Oct. 27, 1964 I. S. GOTTSCHO ETAL 3,154,011

ROTARY WEB FEEDING AND MARKING APPARATUS

Filed June 10, 1963 3 Sheets-Sheet 1

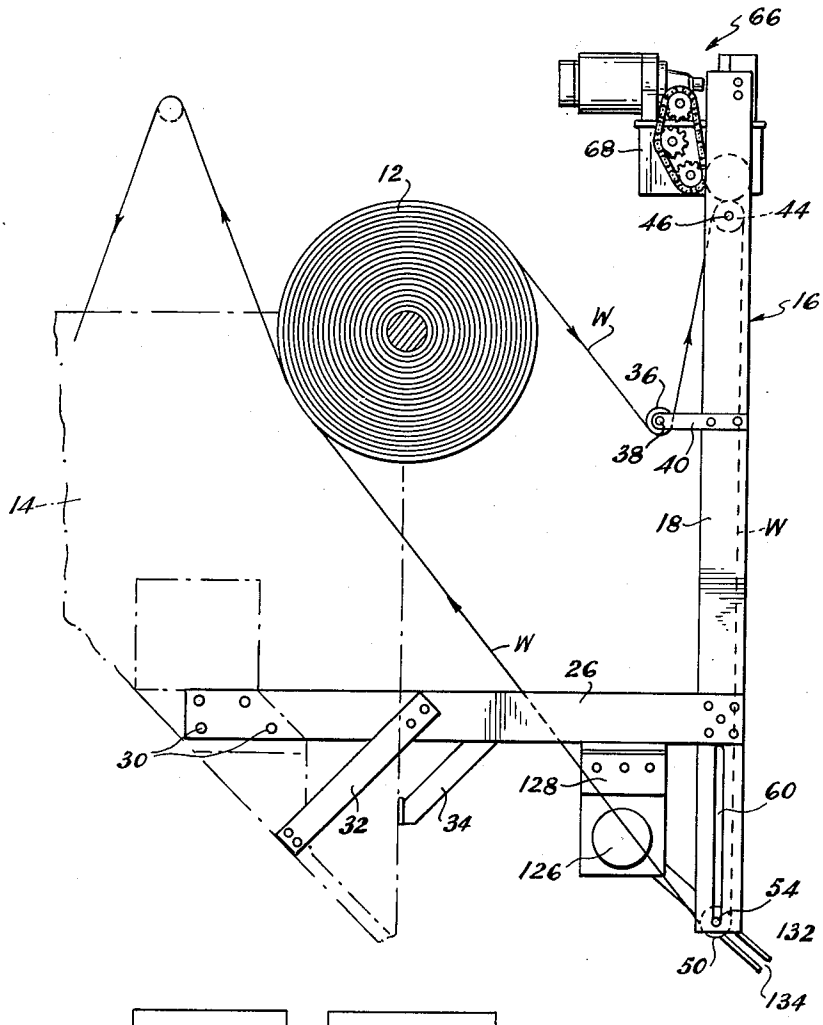

Fig. 1.

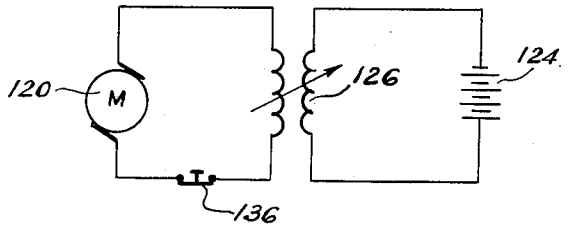

Fig. 9.

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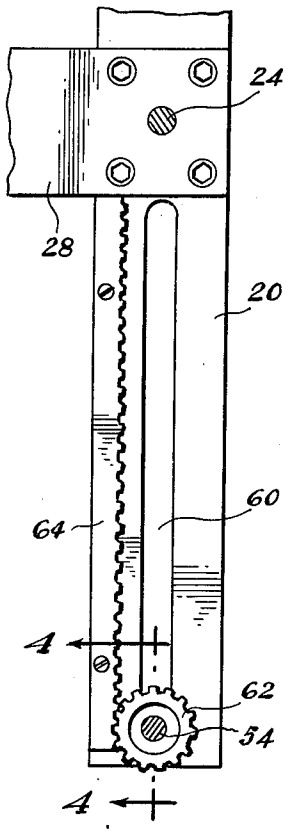

Fig. 3.

