity tips the wire end 14 of the reed 12 downwardly between the orienting rails 63 and the reed 12 enters the chamber 56. Subsequently, the reed 12 is dispensed from the outlet 62 with its wire end 14 down and its paddle end 13 up.

On the other hand, if the first reed 12 is fed onto the track 46 with its paddle end 13 first, the paddle end 13 is maintained horizontally by the hold-down member 67 and is supported by the orienting rails 63 as the reed 12 passes over the inlet 65. The paddle end 13 being supported by the orienting rails 63, the reed 12 is unable to tip downwardly to enter the chamber 56. Therefore, the reed 12 continues to travel above the rectangular opening 61 of the chamber 56. As the paddle end 13 passes over the inlet 66, the wire end 14 and the center of gravity of the reed 12 become unsupported by the track 46. The unsupported center of gravity tips the wire end 14 of the reed 12 downwardly between the orienting rails 63. The reed 12 then falls into the chamber 56 and is dispensed by the outlet 62 with its wire end 14 down and its paddle end 13 up.

Since in orienting the first reed 12 the following reed 12 is spaced from the first reed 12 by a distance at least equal to the length of one reed 12, the following reed 12 does not enter the chamber 56 while the first reed 12 is being oriented. Thus, if the first reed 12 is fed with its paddle end 13 first to the orientor 17 necessitating the feeding of this reed 12 across the entire top of the rectangular opening 61 of the chamber 56, there is not present, directly behind this first reed 12, another reed 12 fed with its wire end first, which can enter the chamber 56 simultaneously with the first reed 12. Therefore, only one reed 12 at a time is dispensed from the outlet 62.

Assume now that, due to some failure of the nozzles 23, 24, and 28 to properly operate, either a bent reed 12 or a group 27 of overlying reeds 12, FIG. 3, is fed to the orientor 17 on the track 46. The bent reed 12, being unable to pass under the hold-down member 67, jams the orientor 17 and causes succeeding reeds 12 to back up on the track 46. Similarly, the group 27 of overlying reeds 12 is unable to pass under the hold-down member 67, succeeding reeds 12 backing up on the track 46. Such a backup of reeds 12 on the track 46 interrupts the light beam 52 for a time longer than the time it takes one reed 12 to travel over the aperture 48. Such interruption of the light beam 52 operates the relay 76 to close the contact 77 for operating the interval nozzle 33.

Operation of the relay 76 also closes a normally open contact 81. Closing of the contact 81 connects a time-delay relay 82 to the source 73 through the conductors 74. The time-delay relay 82 is selected to remain unoperated for a time equal to the time one reed 12 requires to pass over the aperture 48, after such relay 82 is connected to the source 73. Since the reeds 12 are backed up on the track 46 and are not passing over the aperture 48, the time-delay relay 82 operates. Such operation of the time-delay relay 82 closes normally open contacts 83 and 84.

Closing of the contact 83 bypasses the contact 77 for continuously operating the solenoid 78 and the valve 79 to emit a continuous stream of air from the open end of the interval nozzle 33. Such continuous stream of air blows all subsequently fed reeds 12 from the pathway 22 to prevent a greater backup of reeds 12 on the track 46.

Closing of the contact 84 connects a solenoid 85 to the source 73 through the conductors 74. Connecting the solenoid 85 to the source 73 opens a valve 86 to allow a blast of air to emit from the tubular member 72 in the orifice 68. Such blast of air swings the plate 38 away from the stationary plate 37 on the hinge pin 42 to open the chamber 56. Upon such swinging movement of the plate 38, the blast of air also creates turbulence in the

now opened chamber **56**. Due to the movement of the plate **38** away from the stationary plate **37**, and due to the turbulence within the opened chamber **56**, any reeds **12** which are within such chamber **56** and any reeds **12** backed up on the track **46** are ejected, thus clearing the orientor **17** of all reeds **12**. To assure that the movable plate **38** remains open for a time sufficient to clear the orientor **17**, the tab member **53** moves to an overlying relationship with the aperture **48** as the plate **38** is swung open. The overlying relationship of the tab **53** with the aperture **48** maintains the light beam **52** interrupted and the time-delay relay **82** operated.

