Fig. 2

Fig. 3

Fig. 6
WEB FEEDING MECHANISM AND CONTROL MEANS THEREFOR

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This invention relates to web feeding mechanism and control means therefor.

The invention has for an object to provide novel and improved sonic control means adapted for use in web feeding mechanism whereby successive lengths of the web are fed in accordance with spaced indicia formed in the web.

The invention has for a further object to provide novel and improved web feeding mechanism characterized by novel control mechanism adapted to control the feeding of successive equal lengths of the web.

With these general objects in mind, and with the other objects as may hereinafter appear, the invention consists in the novel control means and web feeding mechanism as hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a side elevation illustrating a web feeding, cutting and label applying machine embodying the present control means;

FIG. 2 is a plan view of a web of connected labels;

FIG. 3 is a detail view in side elevation of sonic detecting mechanism forming a part of the control means;

FIG. 4 is a wiring diagram of the sonic control mechanism adapted to deactivate the driving mechanism to discontinue the web feed when the indicia thereon is detected;

FIG. 5 is an associated wiring diagram of the control means adapted to activate the driving mechanism and initiate the web feed after a previously advanced length of the web has been severed and applied; and

FIG. 6 is a side elevation partly in cross section illustrating a modified form of mounting for the sonic receiver remote from the detecting area.

In general the present invention contemplates novel and improved sonic control means embodied in web feeding mechanism. The invention is illustrated as embodied in a machine for advancing an elongated web of connected labels from a supply roll thereof, cutting successive labels and applying the labels to successive, spaced packages or other articles being continuously moved into operating relation to the label applying mechanism. The web may be provided with spaced indicia, herein shown as relatively small openings spaced apart a distance corresponding to the length of successive labels. In operation sonic detecting means is arranged to detect an opening in the web, and suitable relay mechanism responsive to detection of an opening is arranged to terminate operation of the web advancing means whereupon the advanced portion of the web is severed to provide a label which is then applied to a package or other article moving therepast. A cycle of operation of the illustrated machine is initiated to sever and apply a previously advanced label by a package operated switch. After the severed label has been applied, provision is made for automatically advancing a succeeding label, the length of such advance being determined by the sonic actuated control means. The advanced label then remains at rest waiting initiation of a succeeding cycle started by closing of the package operated switch by a package.

In the illustrated embodiment of the invention the sonic detecting means may include a sound transmitter arranged to produce a sound of predetermined frequency at a constant amplitude and a sound receiver arranged to be activated by the tone produced by the transmitter. In operation when the web material passes between the transmitter and receiver the sound waves are interrupted so that the intensity of the sound is reduced and the receiver is not activated. Thereafter, when an opening in the web becomes aligned with the sound wave beam to the receiver, the latter becomes activated and receptive to the change in sound intensity occasioned by the sound wave passing through the opening in the web. This change in intensity of the sound activates a relay to terminate operation of the web advancing means.

In practice such change in sound intensity may be produced by indicia other than openings in the web and may include thin spots, valleys or depressions in the web, or differences in texture of the material comprising the web, or may comprise relatively miniature sensing elements, such as small pinholes in the web. The use of sonic detecting means in a web feeding device is of particular advantage in that it is not affected by varying light conditions adjacent the detecting area; by extraneous vibrations in the machine; or by dust or like material in the air surrounding the machine. The sonic detecting elements may also be relatively small and compact so as to occupy a minimum of space in the machine. The present sonic detecting means thus affords an extremely effective and substantially foolproof control device particularly adapted for use in a web feeding mechanism.

In practice the housings in which the transmitter and the receiver are mounted are preferably arranged in contiguous engagement with the moving web with the web covering the aligned openings in the housings defining the path of the sound waves so as to reduce the effect of extraneous sounds in the detecting area. In a modified form of the invention the receiver may be mounted in an insulating housing to substantially eliminate the reception of sounds other than those produced by the transmitter. In some instances where space is limited and the size and bulk of the insulating housing prevents arrangement of the receiver directly under the web, provision is made for placing the insulating housing and its receiver in a position remote from the detecting area and for guiding the sound waves from the transmitter substantially unimpeded to the insulated receiver.

