Nov. 24, 1936. J. E. CADY 2,061,893

PRINTING APPARATUS

Filed May 22, 1935 2 Sheets-Sheet 1

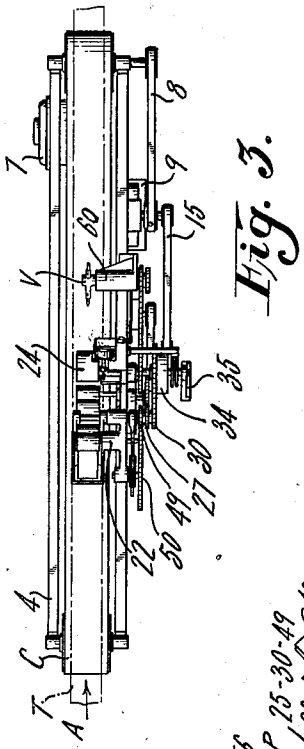


Fig. 3.

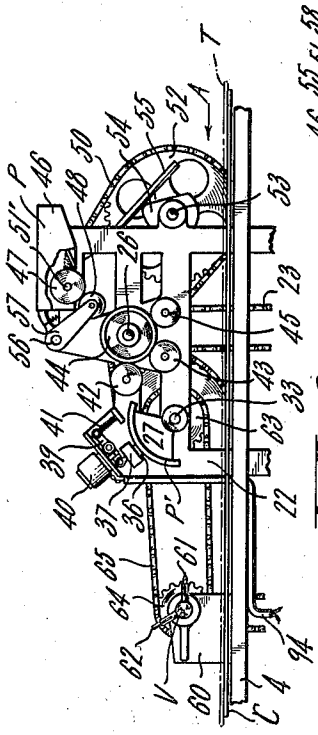


Fig. 2.

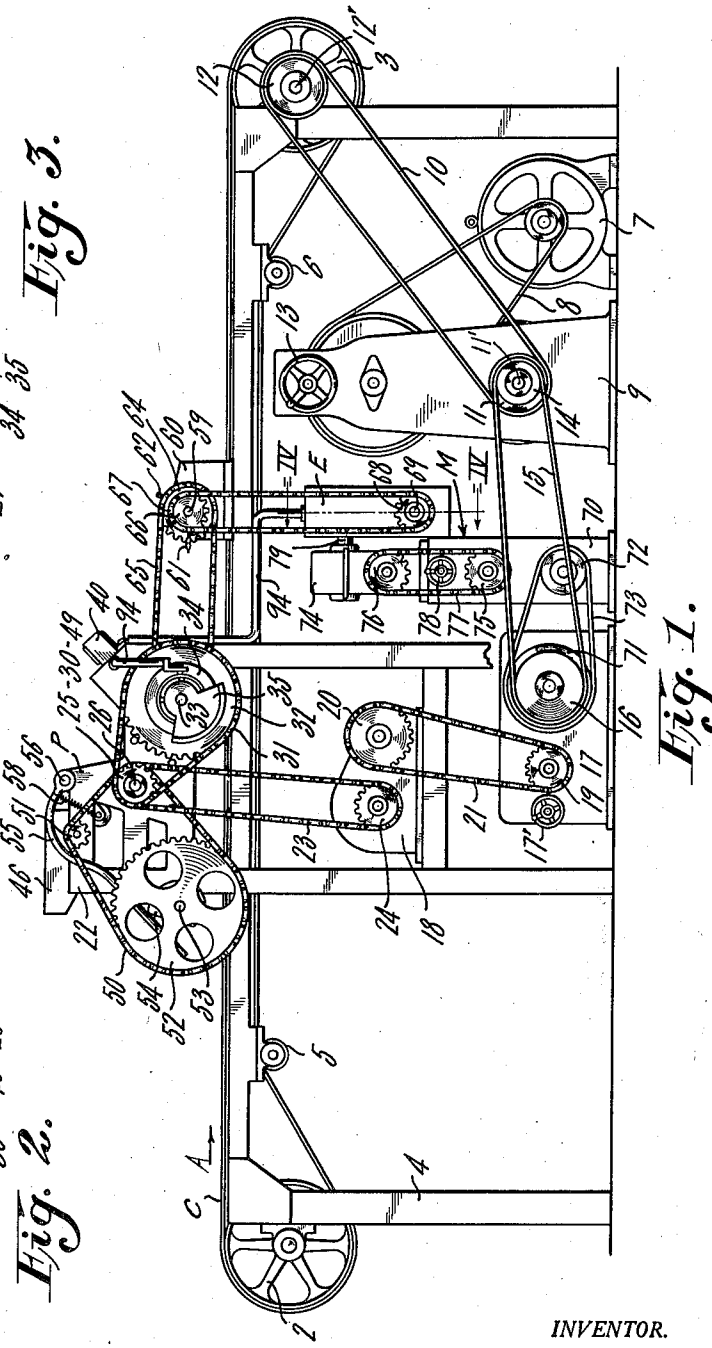


Fig. 1.