As the blast of air emitting from the tubular member **72** continues to swing the plate **38** away from the stationary plate **37**, the tab member **53** moves out of its overlying relationship with the aperture **48**. If the reeds **12** backed up on the track **46** have been removed from such track by the swinging movement of the plate **38**, the light beam **52** is no longer interrupted, and the relay **76** is de-energized to open the contacts **77** and **81**. Such opening of the contact **81** de-energizes the time-delay relay **82**. De-energization of the time-delay relay **82** both opens contact **83** and opens contact **84**, de-energizing the solenoid **85**, to cease emission of air from the tubular member **72**. Since both of the contacts **77** and **83** are now opened, the interval nozzle **33** ceases to emit the continuous stream of air.

If, after the tab **53** is moved out of the overlying relationship with the aperture **48**, reeds **12** remain backed up on the track **46**, the light beam **52** will not be restored and both the interval nozzle **33** and the tubular member **72** will continue to emit blasts of air.

Assuming that the backup of the reeds **12** has been cleared from the track **46** and that the tab member **53** is no longer overlying the aperture **48** due to the swinging of the plate **38** away from the plate **37**, air no longer emits from the tubular member **72** due to the opening of contact **84**. After the forces exerted on the plate **38** by its own inertia and by the coil spring **43** balance, the plate **38** begins to return to its normal closed position adjacent the stationary plate **37**. As the spring **43** swings the plate **38** back to such normal closed position, the tab member **53** again breaks the light beam **52**. However, such breaking of the light beam is not of a sufficient duration to operate the time-delay relay **82**, and the plate **38** returns to its normal closed position.

As can be seen from FIG. 5, it makes no difference in the operation of the conveying apparatus whether the second reed **12** following the first reed **12** actually abuts or is spaced some distance behind the first reed **12**. If the spacing between the first and second reeds **12** is less than the length of one reed **12**, the second reed **12** is blown from the pathway **22** by the interval nozzle **33**. If the second reed **12** is spaced from the first reed **12** by a distance greater than one reed length, the interval nozzle **33** does not operate to return such second reed **12** to the bowl **21**.

The orientor **17** is now cleared of reeds **12** in the chamber **56** and the backup of reeds **12**, including the bent reed **12** or group **27** of overlying reeds **12**, is removed from the track **46**. Therefore, the conveying apparatus further feeds, orients, and dispenses the reeds **12** from the outlet **62** with their paddle ends **13** in an upward position.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An apparatus for conveying elongated articles, which comprises:

means for orienting the elongated articles in a predetermined endwise position, said orienting means including a pair of normally adjacent plates, said plates defining an inlet for receiving said articles, a chamber, and an outlet for dispensing said oriented articles;

means for successively feeding said articles to said inlet of said orienting means in a column of random endwise positions;

means responsive to the presence of said articles of said column of articles for a first predetermined time for ejecting every other article of said column of articles to space apart said articles at intervals at least equal to the length of said articles; and

means responsive to the presence of said articles for a second time greater than said first predetermined time for moving at least one of said plates away from said other plate to open said chamber to permit the movement therefrom of any articles therein.

2. An apparatus for conveying elongated articles, which comprises:

an orientor having a stationary plate and a movable plate normally adjacent to said stationary plate, said plates defining an inlet for receiving said articles, a track leading to said inlet, a chamber, and an outlet for dispensing said articles;

a helical pathway leading up to the track of said orientor;

means for successively feeding said articles up said pathway in a column of random endwise positions onto said track and into the inlet of said orientor;

means responsive to the presence of said articles on said track for a predetermined time for ejecting every other article of said column of articles to space apart said articles on said pathway at intervals at least equal to the length of said articles;

a tubular member fixed to said stationary plate and having an orifice leading into the orienting chamber;

a source of air connected to the tubular member; and

means responsive to the presence of said articles on said pathway for a second time greater than said first time for rendering effective said source of air to produce a blast of air from said orifice to move said normally adjacent plate away from said stationary plate to open said orienting chamber to both discharge any articles within said chamber and remove from said track any articles thereon.

3. In an apparatus for conveying elongated articles, means for orienting the articles, which means comprises:

a stationary plate and a movable plate normally abutting said stationary plate, said normally abutting adjacent plates mutually defining an inlet for receiving said articles, a track defined by said plates leading to said inlet for transporting said articles thereon to said inlet, a chamber defined by said plates communicating with said inlet for receiving oriented articles therein from said inlet, and an outlet defined by said plates for dispensing said articles in said predetermined endwise position; and

means responsive to the failure of said inlet to receive said articles due to stoppage of said articles on said track for moving said normally abutting plate away from said stationary plate to open said chamber to both permit the movement therefrom of any articles therein and remove from said track any articles thereon.