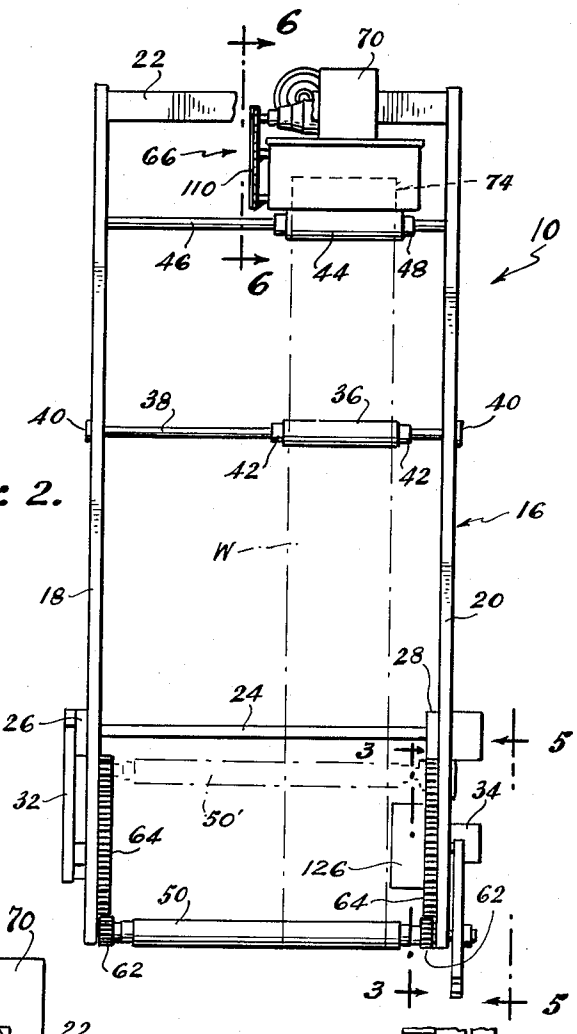

Fig. 2.

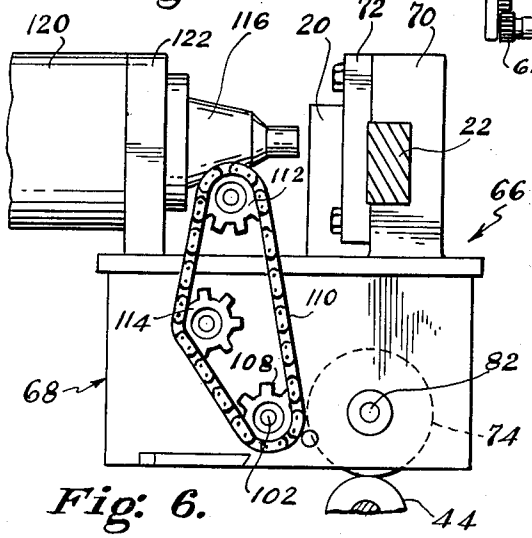

Fig. 6.

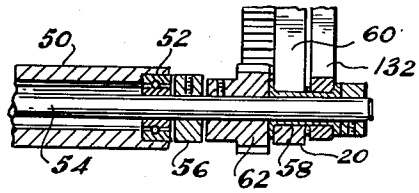

Fig. 4

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ROTARY WEB FEEDING AND MARKING APPARATUS

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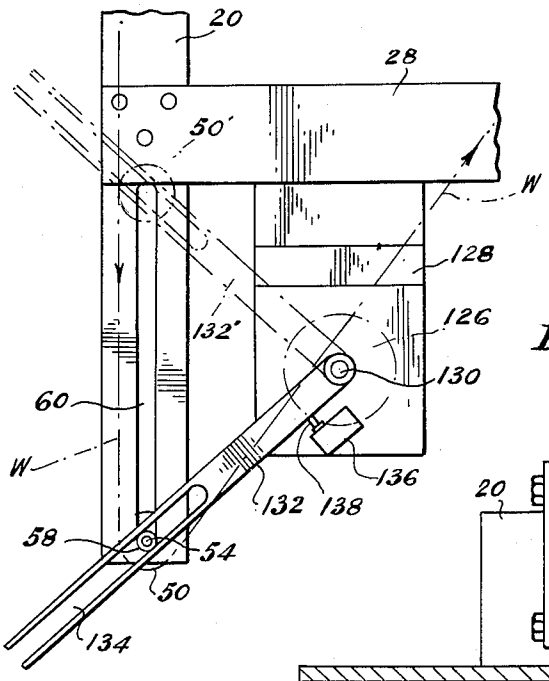

Fig. 5.