Referring now to the drawings and particularly to FIG. 1, the packages 19 to be labeled are advanced in spaced relation on a continuously moving belt 12, and a web 14 of connected labels to be severed and applied is withdrawn from a supply roll 16 thereof by a feed roll 18 mounted on a shaft 20. Rotation of the shaft 20 is controlled by a conventional magnetic clutch and brake unit indicated generally at 22, the driven member of which may be belted to an electric motor 24.

The web 14 is provided on one side thereof with a coating of thermoplastic adhesive and, as illustrated in FIG. 1, the web withdrawn from the supply roll 16 is passed around a resiliently mounted dancing roll 26 adapted to take up the slack in the web, and then around a guide roll 28 and over the upper face of a heater indicated at 30 to soften the thermoplastic adhesive on the opposite side of the web. The web then passes around a pair of idler guide rolls 32, 34 arranged to guide the web in a reverse direction and in engagement with the underside of the heater 30 to further soften the thermoplastic adhesive. The web then passes around the driven feed roll 18 and between the feed roll and a cooperating idler roll 36 which is resiliently urged against the web as shown. The leading end of the web extends across a guide plate 37 into operative relation to a cam operated knife 38 with the advanced portion of the web comprising the length of a label desired to be severed being supported.
on spaced elements 40 between which a severed label is pressed by a cam operated label applying member 42 to press the thermoplastic coated side of the label against the under surface of a package 10 being moved therepast. Thereafter, the continuously moving package is engaged under a presser roll 43 for firmly pressing the label against the under surface of the package.

The cam operated knife 39 is arranged to cooperate with a stationary blade 31 and is connected by linkage indicated generally at 44 to a cam lever 45 having a roll 48 which cooperates with a cam 50 mounted fast on a solenoid shaft 52 forming part of a rotary solenoid 54. The label applying member 42 is likewise connected by linkage indicated generally at 56 to a cam lever 58 having a cam roll 60 for cooperation with a cam 62 also fast on the shaft 52. The rotary solenoid 54 is energized to start rotation of the cams by a package operated trip switch 64 included in the solenoid circuit and arranged to be closed when the forward end of a package to be labeled strikes a trip finger 66 arranged in the path thereof. Rotation of the cams 50, 62 in one direction operates the knife and label applying linkage to effect severance of a previously advanced label and application of the severed label to the package, and when the solenoid shaft 52 approaches the end of its rotation in one direction, a return switch 68 is actuated to deenergize the solenoid and effect spring return of the solenoid shaft 52 in the opposite direction. This movement effects return of the cams 50, 62 to their initial position and retraction of the knife and label applying members. A third cam 69 is provided on the solenoid shaft 52, and as the shaft approaches the end of its return movement the cam 69 is arranged to close a label advancing switch 70 to complete a circuit to the magnetic clutch and brake unit 22 to effect release of the brake and engagement of the clutch to initiate rotation of the feed roll 18 and advance of a succeeding label.

As illustrated in FIG. 2, the web 14 of connected labels is provided with spaced openings 72, the distance between successive openings corresponding to the length of successive labels to be severed and applied. In accordance with the present invention sonic operated control means is indicated generally at 74, FIG. 1, is provided to detect such openings, and through relay mechanism responsive thereto to deactivate the clutch and apply the brake, thus terminating rotation of the feed roll and advance of the web. At this time the advanced portion of the web is disposed inoperative relation to be severed and applied to a succeeding package when the such package strikes the trip finger 66 to initiate a succeeding cycle of operation.

