

May 26, 1964

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3,134,323

WEB PRINTING MECHANISM WITH INTERMITTENT FEED

Filed Sept. 17, 1962

6 Sheets-Sheet 1

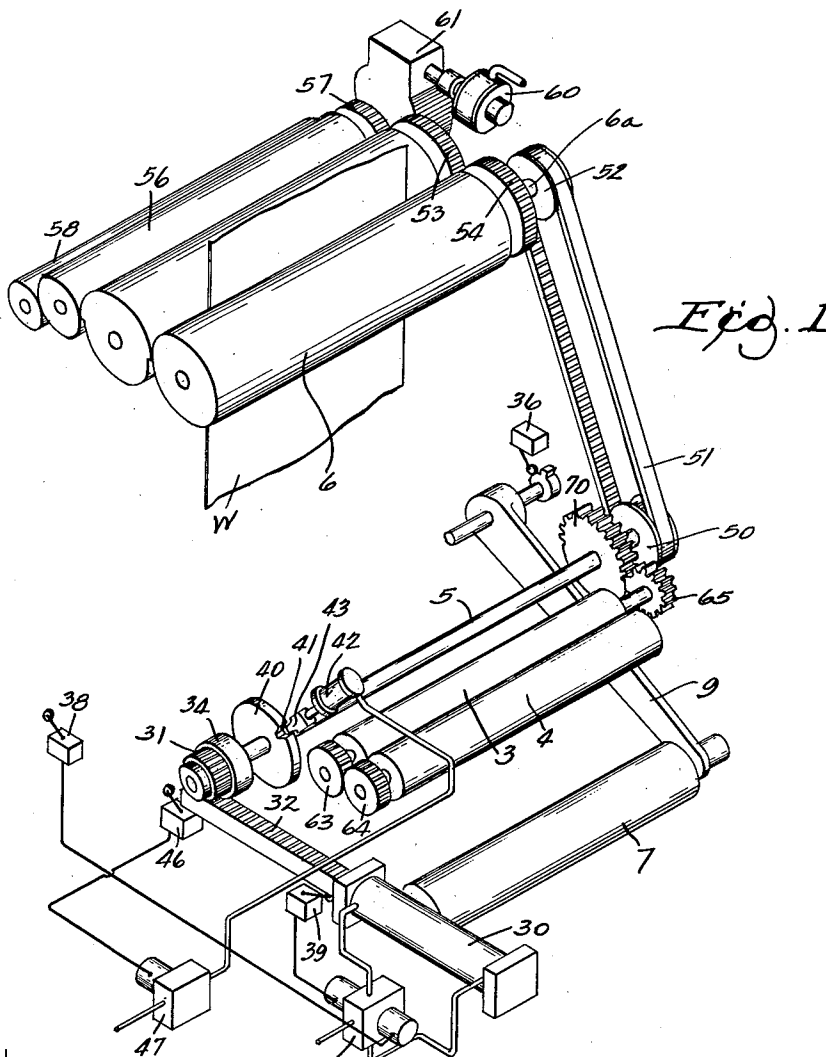


Fig. 1