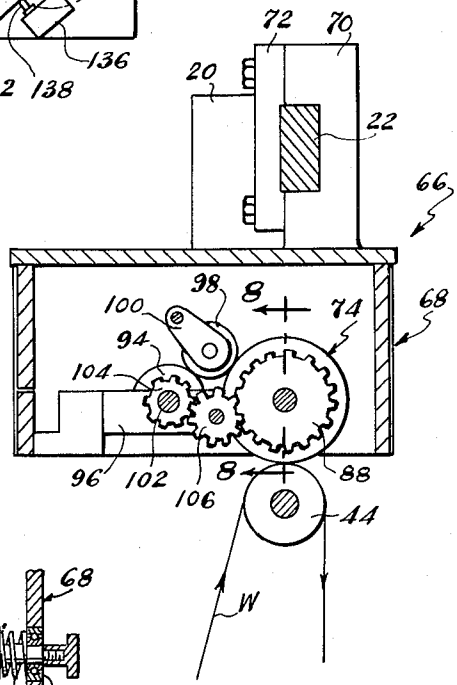

Fig. 7.

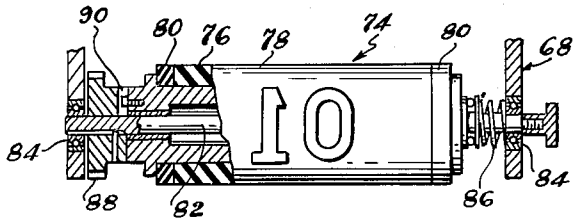

Fig. 8.

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ROTARY WEB FEEDING AND MARKING APPARATUS

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Filed June 10, 1963, Ser. No. 286,655
5 Claims. (Cl. 101—228)

This invention relates generally to marking apparatus, and more particularly is directed to a marking apparatus for repeatedly applying markings, preferably in the form of inked impressions, to a continuous web or sheet, for example, to a web of wrapping material as the latter is fed to a conventional wrapping machine.

Marking apparatus has been previously provided, for example, as in United States Letters Patent No. 2,996,005, issued August 15, 1961, to F.C. Worth, and assigned to same assignee as this application, for applying markings to successive sections or lengths of a continuous web of wrapping material which are to be cut from the latter in a conventional wrapping machine. However, such known marking apparatus must be driven and controlled from a drive shaft, draw rolls or rotary cut-off of the associated wrapping machine. When the wrapping machine is of an intermittently operated type, for example, a Forgrove Model 42C, from which a drive cannot be conveniently obtained because the feed of the web of wrapping material is not related to the rotational movement of a main drive shaft or the draw or feeding rolls of the wrapping machine, then the known marking apparatus intended to be driven and controlled from the wrapping machine cannot be employed.

Accordingly, it is an object of this invention to provide a marking apparatus for repeatedly applying markings to a web of wrapping material as the latter is fed intermittently or at a varying speed to a wrapping machine or other device utilizing the web, and wherein the marking apparatus has a drive that is independent of the associated wrapping machine but controlled so as to synchronize the operation of the marking apparatus with the intermittent or varying feed of the web in the wrapping machine.

In accordance with this invention, the web of wrapping material to be utilized in the wrapping machine is drawn from a supply or parent roll and, before entering the wrapping machine, passes between the die wheel or roller of a marking or printing head and a back-up roller and then is looped around an idler roller mounted with its axis extending parallel to the axes of the die roller and back-up roller and being movable toward and away from the latter so as to vary the effective length of the web between the supply roll and the entry into the wrapping machine when the demand by the latter for the web either exceeds or is less than the speed at which the web is fed to the wrapping machine. The die roller of the marking head is driven from a variable speed electric motor having an energizing circuit that is controlled in response to the movements of the idler roller so that the speed of the electric motor, and hence the feeding of the web from the supply roll to the wrapping machine by bearers on the die roller, is accurately synchronized with the demand for the web by the wrapping machine.