As herein shown, the sonic detecting means 74 is disposed in a position to detect the openings in the moving web at a point immediately preceding the passage of the web around the guide roll 28 and includes a sound transmitter 80 disposed above the web and a sound receiver 82 disposed below the web. As illustrated in FIG. 3, the transmitter and receiver are arranged in vertical alignment substantially centrally of the web being advanced therebetween and are adapted to detect the spaced openings 72 formed along the longitudinal center line of the web. The sound receiver 82 may be suitably housed in a stationary laterally extended bracket 84 supported for longitudinal adjustment on a bar 86 which may be secured to the machine frame. The web 14 may be guided between a roll 88, 90 carried by the bracket 84 in order to maintain the openings in the web in lateral alignment with the sonic detecting elements 80, 82 during movement of the web therebetween and with the underside of the web in contiguous engagement with the upper face of the receiver housing. The transmitter 80 may be suitably housed in an arm 92 mounted at 94 and an upstanding bracket 98 secured to the bracket 84 with the lower face of the transmitter housing bearing directly against the upper face of the web. The transmitter housing is thus "floatingly" mounted to press the moving web against the receiver housing in close fitting and parallel relation. The direct and relatively close fitting engagement of the sonic detecting units and the web therebetween provide in effect a closed passageway between the web and the openings in the web and they tend to eliminate the effects of extraneous sound waves which might otherwise inadvertently trigger the control mechanism. The direct engagement of the detecting elements and their housings with the web also tends to eliminate the sympathetic vibration of a relatively thin web material passing between the detector elements which might otherwise occur if the elements were spaced from the web. It further reduces the effects of extraneous sounds, the receiver 82 may be mounted in an insulating housing similar to that shown in FIG. 6.

Referring now to FIG. 6, in a modified form of the invention, where the limited space under the web prevents placing of the insulating receiver directly below the web, the provision is made for mounting the sonic receiver 82 in an insulating housing in a position remote from the detecting area where it may be less subject to the influence of extraneous sounds. In the modified form of the invention the transmitter 80 may be mounted in a solid housing 100 arranged to bear against the web 14 by its own weight with the face of the housing in direct engagement with the upper surface of the web as the web is advanced thereunder. The housing 100 is provided with a relatively small opening 102 in the lower face thereof through which the sounds produced by the transmitter may pass. The opening 102 is aligned with a similar opening 104 in the upper face of a sound chamber housing 106 disposed below the web. A nipple 110 communicating with the sound chamber 106 is connected by a plastic tube 112 to the open end of the tube 78 as illustrated. The plastic tube may be of a type characterized by its ability to confine and carry the sound from the transmitter substantially unimpared to the receiver, one such plastic tubing being commercially available under the trade name of "Tygon" tubing.

As herein shown, the receiver 82 is mounted between upper and lower sections 114, 116 of sound insulating material which may comprise sponge rubber which is held in resilient engagement about the receiver by a flexible sound insulating material 118, such as cardboard, wrapped thereabout. The assembly is combined within an outer sheet metal housing 120. In operation the sonic receiver 82 thus mounted substantially eliminates all extraneous sounds and vibrations and is receptive only to the sounds transmitted by the sonic element 80 when an opening 72 in the web arrives in alignment with the openings 102, 104 in the transmitter housing 100, and the sound chamber housing 106, respectively.

Referring now to the electrical control circuit shown in FIG. 4, the sound source consists of a modified Hartley type vacuum tube electronic oscillator, tuned to an audio frequency of from 900 to 950 cycles per second. The oscillator tube V1 comprises a 6C4 triode indicated at 200. The signal is coupled by a transformer T3 to the transmitter transducer P1, identified by the numeral 80, which comprises a low power 15 ohm impedance unit. The amplifier consists of a two-stage transformer-resistive type voltage amplifier of conventional form. The receiving transducer P2, indicated at 82, comprises a 500 ohm impedance unit located in line with the sound path of P1, and sound energy received by P2 is converted to electrical energy and amplified through the amplifier tube V2, indicated at 202, which comprises a 6AT6 tube, and V3, indicated at 204, which comprises a 6C4 amplifier output tube. The voltage output is coupled in a series adding manner to the bias voltage of the tube V4, indicated at 206, which comprises a 2D21 thyatron rectifier.

In operation a sound signal received by P2 will cause V4 to fire, energizing the deactivating coil of relay CR1,
indicated at 207, which comprises the brake and clutch relay. Referring now to FIG. 5, when the web feeding device is in an operative condition, but not activated, switches S1 and S2 are in their normally closed contact position, and S3 is activated to its normally open position. Capacitor C1, therefore, has been charged from silicon rectifier 288 through S1 normally closed contact.