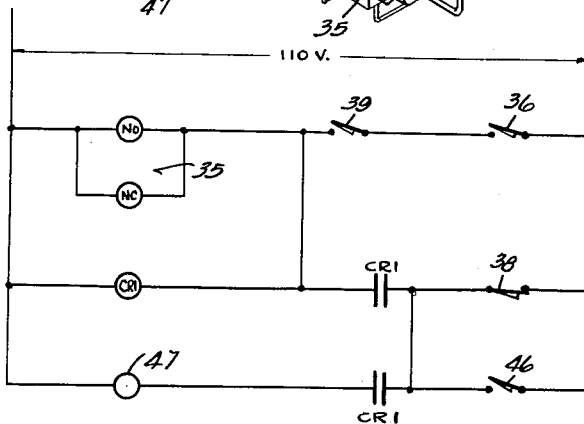


Fig. 7

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6 Sheets-Sheet 2

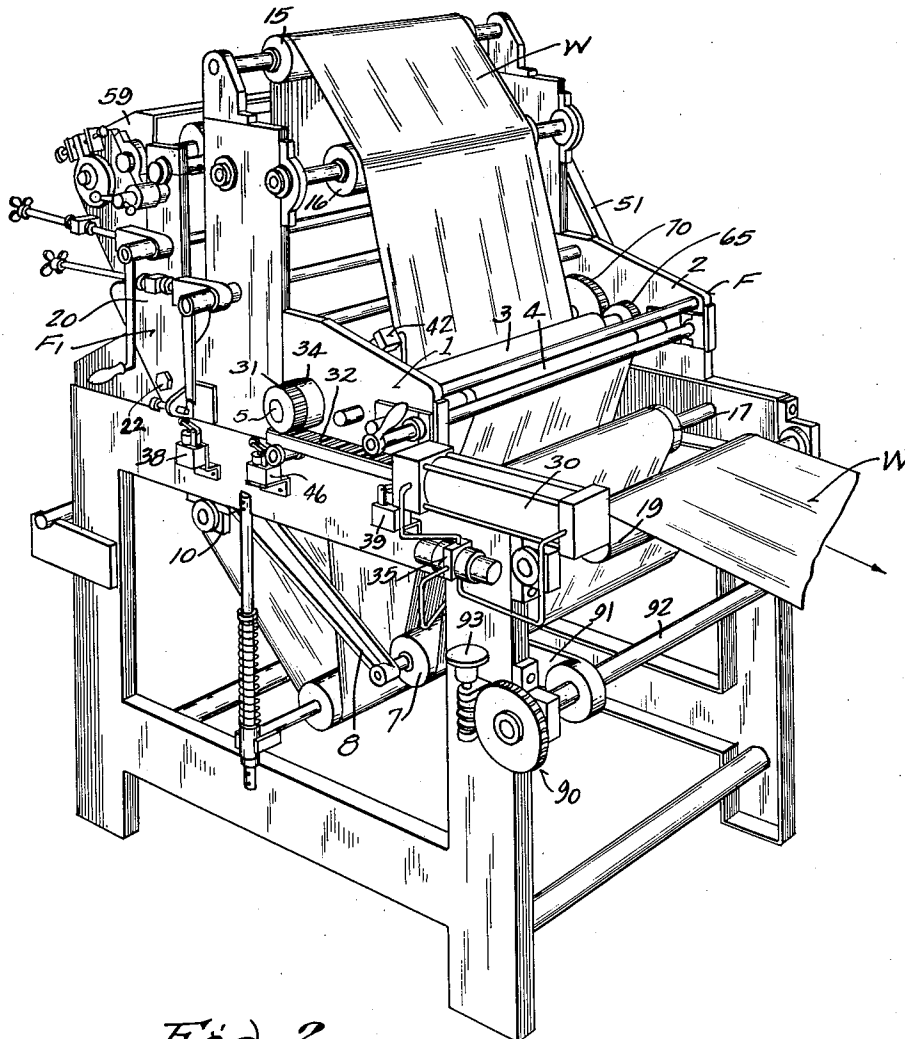


Fig. 2

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6 Sheets-Sheet 3