In a preferred embodiment of the invention, the circuit for energizing the variable speed electric motor includes a variable transformer actuated by movements of the idler roller to either increase or decrease the speed of the motor, and hence the speed at which the die roller rotates to feed and simultaneously mark the web of wrapping material, in response to the movements of the idler roller resulting from a decreasing or increasing length, respectively, of the web between the supply roll and the wrapping machine.

Further, the energizing circuit for the variable speed motor preferably includes a normally closed switch which is opened, thereby to halt operation of the motor, upon a predetermined movement of the idler roller in response to the feeding of the web by the rotated die roller at a speed in excess of that at which the wrapping machine demands or accepts the web, for example, when the feeding of the web within the wrapping machine is interrupted.

The above, and other objects, features and advantages of the invention, will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

FIG. 1 is a side elevational view of a marking apparatus embodying the present invention, and which is shown associated with a conventional wrapping machine having its outline partly defined by broken lines;

FIG. 2 is a front elevational view, partly broken away, of the marking apparatus of FIG. 1;

FIG. 3 is an enlarged, fragmentary sectional view taken along the line 3—3 on FIG. 2;

FIG. 4 is a fragmentary, detail sectional view taken along the line 4—4 on FIG. 3;

FIG. 5 is an enlarged, fragmentary elevational view of a portion of the apparatus, as viewed in the direction of the arrows 5—5 on FIG. 2;

FIG. 6 is an enlarged sectional view taken along the line 6—6 on FIG. 2, and showing the drive for the marking head of the apparatus;

FIG. 7 is a side elevational view of the marking head, but with the side wall removed to show components of the marking head;

FIG. 8 is a sectional view of the die roller of the marking head, as viewed along the line 8—8 on FIG. 7; and

FIG. 9 is a wiring diagram of the energizing circuit for the motor driving the die roller of the marking head.

Referring to the drawings in detail, and initially to FIGS. 1 and 2 thereof, it will be seen that the marking apparatus embodying this invention which is there illustrated and generally identified by the reference numeral 10, is intended to apply repeated inked markings to a continuous web W of wrapping material as the latter is unwound from a supply roll 12 and fed into a conventional wrapping machine 14 (represented by broken lines on FIG. 1). The machine 14 may be of the type that operates intermittently, for example, a Forgrove machine, Model 42C, and is characterized by its intermittent demand for the web of wrapping material. Such a machine includes a feeding system that intermittently draws the web of wrapping material into the entry of the wrapping machine from the supply roll 12 and, during the feeding phase of each operating cycle of the machine 14, the speed at which the web passes into the entry of the wrapping machine may also fluctuate.

The marking apparatus 10 is shown to generally comprise a frame 16 mounted at the front of the wrapping machine 14 and including elongated, vertical side members 18 and 20 held in spaced apart parallel relationship by a top cross bar 22 and a laterally extending cross rod 24 (FIGS. 2 and 3) secured, at its opposite ends, to lower end portions of side members 18 and 20. Horizontal support arms 26 and 28 extend rearwardly from the lower end portions of side frame members 18 and 20, respectively (FIGS. 1, 2, 3 and 5), and have their ends suitably secured, as at 30 on FIG. 1, to the frame or housing of the wrapping machine 14. Braces 32 and 34 extend from arms 26 and 28 (FIGS. 1 and 2) and are also secured to the frame of the wrapping machine for rigidly supporting the frame 16 on the wrapping machine with the side frame members 18 and 20 extending upwardly in a vertical plane in front of the supply roll 12.

The web W drawn from the top of the supply roll **12** passes under a guide roller **36** freely rotatable on a laterally extending axle **38** which is supported, at its opposite ends, by brackets **40** projecting rearwardly from side frame members **18** and **20** at locations approximately mid-way between top cross bar **22** and rod **24**. The roller **36** is axially interposed between collars **42** (FIG. 2) which are suitably secured on axle **38** for axially locating the guide roller **36** in alignment with the supply roll **12**.

The web W travels upwardly from the guide roller **36** and passes over a back-up or impression roller **44** which is freely rotatable on an axle **46** extending laterally between side frame members **18** and **20** at a location below the top cross bar **22**. Collars **48** are suitably secured on axle **46** adjacent the opposite ends of back-up roller **44** for adjustably locating the latter in alignment with guide roller **36**.