A package 10 moved by the conveyor 12 strikes S1 discharging capacitor C1 through CR2 activating coil, indicated at 212, which comprises a latch type relay and which remains closed though the energy from C1 has decayed. CR2 normally open contacts now engage the rotary solenoid and its rectifier power source 210. The solenoid travel actuates the knife and label applying mechanism, and at the end of its energized stroke the solenoid activates switch S3, indicated at 68. The switch S2 energizes the deactivating coil 212 of CR2, thus deenergizing solenoid S4 which returns by spring action to its initial position.

During the movement of the rotary solenoid through its energized stroke the cam 69 permits the switch S3, indicated at 70, to return to its normally closed contact position charging capacitor C2 by silicon rectifier 209. When the solenoid returns to its initial position the cam 69 activates S3 to its normally open contact position discharging capacitor C2 through CR1 activating coil, indicated at 207. CR1 comprises a latch type relay and remains closed though the charge of C2 has decayed. Cam 69 in parallel with CR1 activating coil serves to prolong the energized condition of the coil. The normally open contact of CR1 is now closed, and the normally closed contact thereof is now open. Thus, the clutch portion of the driving unit 22 is now engaged, and the brake portion is deenergized. The motor drive connection 24 is continuously operated, and when the clutch is engaged, the web feed roll 18 is rotated until a pre punched indexing hole 72 comes into alignment with the sound path between P1 and P2. When this occurs the sound energy passes through the hole energizing P2 actuating amplifier and thyratron, thus deenergizing CR1 to disengage the clutch and energize the brake to discontinue rotation of the feed roll 18. The cycle is now complete and the package 10 continues past S1 allowing S1 to return to its normal position. The C1 capacitor is thus recharged ready for a succeeding cycle started by engagement of a succeeding package with the switch arm 66.

Dw the operation of the machine the sound is transmitted continuously, and in practice there is a slight overfeed of the web so that when the web comes to rest the opening 72 which triggered the web terminating operation will be disposed slightly beyond the path of the sound waves. However, the illustrated circuit provides a time delay through capacitor C4 so that the clutch and brake circuit will hold even though the web is stopped with an opening 72 directly in alignment with the sound path.

While the present invention has been illustrated and described as embodied in web feeding mechanism, it will be understood that the invention may be embodied in other forms within the scope of the following claims, such for example as, but not by way of limitation, in mechanisms for indexing and controlling the operation of conveyors, filling machines, stamping machines and packaging machines.

Having thus described the invention, what is claimed is:

1. In web feeding mechanism, in combination, means for advancing a web having spaced indicia thereon, sonic control means including a sound transmitter and a sound receiver wherein air is the medium of transmission of the sound from the transmitter to the receiver, said transmitter and receiver being arranged on opposite sides of and in contiguous engagement with the web and adapted to detect the indicia on the moving web, means for insulating said sound receiver to exclude extraneous sounds, and means responsive to detection of said indicia for terminating advancement of the web, the contiguous engagement of the detecting elements with opposed sides of the web providing a closed passageway for the sound to pass through the openings in the web whereby to eliminate extraneous sounds and to also prevent sympathetic vibration of the web passing therethrough.

2. In web feeding mechanism, in combination, means for advancing a web having longitudinally spaced openings therein, control means including sonic operated detecting means comprising a sound transmitter and a sound receiver wherein air is the medium of transmission of the sound from the transmitter to the receiver, said transmitter and receiver being arranged on opposite sides of the web arranged to detect the openings in the moving web, said transmitter and said receiver being enclosed within housings having aligned openings therein defining the path of the sound waves, said web acting as a valve to reduce the intensity of the sound waves transmitted to said receiver, the adjacent faces of said housings being arranged in contiguous engagement with their respective faces of the advancing web passing therethrough, the contiguous engagement of the detecting elements with opposed sides of the web providing a closed passageway for the sound to pass through the openings in the web whereby to exclude extraneous sounds and to also prevent sympathetic vibration, and means responsive to detection of an opening in the web aligned with the path of said sound waves from the transmitter to the receiver for terminating advancement of the web.

3. Web feeding mechanism as defined in claim 2 wherein the sound receiver is mounted in an insulating housing to further exclude extraneous sounds therefrom.

4. Web feeding mechanism as defined in claim 3 wherein the transmitter housing is movable mounted to bear against the web and to urge the advancing web into engagement with the adjacent face of the receiver housing.