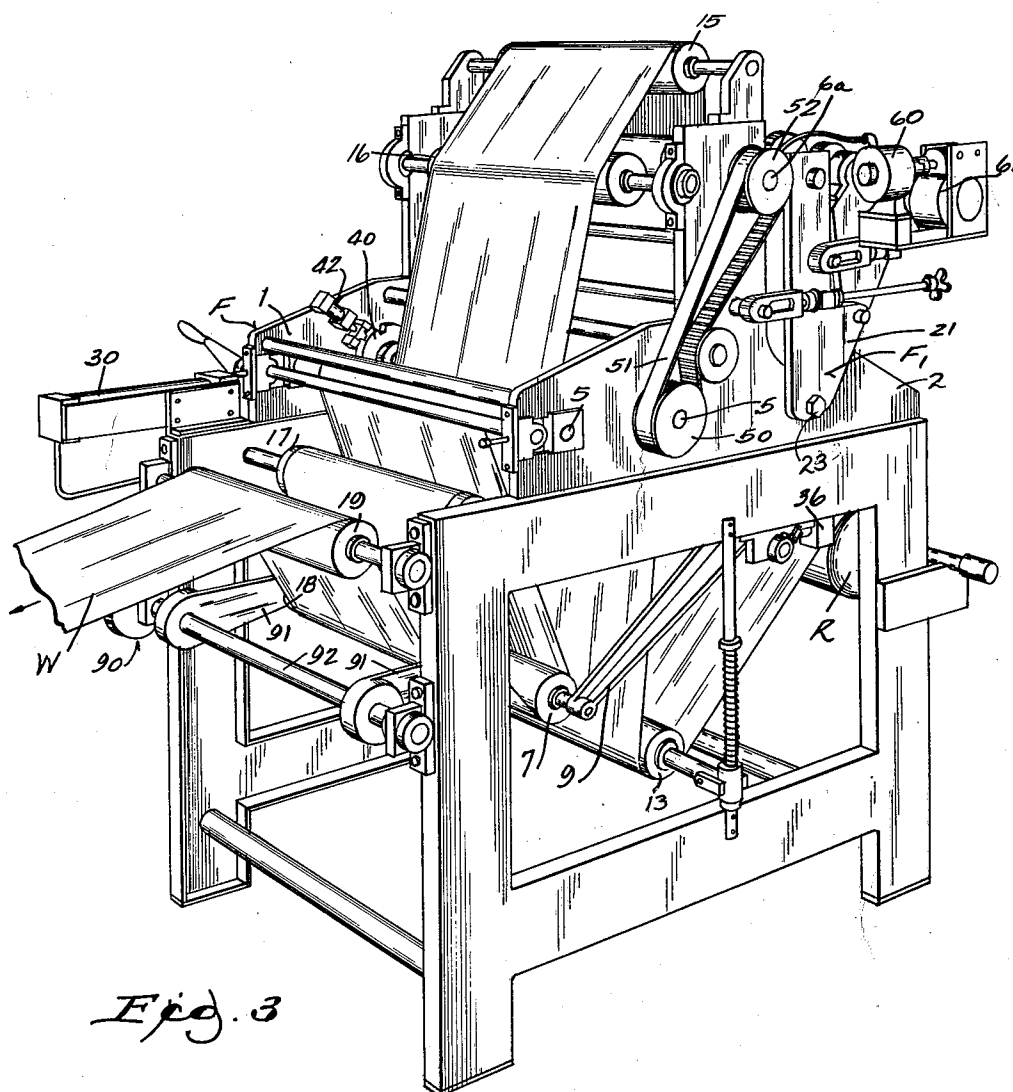


Fig. 3

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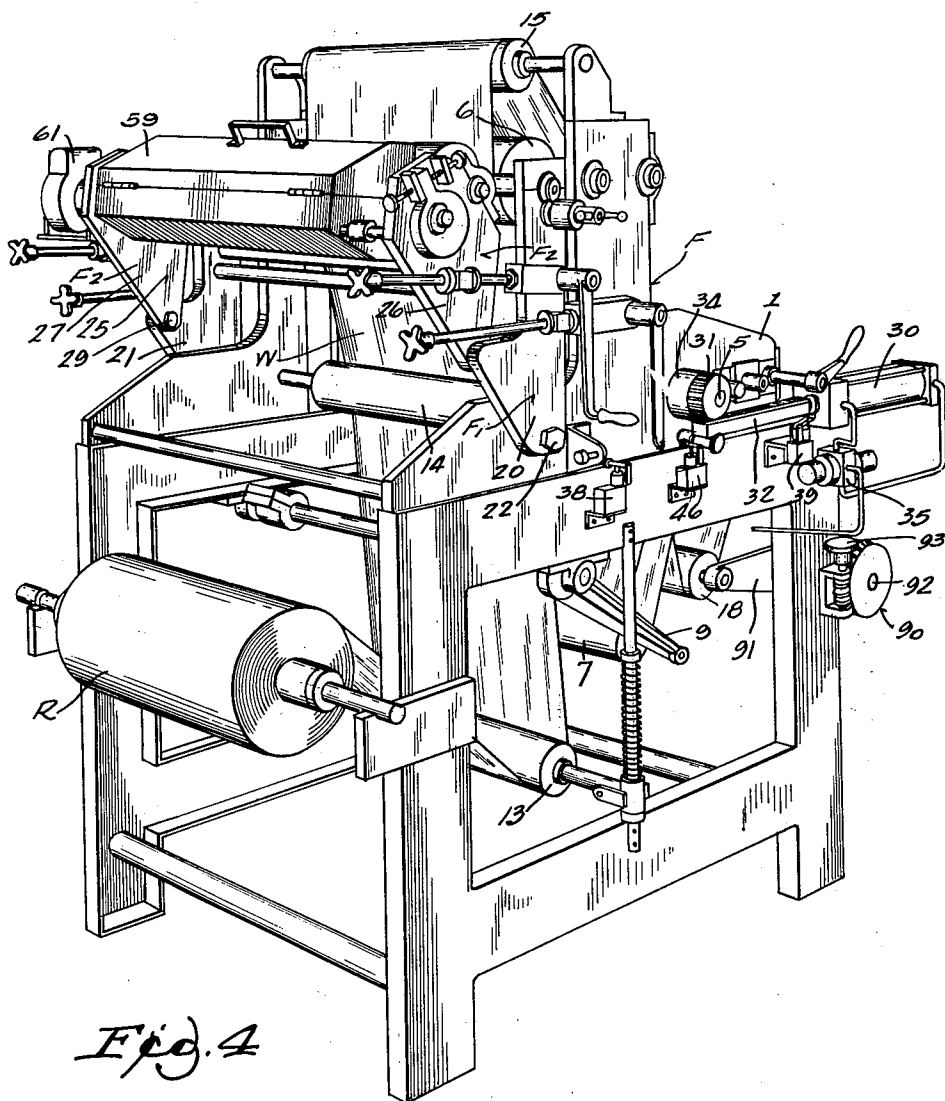
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6 Sheets-Sheet 4