The web W travels downwardly from back-up roller **44** and passes under an idler roller **50** (FIG. 1) from which the web travels upward and rearwardly for entry into the wrapping machine **14**. As shown particularly on FIG. 4, the idler roller **50** is supported, as by bearings **52**, for free rotation on a shaft **54** having collars **56** fixed thereon at the opposite ends of the roller **50** for axially locating the latter on shaft **54**. The opposite end portions of shaft **54** have bushings **58** thereon which are slidably and rotatably received in vertically elongated slots **60** formed in the lower end portions of side frame members **18** and **20** (FIGS. 1, 3 and 5). Thus, the idler roller **50** is both rotatable and free to move vertically toward and away from the back-up roller **44**. The force of gravity, or weight of roller **50** tends to move the latter downwardly to the limit of such movement permitted by slots **60**, and the idler roller is intended to be moved upwardly from that position by tension in the web W between the wrapping machine **14** and the supply roll **12**. In order to ensure that the axis of idler roller **50** will remain horizontal, that is, parallel to the axis of back-up roller **44**, during the vertical movements of roller **50**, gears **62** are secured on the end portions of shaft **54** and mesh with racks **64** secured to the inner surfaces of side frame members **18** and **20** and extending vertically along the adjacent slots **60** (FIGS. 2, 3 and 4).

The marking apparatus **10** further comprises a marking head **66** that includes a housing **68** provided with a generally C-shaped mounting bracket **70** (FIG. 6) extending from its top wall to embrace the top cross bar **22** of frame **16** and being adjustably secured along bar **22** by means of a clamping plate **72**. As shown particularly on FIG. 7, the marking or printing head **66** further has a die wheel or roller **74** rotatably mounted within the housing **68** so as to project downwardly through the open bottom of the latter for effecting simultaneous feeding and marking engagement with the web W as the latter passes over the back-up roller **44**.

As shown on FIG. 8, the marking roller **74** includes a generally cylindrical body **76** having one or more suitable marking elements **78** secured on its periphery and provided with raised characters corresponding to the inked impression to be repeatedly applied to the web W. Also secured on the body **76** adjacent the opposite ends thereof are circumferentially extending bearers **80** formed of rubber or other frictional material, and which are radially dimensioned to frictionally engage the web W against back-up roller **44** and thereby pull the web from supply roll **12** in response to rotation of marking roller **74**.

The body **76** of marking roller **74** is mounted on a shaft **82** having its opposite ends journalled in bearings **84** carried by the side walls of housing **68**, and a spring **86** urges the body **76** axially toward a gear **88** which is secured on an end portion of shaft **82**. The radial face of the hub of gear **88** is formed with a radial slot **90** which receives the head of a screw **92** secured in the adjacent end of body **76** to provide a rotational coupling between gear **88** and body **76**.

In order to apply ink to the raised characters on the marking element **78** during rotation of marking roller **74**, the marking head **66** further includes a rubber ink roller **94** (FIG. 7) journalled in the sides of an ink reservoir **96** supported in housing **68** so that the ink roller **94** picks up ink from the reservoir during its rotation, and a metering or ink transfer roller **98** rotatably supported by adjustable arms **100** for simultaneous rolling contact with the surface of inking roller **94** and with the surfaces of the raised characters of marking element **78**. The shaft **102** of inking roller **94** constitutes the drive shaft of head **66** and carries a gear **104** meshing with an idler gear **106** which, in turn, meshes with the gear **88** of the marking roller (FIG. 7).

As shown on FIG. 6, the drive shaft **102** of head **66** projects out of housing **68** and has secured thereon a sprocket **108** driven by an endless chain **110** running around a drive sprocket **112** and an idler sprocket **114**. The drive sprocket **112** is secured on the output shaft **114** of a reduction gear unit **116** driven by an electric motor **120** mounted, as by a bracket **122**, on the top wall of housing **68**.

In accordance with the present invention, the motor **120** is a variable speed motor of a type that is commercially available, for example, the motor available from R. A. Boehm under the designation Serial No. B9076 with a No. 280 gear reduction unit. Further, the operation of motor **120** is controlled so that the rotation of marking roller **74** will effect feeding and simultaneous repeated marking of the web W at a speed corresponding to that at which the wrapping machine demands the web or effects internal feeding thereof.