4. In an apparatus for conveying reeds having wire-like ends and oppositely extending flat ends, means for orienting the reeds, which comprises:

a stationary plate and a movable plate normally adjacent said stationary plate, said normally adjacent plates defining a funnel-shaped chamber having an upper enlarged entrance and a lower restricted outlet for dispensing said reeds;

a pair of rails spaced apart a distance greater than the diameter of said wire-like ends and less than the width of said flat ends, one of said rails being fixed to each

plate within said entrance for supporting said flat ends and permitting said wire-like ends to pass between said rail to orient said reeds with their flat ends up, the ends of said rails and the sides of said rectangular entrance defining a pair of inlets leading from said entrance and into said chamber for receiving said reeds;

a track formed on the upper surfaces of said plate and leading to said entrance for feeding said reeds to said rails and said inlets; and

means responsive to the failure of said inlets to receive said reeds due to stoppage of said reeds on said track for moving said normally adjacent movable plate away from said stationary plate to open said chamber both to permit the movement from said chamber of any reeds therein and to separate said rails and said track to remove therefrom any reeds thereon.

5. In an apparatus for conveying elongated articles, means for orienting the articles, which means comprises:

a stationary plate and a movable plate normally contiguous to said stationary plate and pivotally mounted to said stationary plate, said plates defining a track, a rectangular entrance for receiving said articles from said track, a funnel-shaped chamber having an upper wide portion leading into said entrance and a lower restricted portion, and an outlet leading from said lower restricted portion of said funnel-shaped chamber for dispensing said articles;

means including a pair of spaced rails mounted within said entrance for orienting said articles in a predetermined endwise position to deposit said oriented articles in said chamber;

a tubular member leading into said chamber through an orifice in said stationary plate; and

means responsive to the stoppage of said articles on said track for producing a blast of air from said tubular member to pivot said normally contiguous plate away from said stationary plate to open said chamber to eject any articles within said chamber and to separate said track to remove any articles from said track.

6. An apparatus for conveying elongated articles, which comprises:

a bowl including a pathway which holds a plurality of said articles;

means including a pair of spaced rail members for orienting said articles in a predetermined endwise position to dispense said oriented articles;

a track leading into said orienting means;

means for successively feeding said articles in random endwise orientations out of said bowl, on said pathway, along said track, and into said orienting means;

means responsive to a foremost of said articles being fed on said track for removing from said pathway the next following article which is spaced less than the length of one article from said foremost article to space said successively fed articles by a distance at least equal to said length; and

means responsive to the failure of said orienting means to continuously receive therein articles due to cessation of movement of said articles along said track for removing from said orienting means any articles therein and for continuously operating said removing means to remove any articles present on said track.

7. An apparatus for feeding and orienting reeds having a predetermined length, which comprises:

means for receiving and for orienting said reeds in a predetermined endwise position, said orienting means including at least two, normally abutting, relatively movable plates which define a chamber for receiving said oriented reeds, a track leading into said chamber, and an outlet communicating with said chamber for dispensing said oriented reeds;

a vibratory pathway for longitudinally feeding said reeds thereon to said track in random endwise orientations;

an air nozzle mounted adjacent said pathway;

means responsive to a foremost of said reeds being fed on said track for operating said air nozzle to blow said reeds off said pathway, said air nozzle operating means being positioned at a point adjacent said track which is spaced by said length from said air nozzle in the direction in which said reeds are longitudinally fed; and

means responsive to stoppage of said articles on said track for moving one of said plates relative to the other of said plates to remove from said chamber any articles therein and to separate said track to remove any articles thereon, and for continuously operating said air nozzle to blow from said pathway all of said reeds fed thereon.