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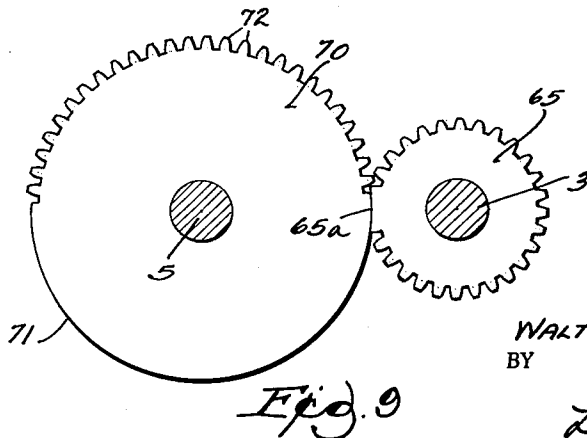
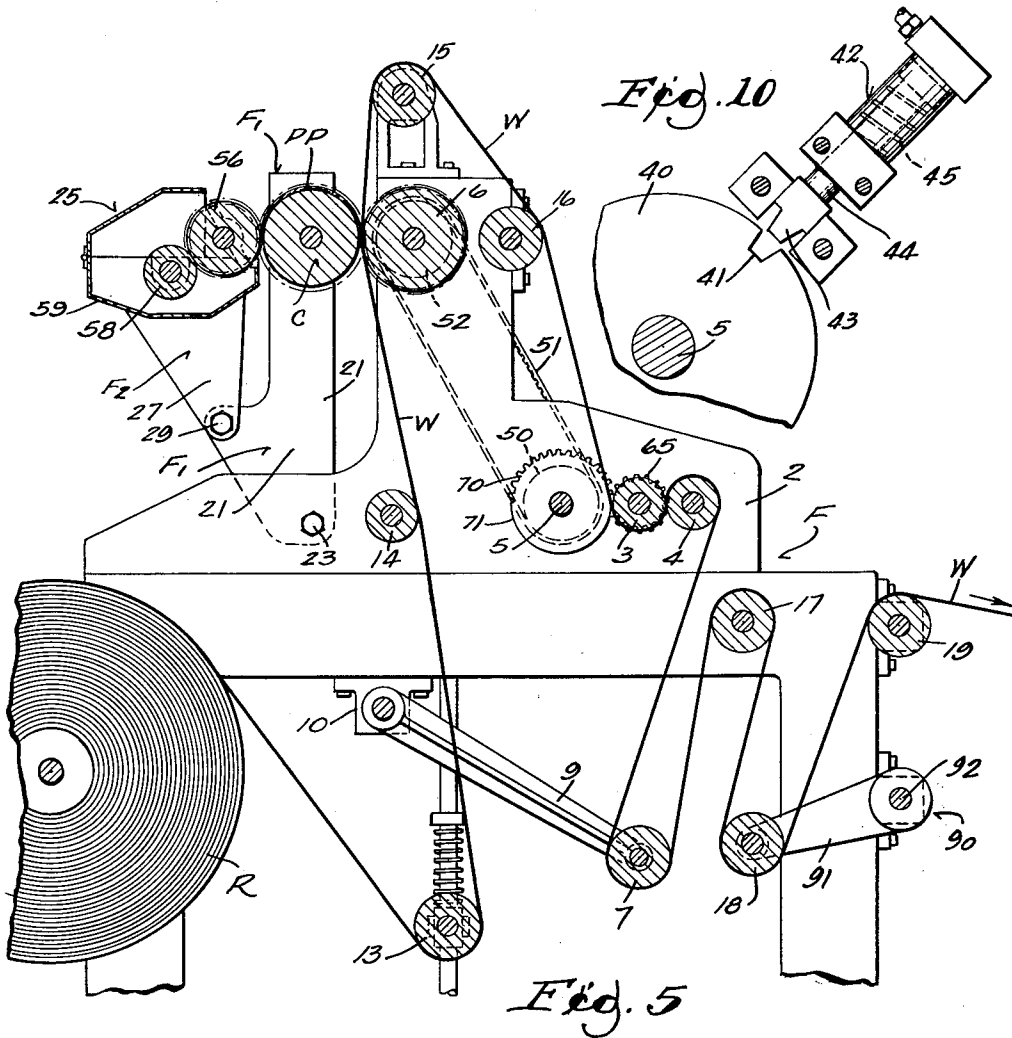
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WEB PRINTING MECHANISM WITH INTERMITTENT FEED