5. In web feeding mechanism, in combination, means for advancing a web having longitudinally spaced openings therein, and control means including sonic detecting means arranged to terminate advance of the web when an opening is detected, said sonic detecting means comprising a sound transmitter disposed above the web, a housing for said transmitter in direct engagement with the moving web and having a relatively small opening in the engaging wall thereof defining the path of the sound waves, a sound chamber housing disposed below and in direct engagement with the web, said sound chamber housing having a relatively small opening in the engaging wall thereof aligned with said transmitter housing opening, a sound receiver disposed remote from said sound chamber, the air being the sole medium of transmission of the sound waves from the transmitter to the receiver, and means connecting said sound chamber and said receiver for confining and guiding the sound waves through the air in said connecting means substantially unimpaired from the sound chamber to the receiver, the direct engagement of the detecting elements with opposed sides of the web providing a closed passageway for the sound to pass through said aligned openings and the openings in the web whereby to eliminate extraneous sounds and to also prevent sympathetic vibration of the web passing therethrough.

6. Sonic control means as defined in claim 5 wherein the remotely positioned receiver is mounted in an insulating housing.

7. Sonic control means as defined in claim 5 wherein the connecting means between the sound chamber and the receiver comprises a plastic tube.

8. Indexing mechanism for controlling the operation of a machine, in combination, means for advancing successive objects to the machine, sonic control means including a sound transmitter and a sound receiver wherein the air is the medium of transmission of the sound from the transmitter to the receiver, said sonic control means being arranged to detect objects moved theresthereby said advancing means, and means responsive to a change in the
intensity of the sound transmitted by the transmitter and received by the receiver upon the detection of an object for actuating and terminating said machine, said transmitter and said receiver being arranged in contiguous engagement with opposed sides of the web providing a closed passageway for the sound to pass through the openings in the web whereby to eliminate extraneous sounds and to also prevent sympathetic vibration of the web passing therebetween.

9. For use with a package labeling machine having means for severing and applying a previously advanced label length and having package operated means for initiating operation of said label severing and applying means, the improvement comprising web feeding mechanism including means actuated at the end of a label applying operation for initiating advance of a succeeding label length, sonic operated detecting means including a sound transmitter and a sound receiver arranged in contiguous engagement with opposed sides of the web and between which the web passes, the passage of the web material therebetween effecting a reduction in the sound intensity transmitted to the receiver, and means responsive to an increase in the sound intensity when an opening in the web is detected for terminating advancement of the web, the contiguous engagement of the detecting elements with opposed sides of the web providing a closed passageway for the sound to pass through the openings in the web whereby to eliminate extraneous sounds and also to prevent sympathetic vibration of the web passing therebetween.

10. For use with a package labeling machine, web feeding mechanism having a feed roll for advancing a web of label material provided with openings therein spaced longitudinally of the web a distance corresponding to the desired length of successive labels, said labeling machine having means for severing successive labels from the web and means for applying the severed labels to successive packages being moved past the label applying means, the improvement comprising a control circuit including a package operated switch for initiating operation of said label severing and applying means, means for rotating said feed roll including an electric clutch and brake unit actuated at the end of a label applying operation for initiating the advance of a succeeding label, sonic operated detecting means including a sound transmitter and a sound receiver in contiguous engagement with opposed sides of said web and between which the web passes, the passage of the web material therebetween effecting a reduction in the sound intensity received by the sound receiver, and an amplifier and a relay also in circuit with said clutch and brake unit and responsive to an increase in the sound intensity received by the receiver when an opening is detected for terminating advancement of the web, the contiguous engagement of the detecting elements with opposed sides of the web providing a closed passageway for the sound to pass through the openings in the web whereby to eliminate extraneous sounds and also to prevent sympathetic vibration of the web passing therebetween.

11. The combination as defined in claim 10 wherein the feed roll for advancing the web provides a slight overfeed after an opening in the web has been detected to discontinue advance of the web whereby to advance the opening beyond the detecting elements before the web comes to rest.

12. The combination as defined in claim 11 wherein the circuit includes a time delay so that the clutch and brake circuit will hold even though the web is stopped with an opening directly in alignment with the sound path.

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