As shown on FIG. 9, the circuit for energizing the variable speed motor **120** includes a source of electric current **124** and a variable transformer **126** of a type that is available commercially, for example, under the designation 100 BJ Adjust-A-Volt from the Standard Electric Products Company. The voltage impressed on the motor **120**, and hence the speed of rotation of the latter, are varied by actuation of the variable transformer **126**.

In accordance with the present invention, the variable transformer **126** is actuated to vary the speed of rotation of motor **120**, and hence the speed at which the web is fed from supply roll **12** to the wrapping machine **14**, in response to movement of the idler roller **50** vertically toward and away from the back-up roller **44**. Such actuation of the variable transformer **126** is achieved by mounting the latter on a bracket **128** suspended from the horizontal frame member **28** at a location adjacent the side frame member **20** (FIGS. 1 and 5). The variable transformer **126** has an actuating shaft **130** (FIG. 5) which is turnable in the clockwise direction to increase the voltage fed to the motor **120**, and thereby increase the speed at which the web is fed, and in the counter-clockwise direction, as viewed on FIG. 5, to reduce the voltage fed to the motor, and hence reduce the speed of feeding of the web. An arm **132** is secured on the shaft **130** and formed with a longitudinally extending slot **134**, and the bushing **58** on the end of shaft **54** slidable in the slot **60** of side frame member **20** extends outwardly beyond the latter and is also slidably received in the slot **134** of arm **132** (FIGS. 4 and 5).

Referring again to FIG. 9, it will be seen that the circuit for energizing the motor **120** further preferably includes a normally closed switch **136** which, when opened, interrupts the energizing circuit of the motor, and thereby halts the operation thereof. As shown on FIG. 5, the switch **136** is also mounted on the bracket **128** and has an actuating plunger **138** which is engaged by the arm **132**, and thereby depressed to open the contacts of switch **136**, when arm **132** is in its lowermost position (shown in full lines on FIG. 5) corre-

sponding to the location of the bushings **58** of idler roller **50** at the bottom ends of the slots **60**, to which position the idler roller **50** is urged by the force of gravity acting thereon.

The above described marking apparatus **10** operates as follows:

Assuming that the web feeding mechanism of the wrapping machine **14** is initially inoperative, and that gravity has moved the idler roller **50** to its lowest position shown in full lines on FIGS. 2 and 5, then the arm **132** is also angularly displaced to its lowest position and causes opening of the contacts of switch **136** so as to render the motor **120** inoperative and thereby interrupt the drive of the marking roller **74** of the marking head. When the wrapping machine **14** commences the feeding of the web therein, and thus demands web from the supply roll **12**, the tension created in the web W between the wrapping machine and the supply roll will cause upward movement of the idler roller **50**. The upward movement of roller **50** reduces the length of web W between the nip of rollers **44** and **74** and the entry to machine **14** so that the web can be fed in the wrapping machine even though the feeding and marking roller **74** is initially at rest. The initial upward movement of the idler roller **50** causes corresponding upward angular movement of the arm **132** for releasing the plunger **138** of switch **136**, so that the contacts of the latter close to commence the operation of motor **120**. Further upward movement of roller **50** and arm **132** turns the actuating shaft **130** of variable transformer **126** in the direction for increasing the speed of operation of the motor, and hence the speed at which the marking roller **74** is rotated for simultaneously feeding the web from the supply roll **12** and also repeatedly applying inked markings or impressions to the web. The idler roller **50** continues to move upwardly so long as the speed at which the wrapping machine **14** demands the web is greater than the speed at which the web is fed from the supply roll by rotation of the marking roller **74**, thereby to progressively increase the speed of rotation of motor **120**. When the speed at which the web is fed from the supply roll by rotation of the marking roller 74 exceeds the demand of the wrapping machine, that is, the speed at which the web is fed within the wrapping machine, then a slack or reduced tension develops in the web between the back-up roller **44** and the entry to the wrapping machine, and such slack permits gravity to effect downward movement of the idler roller, for example, from its uppermost position indicated at **50'** on FIGS. 2 and 5. During such downward movement of the idler roller, the control arm of the variable transformer **126** is also moved down from its uppermost position, as indicated in broken lines at **132'** on FIG. 5, thereby to turn the actuating shaft **130** of the variable transformer **126** in the direction for reducing the speed of motor **120** and correspondingly reducing the speed at which the web is fed to the wrapping machine. Finally, when the feeding of the web within the wrapping machine is halted or interrupted, the continued feeding of the web from the supply roll by rotation of marking roller **74** results in slack which permits the idler roller **50** to return to its lowest position. When roller **50** reaches its lowest position, arm **132** is also returned to its lowest position and again causes depression of the plunger **138** of switch **136** for opening the contact of the latter and thereby stopping operation of the motor **120**.