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6 Sheets-Sheet 5



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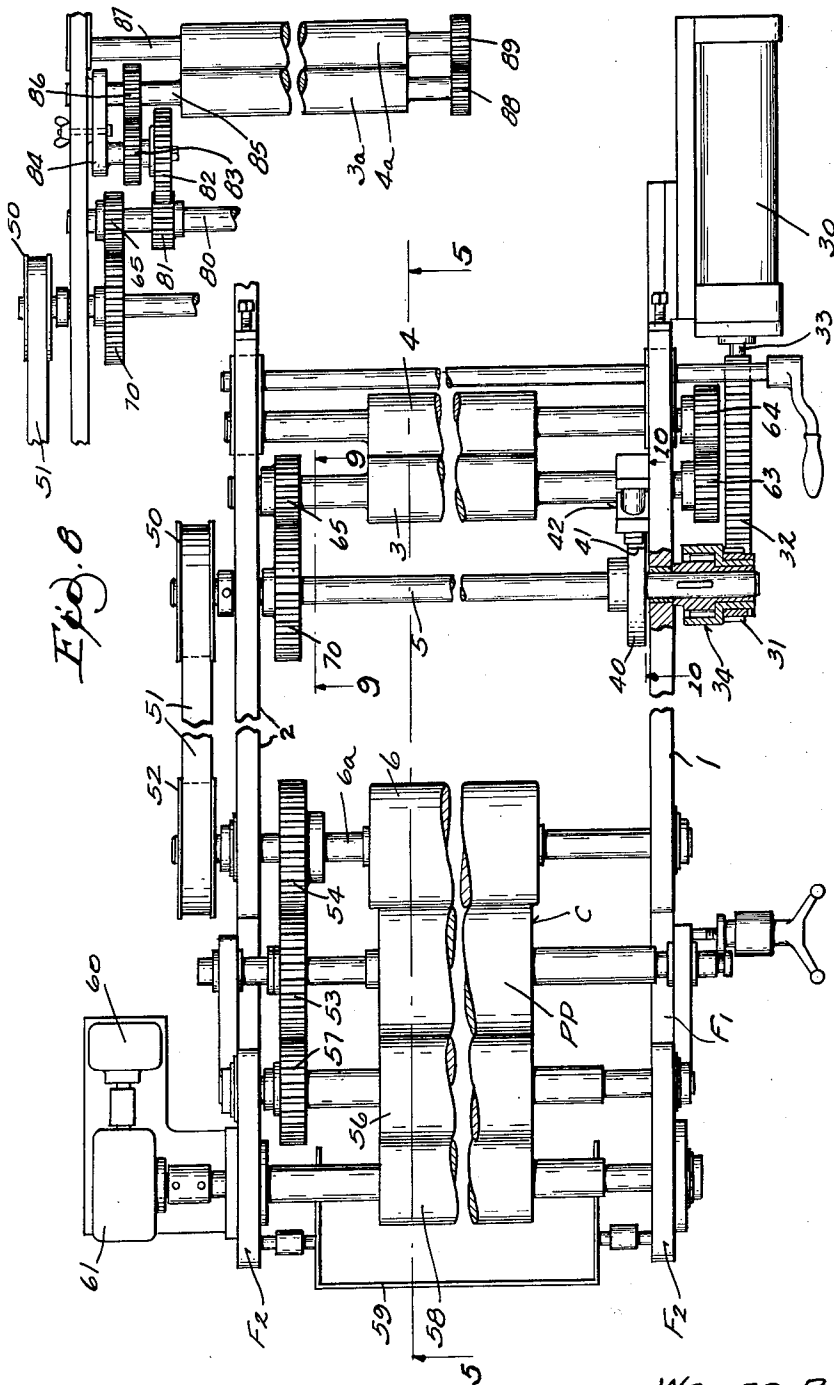
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WEB PRINTING MECHANISM WITH INTERMITTENT FEED

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6 Sheets-Sheet 6



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WEB PRINTING MECHANISM WITH INTERMITTENT FEED

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8 Claims. (Cl. 101—228)

This invention relates in general to web printing mechanism of the type which can be operated intermittently and at irregular periods or continuously. The invention finds particularly though not exclusive utility for use at the infeed side of package machines and for supplying a web printed with individual wrappers in accordance with either the continuous or intermittent demand of the wrapping machine.

In operations of this character where the printing cylinder is not rotating or printing continuously, serious problems have arisen due to the ink drying on the printing cylinder or other of the parts associated therewith. For example, dry spots develop on either the printing cylinder or ink rolls, resulting in poor or incomplete printing. Frequent cleaning of the equipment and waste of ink and web are the result.

In accordance with the present invention, an intermittent printing mechanism has been provided which overcomes the above difficulties. More specifically, with the present mechanism it is possible to apply ink to the cylinder immediately and only before the actual printing is to be done. The arrangement is such that during one-half of a revolution of the printing cylinder, ink is taken up by the cylinder, and the other half revolution is used for the actual printing; furthermore, the ink is not taken up by the cylinder until immediately prior to the actual printing operation, otherwise no ink is present on the printing cylinder.

A further aspect of the invention provides that the ink roll is continuously driven at a relatively slow speed so as to be ready for instantaneous use at all times, and this ink roll is overdriven by the printing cylinder whenever the latter comes into operation.

The drive arrangement used in the present invention results in an actual printing speed which is at least twice that of the speed of the web pulled from the machine and, as a result, there is furthermore no chance for the ink to dry during the actual printing operation, regardless of the demand for web made by the associated wrapping machine.

The printing mechanism provided by the present machine is an integral and self-contained unit capable of being used with conventional wrapping or other machines of many types. The mechanism is automatic in operation and is correlated with and actuated by the machine with which it is used. The mechanism is capable of being operated at completely spasmodic or regular intervals, with any periods of time between operation, and without drying of the ink on any of its parts and without malfunction or non-function. Alternatively, the mechanism will operate continuously at the higher speeds required with modern packaging machines.