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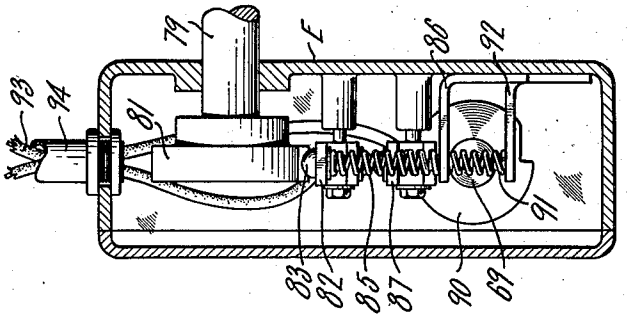


Fig. 5.

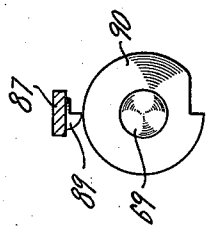


Fig. 6.

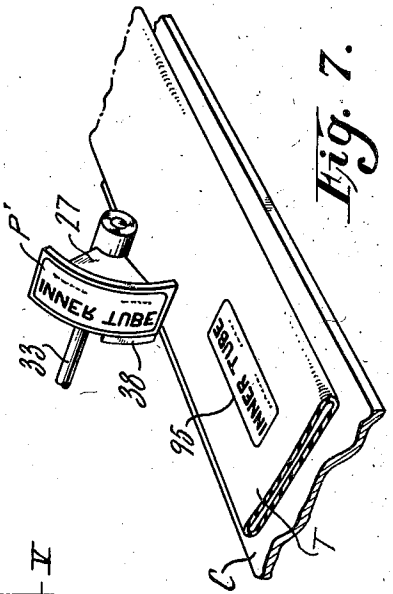


Fig. 7.

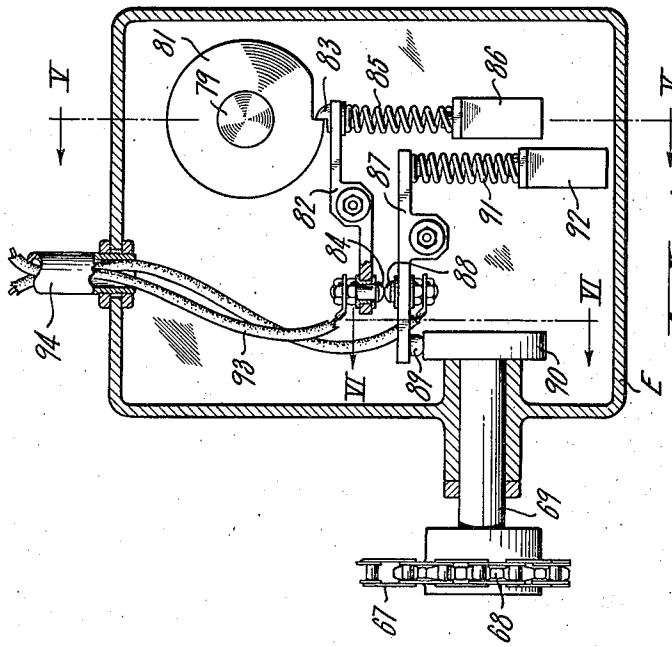


Fig. 4.

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UNITED STATES PATENT OFFICE

2,061,893

PRINTING APPARATUS

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Application May 22, 1935, Serial No. 22,690

11 Claims. (Cl. 101—228)

My invention relates to an improved printing apparatus for printing labels or other insignia upon a continuously moving surface at substantially equally spaced positions.

My invention may be used for printing the surface of different kinds of materials and articles and particularly for printing labels or other insignia upon relatively long lengths of material at predetermined spaced positions, wherein it is desirable to change the distance between the printed portions and to change the character of the printed portions from time to time. My invention is particularly useful for printing labels or other insignia upon inner tubes for pneumatic tires. In the application of my invention to printing inner tubes, the labels are impressed upon the surface of the tube, of which the inner tube is made, while the tube is flattened out and in long lengths and before the tube has been cut into lengths required for inner tubes of a particular diameter. For inner tubes of different diameters the space between the prints must be increased or decreased, as the case may be, to position the print at a definite position on the finished tube.

In accordance with my invention I have provided an apparatus for printing labels or other insignia upon the flattened surface of a rubber tube at predetermined spaced intervals while the tube is in motion so that each finished inner tube will be provided with its insignia at a predetermined location. This is accomplished by moving a printing plate into and out of contact with the surface of the tube and in synchronism with the movement of the tube and by stopping the plate at a predetermined point in its travel and then starting the movement of the plate after the surface of the tube has moved a predetermined distance in respect to the position of the plate. It is desirable to use a quick-drying ink in this printing operation and therefore the plate is quickly impressed upon the surface of the tube after the ink has been applied to the plate. Means are also provided for locating the position of the valve and the place for cutting the tube for an inner tube of a given diameter, which means is directly driven by and in synchronism with the printing plate. The setting of the apparatus for printing the prints and markings at predetermined spaced intervals may be changed from time to time to properly locate the position of the prints and the markings upon inner tubes of various diameters.