It will be apparent that the speed of movement of the web W over the back-up roller **44** is always equal to the peripheral velocity of the die roller **74** thereby to ensure the application of inked markings without blurring or smearing. Further, such marking of the web is accomplished simultaneously with the feeding thereof in accordance with the demand for the web by the associated wrapping machine even though the marking head cannot be conveniently driven from a drive shaft or other rotated element of the wrapping machine.

Although an illustrative embodiment of the invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. An apparatus for applying markings to a continuous web as the latter passes from a supply roll to a machine acting on the web and in which the web is fed at a varying speed; said apparatus comprising a rotatable back-up roll over which the web passes between the supply roll and the machine, a marking head including a die roller in rolling contact with the web on said back-up roll for simultaneously withdrawing the web from the supply roll and marking the web upon rotation of said die roller, a variable speed electric motor, means connecting said die roller with said motor so as to be driven by the latter, an idler roller having the web looped therearound intermediate said die and back-up rollers and said machine, means mounting said idler roller for movement in directions increasing and decreasing the length of the web between said die and back-up rollers and said machine in response to a decrease and increase, respectively, in the tension in said length of the web, an electrical circuit for energizing said motor including a variable transformer having a movable actuating member for varying the speed of said motor, means connecting said idler roller with said actuating member for moving the latter in response to said movement of the idler roller, thereby tending to maintain the speed at which said die roller withdraws the web from the supply roll substantially equal to the speed at which the web is fed in said machine, a normally closed switch interposed in said circuit, and means opening said switch upon a predetermined movement of said idler roller in said direction increasing the length of the web so as to halt operation of said motor when feeding of the web in said machine is interrupted.

2. An apparatus for applying markings to a continuous web as the latter is withdrawn from a supply roll and passes into a wrapping machine which utilizes sections of the web and intermittently demands the web at a varying speed; said apparatus comprising a frame mounted adjacent the wrapping machine, a back-up roll rotatably mounted in said frame, means guiding the web from the supply roll over said back-up roller, a marking head mounted on said frame and including a die roller carrying marking means and bearers for rolling contact with the web on the back-up roller for simultaneously marking the web and feeding the latter upon rotation of said die roller, a variable speed electric motor, means connecting said die roller with said motor for variable speed drive by the latter, an idler roller, means mounting said idler roller for vertical movement in said frame below said back-up roller with the web being looped under said idler roller before passing into said wrapping machine, whereby said idler roller is moved downwardly by gravity in response to a decreasing tension in the web and is moved upwardly in response to an increasing tension in the web, control means for said motor increasing and decreasing the speed of said motor in response to upward and downward movements, respectively, of said idler roller, and switch means halting operation of said motor upon a predetermined downward movement of said idler roller.

3. An appartus as in claim 2; wherein said means mounting the idler roller in the frame includes a shaft on which said idler roller is freely rotatable, said frame having vertical slots in which end portions of said shaft are slidable, gear racks extending along said slots, and gears secured on said end portions of the shaft and meshing with the adjacent gear racks to maintain parallelism between

the axis of said back-up and idler rollers during vertical movement of the latter.

4. An apparatus as in claim 3; wherein said control means for the motor includes an electrical energizing circuit including a variable transformer having a turnable actuating member, and an arm extending radially from said actuating member and having a longitudinal slot therein; said shaft of the idler roller extending, at one end, into said slot of said arm to turn said actuating member of the transformer in response to said movements of the idler roller.

5. An apparatus as in claim 4; wherein said switch means has normally closed contacts and an actuating member for opening said contacts upon depression thereof, said switch means being mounted so that said actuating member projects into the path of movement of said arm with the idler roller and is depressed by said arm to open said contacts and halt operation of the motor upon said predetermined downward movement of the idler roller.

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