These and other objects and advantages will appear later as this disclosure progresses, reference being had to the accompanying drawings, in which:

FIGURE 1 is a perspective, schematic view of certain of the parts of a mechanism embodying the invention;

FIGURE 2 is a perspective view of a mechanism made in accordance with the present invention and in which the parts shown in FIGURE 1 are utilized, certain parts being shown in section, broken away, or removed for clarity in the drawings;

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FIGURE 3 is another perspective view of the machine, but taken from the opposite side from that of FIGURE 2;

FIGURE 4 is another perspective view of the machine, taken from the same general side as FIGURE 2, but more from the infeed side thereof;

FIGURE 5 is a longitudinal cross-sectional view taken through the mechanism shown in the above figures, and along line 5—5 in FIGURE 6, certain parts being shown in section, broken away, or removed;

FIGURE 6 is a "spread-out" plan view of the drive between the various parts, certain parts shown in section, broken away, or removed;

FIGURE 7 is a wiring diagram as used in the above mechanism;

FIGURE 8 is a spread out view of the drive mechanism for a modified form of the invention;

FIGURE 9 is an enlarged cross-sectional view taken along line 9—9 in FIGURE 6; and

FIGURE 10 is an enlarged fragmentary and sectional view taken along line 10—10 in FIGURE 6.

General Arrangement

The general organization of the machine includes the main frame F of the machine comprising the two spaced-apart vertical sides 1 and 2 between which are journaled, on conventional antifriction bearings, the stationary feed roll 3, the throw-off feed roll 4, the main drive shaft 5, and the impression cylinder 6.

A dancer roll 7 is swingably mounted by its two arms 8 and 9 in their respective bearing assemblies 10 and 11 mounted on the main frame, and the weight of this dancer roll pulls the available slack web downwardly to form a web loop in the known manner.

The web W is fed from the supply roll R rotationally mounted on the machine, and various idler rolls 13 through 19 inclusive guide the web through the mechanism and out in the discharge direction indicated by the arrow at the right side in FIGURE 2 to where the web then enters the machine (not shown) for subsequent cutting and use of the web as individual wrappers.

The printing cylinder C is rotatably journaled in the first sub-frame F1 which is comprised of two vertical plates 20 and 21 adjustably swingable on the main frame by bolts 22 and 23 respectively.

The ink supply and applying unit 25 is carried by the second sub-frame F2 comprising the side plates 26 and 27 which are pivotally mounted on stub shafts 28 and 29 carried by the first sub-frame F1.

Generally, therefore, the cylinder C is adjustable relative to the impression roller 6, and the ink unit 25 is adjustable relative to the printing cylinder.

The near side of the machine in FIGURE 2 is the operator's side, and most of the controls and adjustments are accessible therefrom, as will appear.

Generally, the present machine is operated in accordance with the demand of the machine (not shown) with which it is associated. In other words, the present machine is operated in accordance with the draw-off of the printed web, and this operation may be intermittent or continuous and at various speeds.

As the web W is pulled from the present machine, it raises the dancer roll 7, which in turn actuates a micro-switch to signal a solenoid and thereby gives an extension stroke to an air cylinder. During this extension stroke, a gear rack carried by the cylinder rod rotates the main drive shaft one revolution, which causes one revolution of the printing cylinder. During the first one-half revolution of the cylinder, ink is applied thereto and only during the second half of cylinder revolution does actual printing occur. The feed rolls are also actuated by the drive shaft to pull a predetermined length of web through

the machine, but this feed roll actuation only occurs during the said second half revolution of the printing cylinder.

The inking roll which applies ink to the printing cylinder is driven by the latter.

As a result, ink is applied to the cylinder immediately before use and only then, and the ink never dries on the cylinder but is always freshly applied before use, regardless of the intermittent cycling of the machine.

More specific reference to the various parts of the machine and their operation will now be made to more fully explain the above objects and advantages of the invention, as well as others.

Main Drive

The main drive shaft 5 is rotated one revolution for each printing cycle of the machine by the double-acting air cylinder unit 30. More specifically, a gear 31 is fixed to one end of the drive shaft and meshes with the rack gear 32 fixed to the end of the rod 33 of the cylinder unit. As the piston is extended, the rack rotates the drive shaft 5 through the conventional one-way or over-running clutch 34. This clutch permits return of the piston to the contracted position without moving the drive shaft.

The double-acting cylinder unit is actuated for its above-mentioned extension stroke by a conventional four-way solenoid air valve 35 which in turn is triggered by a micro-switch 36 (FIGURES 3 and 7) that is contacted by the dancer roll arm 9 when the latter swings upwardly as a result of the web being drawn from the present machine.

The four-way solenoid air valve 35 acts to admit air under pressure to the head end of the cylinder 30 thereby forcing the gear rack to move out and rotates the main drive shaft one revolution, as previously indicated.