8. An apparatus for feeding and orienting reeds, which comprises:

orienting means for receiving the reeds to orient said reeds in a predetermined endwise position;

a vibratory pathway for feeding longitudinally said reeds in a column to said orienting means in random endwise orientations;

means for preventing overlying and bent reeds from being received by said orienting means to stop the movement of said column of reeds;

an air nozzle mounted adjacent said track;

detecting means for generating a first signal in response to a foremost of said reeds being fed on said pathway and for generating a second signal in response to failure of said orienting means to receive said reeds when the movement of said column is stopped;

means for mounting said detecting means between said air nozzle and said orienting means at a point separated from said air nozzle by the length of said reeds;

first control means responsive to said first signal for blowing air through said air nozzle to space said fed reeds by a distance at least equal to said length; and

second control means responsive to said second signal for continuously operating said air nozzle, for removing from said orienting means any reeds therewithin, and for removing from said pathway any reeds thereon between said air nozzle and said orienting means.

9. An apparatus for conveying bent and straight elongated articles, comprising:

a track;

means connected to said track for orienting said articles in a predetermined endwise position, said orienting means including a plate movable to eject from said orienting means any articles therein, and to eject from said track any articles thereon;

means for feeding thereon said articles in a column of random endwise positions along said track and into said orienting means, said column including randomly distributed groups of said articles, said groups including one or more of said bent and straight articles;

means responsive to the presence of a first of said groups of reeds for removing from said feeding means the group of articles behind said first column group to space said groups of articles on said track by a distance at least equal to the length of one of said articles;

means mounted on said track for preventing articles of said groups which include a plurality of said articles from being fed into said orienting means to stop the feeding of said column of articles on said track, and for preventing said bent articles from being fed into said orienting means to stop the feeding of said column of articles on said track; and

means responsive to stopping of the feeding of said

column of articles for continuously operating said removing means to prevent further feeding of said articles to said track and for moving said plate.

10. An apparatus for conveying bent and straight reeds having wire-like ends and opposed flattened ends and having predetermined lengths, comprising:

a bowl;

an upwardly directed, helical pathway within said bowl;

a first air nozzle mounted adjacent said pathway;

reed orienting means having an entrance and a vertical chamber communicating with said entrance for receiving randomly positioned reeds and for dispensing said reeds with their wire-like ends downward, said orienting means including a pair of spaced, orienting rails mounted at the top of said chamber within said entrance, said rails being shorter than said entrance to define a pair of inlets and being spaced apart a distance less than the width of said paddle ends and greater than the diameter of said wire-like ends;

a horizontal track connecting said pathway to said entrance, said track having an aperture therethrough separated from said first air nozzle by said length;

vibratory means for feeding said bent and straight reeds in random end-to-end relations and in random groups of overlying and non-overlying relationships at a constant velocity from said bowl, up said pathway, onto said track, over said aperture in a first predetermined time, and to said entrance of said chamber;

means for preventing said bent reeds and said reeds in said groups of overlying reeds from being fed into said entrance to back said reeds up on said track to continuously cover said aperture for a time greater than said first predetermined time;

movable means normally positioned to form a wall of said chamber and mounted on a vertical axis for swinging away from said chamber to establish an ejecting exit in said chamber and to separate said track;

a spring biasing said movable means to said normal position;

a horizontally disposed tab member mounted to said movable means which covers said aperture when said movable means is swung away from said chamber;

a second air nozzle positioned within and directed transversely across said chamber;

photoelectric means positioned on one side of said aperture above the plane of said tab for momentarily producing an air blast from said first air nozzle for as long as a foremost of said fed reeds passes over said aperture with said constant velocity; and

means connected to said photoelectric means and responsive to said aperture being covered for a time greater than said first predetermined time for continuously operating said first air nozzle to prevent further reeds from being fed to said track and for producing an air blast from said second air nozzle to swing said movable means away from said chamber to establish said ejecting exit, to separate said track, and to produce turbulence to remove from said chamber through said ejecting exit any reeds in said chamber and to remove from said separated track any reeds thereon, said tab member covering said aperture to ensure operation of said first and second air nozzles for a time necessary to remove said backup of said reeds from said track, said spring returning said movable means to said normal position when said backup of said reeds is removed.

References Cited by the Examiner

UNITED STATES PATENTS

2,570,923	10/1951	Dodge	198—31
2,802,560	8/1957	Engleson	198—31
2,915,165	12/1959	Bell	198—33

References Cited by the Applicant

UNITED STATES PATENTS

2,713,410	7/1955	Irmscher.
3,011,101	11/1961	Boyce.
3,033,418	5/1962	Hollopetre.

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