The micro-switch 36 acts to trigger the complete cycle when the dancer arm rises, and the feed rolls then pull the proper length of web for one repeat operation.

The cylinder unit 30 is actuated to its return movement when the rack strikes another micro-switch 38 at the end of its extension stroke, thereby actuating the four-way valve. A third micro-switch 39 is contacted when the piston rod has been fully retracted and completed its operation for one cycle of the machine, and insuring complete retraction of the unit before the next cycle.

In summary, the ram return micro-switch 38 is located at the end of the rack stroke and serves to signal that a complete feed has been made. The ram back micro-switch 39 insures complete cycling of the system and is located at the retracted position of the gear rack and prevents double cycling.

Index Means

The drive shaft also has an index wheel 40 fixed thereto and a notch 41 is formed in the periphery of this wheel. An indexer air cylinder unit 42 of the single-acting type is mounted on the inside of frame side 1 and has a dog portion 43 on the end of its rod 44. This dog portion is engageable in the notch 41 of the wheel when the cylinder unit is extended to thereby lock the drive shaft in position and prevent overcoasting of the machine. This insures that only one revolution of the shaft will occur per cycle and that the drive shaft stops dead at the end of each cycle. The cylinder unit is spring biased to the contracted or non-locking position by a spring 45 which returns the rod when air is shut off to the unit. The unit 42 is operated or extended when the rack 32 of the cylinder unit 30 strikes a micro-switch 46 mounted on the machine frame during its extension stroke. This causes extension of indexer unit 42 before the drive shaft has completed its one revolution; and the dog therefore rides on the periphery of wheel 40 until the notch 41 comes into the full revolution position. At that time, the dog is forcibly inserted into the notch,

stopping the drive immediately. When the rack 32 retracts, it disengages micro-switch 46 and causes valve 47 to open, thereby permitting the return spring 45 to withdraw the dog. The drive shaft is thus ready for the next driving stroke of the cylinder unit 30.

At the other end of the drive shaft 5 are the connections to the feed rolls and printing cylinder as follows.

Drive to Cylinder

Secured to the outer end of the shaft 5 is a toothed timing pulley 50 over which is trained the endless timing belt 51 which also engages a timing pulley 52 fixed on the end of the shaft 6a of the impression cylinder 6, and this connection is a one-to-one ratio.

The printing cylinder is driven by the impression roller by the constant mesh gears 53 and 54 fixed to their respective shafts.

The Anilox roll 56 is in turn driven through its gear 57 from the gear 53 with which it is in constant mesh.

The ink roll 58 within the fountain 59 is normally driven at a slower peripheral speed than the Anilox roll against which it abuts in ink transferring relationship. The ink roll is continuously driven by an air motor 60 through a gear reduction unit 61. The ink roll can be overdriven by the printing cylinder through the anilox roll. More specifically, the ink roll is continuously driven at a slow speed by the air motor 60 to insure that this roll has a fresh supply of ink entirely around its periphery at all times, and as this roll is located within the enclosed fountain, evaporation of the ink and drying of the roll at that location are not crucial problems.

Feed Roll Drive

The feed rolls 3 and 4 are connected together through their respective constant mesh gears 63 and 64 and are driven through gear 65 fixed to the end of the shaft of roll 3. Power is transmitted from the drive shaft 5 to the gear 65 through a larger gear 70.

It will be noted that gear 70 is actually a blank 71 (FIGURE 8) for one-half of its periphery, containing teeth 72 only on the other half which mesh in driving relationship with gear 65 during one-half revolution of the drive shaft and only while the printing cylinder is actually printing the web.

Gear 65 has an arcuate locking surface 65a which abuts against the blank portion 71 of gear 70 and thereby locks the feed rolls against movement during that portion of the cycle in which ink is applied to the printing cylinder.

The arrangement shown in FIGURE 8 is a modification of the drive mechanism to the feed rolls in which interchangeable gears can be inserted so as to provide multiple repeat printing operations instead of the single repeat operation shown in the other figures. This modification is used, for example, for printing on different lengths of wrappers.

The modification as shown in FIGURE 8 utilizes the same gear 70 and also the same gear 65. However, the gear 65 in the modified form is mounted on the end of shaft 80. Another gear 81 is fixed to shaft 80 and meshes with the interchangeable gear 82. Gear 82 is swingably mounted together with another gear 83 on the end of the swinging arm 84. Arm 84 in turn is swingably mounted on shaft 85 that is suitably journaled in the side frames. Another gear 86 is fixed to shaft 85 and is in constant mesh with gear 83. One of the draw rolls 3a is fixed to shaft 85, while its mating feed roll 4a is mounted on shaft 87. The feed rolls are suitably connected together for synchronized feeding movement through their respective constant mesh gears 88 and 89.

As previously indicated, gear 82 can be replaced with others of different size, and any of the gears selected can be caused to mesh with gear 81 because of its swingable mounting on arm 84.

With this modification, the printing cylinder printing surface is still always just twice the amount of the web

pulled out—that is to say, the gear on the printing cylinder has twice the number of teeth as that on the change gear.

A compensator indicated generally at 90 is provided for insuring that the printed pattern on the web is positioned correctly in the wrapping machine. In other words, the compensator provides that the printed material is placed in the wrapping machine in exactly the proper location. The compensator 90 operates as follows.

The roller 18 is swingably adjusted on its arms 91 about the pivot shaft 92. A hand adjustment knob 93 (FIGURE 4) acts to swing the roller 18 vertically to any one of its adjusted positions and thereby vary the effective distance between the actual printing cylinder C and the wrapping machine.

With this compensator, the web is positioned in exact and proper relationship to the wrapping machine regardless of the size of change gear selected—that is to say, regardless of the number of repeat operations on the machine.

Operation

The cylinder C is blank for one-half of its circumference, and the plate PP occupies the other half. Ink is first and only applied to the plate during one-half revolution of the cylinder C, and then the plate comes in contact with the web to print during the other half revolution.

Due to the blank portion 71 of the gear 70, the feed rolls 3 and 4 are not driven during the time the printing cylinder C is having ink applied to its printing plate PP. The printing cylinder and the feed rolls each make one complete revolution for each cycle of the machine.

Stated otherwise, for one cycle of operation, the printing cylinder rotates continuously for one revolution and during the first half of that revolution, the semi-cylindrical printing plate PP is moved over the Anilox roller and has ink applied thereto; during the second half of that cylinder revolution, the actual printing on the web occurs. The feed rolls are operative to draw the web through the machine only during the time actual printing is being done and not when ink is being applied to the printing plate.

The Anilox roll is not in contact with the printing plate when the machine is not operating and is only contacted by the plate immediately prior to printing.

It should also be recognized that the actual speed of printing is twice as fast as the web is drawn out of the machine; in other words, the web loop at the dancer roll is formed by the present printing mechanism at least twice as fast as the web loop is pulled out by the associated machine (not shown).

The actual printing speed is the same regardless of the amount which the machine is used, that is, whether 30 or 100 twelve-inch sheets per minute were required. Therefore, the ink does not have a chance to dry during the actual printing portion of the cycle.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. Web printing mechanism comprising, feed rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only a portion of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter continuously one revolution per cycle of operation of the mechanism, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent drive connection between said drive shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder to thereby feed the web through the mechanism only as printing of the web occurs and drive means for intermittently rotating said drive shaft.

2. Web printing mechanism comprising, feed rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter one revolution per cycle, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent drive connection between said shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder, drive means for intermittently rotating said drive shaft, and means operative by tension in the web at the outfeed side of the mechanism to actuate said drive means.

3. Web printing mechanism comprising, feed-rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a one-to-one positive drive connection with said cylinder for intermittently rotating the latter one revolution per cycle, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent drive connection between said shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder and thereby feeding the web in synchronization with the speed of said printing cylinder surface, and drive means for intermittently rotating said drive shaft.

4. Web printing mechanism comprising, feed rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter one revolution per cycle, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent drive connection between said shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder, drive means for intermittently rotating said drive shaft, index means actuated by said drive means for positively stopping rotation of said drive shaft at the end of a cycle, and means operative by tension in the web at the outfeed side of the mechanism to actuate said drive means.

5. Web printing mechanism comprising, feed rolls, for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter one revolution per cycle, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent drive connection between said shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder and thereby feeding the web in synchronization with the speed of said printing cylinder surface, drive means for intermittently rotating said drive shaft, index means actuated by said drive means for positively stopping rotation of said drive shaft at the end of a cycle, and means operative by tension in the web at the outfeed side of the mechanism to actuate said drive means.

6. Web printing mechanism comprising, feed rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter continuously one revolution per cycle of operation of the mechanism, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an in-

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intermittent drive connection between said drive shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder and thereby feeding the web in synchronization with the speed of said printing cylinder surface and only as printing of the web occurs, drive means for intermittently rotating said drive shaft, and index means actuated by said drive means for positively stopping rotation of said drive shaft at the end of a cycle.

7. Web printing mechanism comprising, continuously nipping feed rolls for pulling a web through said mechanism, a printing cylinder having a printing surface around only one-half of its circumference, ink means for applying ink to said surface, a drive shaft having a positive drive connection with said cylinder for intermittently rotating the latter one revolution per cycle, whereby during the first one-half revolution said surface contacts said ink means and during the second half of said revolution said surface prints said web, an intermittent gear drive

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connection between said shaft and said feed rolls for rotating the latter only during the last half revolution of said cylinder, a hydraulically actuated rack and pinion drive for periodically rotating said drive shaft one revolution per cycle, a cylinder and piston index means engageable directly with said drive shaft for positively stopping rotation thereof at the end of a cycle.

8. Mechanism as defined in claim 7 including means operative by demand of the web at the outfeed side of the mechanism to actuate said rack and pinion drive.

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