My invention also contemplates the use of rotary printing plates having the same radius of curvature so that they may be interchangeable with one another and when used in combination with the mechanism for starting and stopping the plates, any one of the plates may be used for printing and marking tubes of different diameters.

The foregoing and other objects and advantages will appear more fully in the following detailed description, when considered in connection with the accompanying drawings in which:

Fig. 1 is a rear side elevational view of an embodiment of my invention;

Fig. 2 is a portion of a front side elevational view of my invention;

Fig. 3 is a plan view of the embodiment illustrated by Fig. 1;

Fig. 4 is a side elevational view, in section, of a cam and electrical controlling means, taken along line IV—IV of Fig. 1;

Fig. 5 is an elevational view, in section, taken along line V—V of Fig. 4;

Fig. 6 is an end elevational view of a cam taken along line VI—VI of Fig. 4; and

Fig. 7 is a perspective view of a portion of the apparatus illustrating the label as it is printed on an inner tube.

Referring particularly to Figs. 1, 2, and 3, the tube stock T is continuously carried by a conveyor C in the direction indicated by the arrow A underneath the printing apparatus P and the marking device V. The printing apparatus P is provided with a printing plate P' which is geared to the marking device V. The plate P' and the marking device V are intermittently rotated and during their rotation they are moved into and out of contact with the surface of the tube stock T and with a peripheral speed equal to linear speed of the surface. The successive contacts of the plate P' produce equally spaced labels or other insignia upon the surface of the tube and successive contacts of the marking device V produce equally spaced marks which locate the position of the valve and the end of an inner tube of a certain length.

The intermittent rotational movements of the printing plate P' and the marking device V are controlled by a switch control mechanism E in timed relation to a predetermined distance moved by the tube stock T after the respective preceding print or mark is made upon the stock T. The set timed relation may be changed from time to time by a control mechanism M in order to print the labels and mark the tube at differently but uniformly spaced points for tubes of various diameters.

With reference to the drawings, and in particular to Fig. 1, the conveyor C consists of a belt looped about and supported by pulleys 2 and 3, which, in turn, are mounted on a frame or table 4. Guide rollers 5 and 6 operate to bring the lower conveyor belt reach in closer proximity with the upper reach in order to provide more space for mechanism therebelow.

During the operation of the apparatus the conveyor C is driven continuously through the medium of an electric motor 7 which, through a belt 8, drives a variable speed unit 9. A belt 10 engaging with a pulley 11 keyed to a shaft 11' of the variable speed unit 9, and engaging with a pulley 12 keyed to the shaft 12' of the conveyor belt pulley 3, completes the drive which operates to move the conveyor belt continuously. A hand wheel 13, forming a part of the variable speed unit 9, permits adjustment of the proper speed of the conveyor C and of the remainder of the apparatus.

The printing apparatus P, supported on the frame 22, is driven from a pulley 14 keyed to the shaft 11' of the variable speed unit 9. The driving mechanism comprises a belt 15 cooperating with the pulley 14 and a pulley 16 of a variable speed unit 17 which drives a speed reduction mechanism 18 through a sprocket 19 of the variable speed unit 17 and a sprocket 20 on the speed reduction mechanism 18 and a sprocket chain 21 meshing with the sprockets 19 and 20. A chain 23 cooperating with a sprocket 24 of the speed reduction unit 18 and a sprocket 25 keyed to shaft 26 rotatably mounted in the frame 22 drives the printing apparatus P. A hand wheel 17' is provided for adjusting the speed of the variable speed unit 17 to make the peripheral speed of the printing plate P' substantially equal to the speed of the tube stock T.

The printing plate P' is mounted on a rotatable carrier 27, as shown in Fig. 2. The carrier is keyed to a shaft 33 and is driven by a sprocket 30 keyed to the shaft 26 and which meshes with a chain 31 which, in turn meshes with and drives a sprocket 32 freely rotatable on and about the shaft 33. The sprocket 32 is not keyed to the shaft 33, but cooperates therewith through a magnetic clutch 34 which is adapted to engage the sprocket 32 with the shaft 33 only at such times as the magnetic clutch 13 is energized by means hereinafter described and which is adapted to disengage the sprocket and shaft at other times. On the shaft 33, at the end opposite to that on which the plate P' is mounted, is a segment 35 diametrically opposite to the printing plate P' for the purpose of counterbalancing it.

In order to insure that the printing plate will stop and start at a predetermined point in its path of travel, I provide a latch or stop 36 (Fig. 2) slidable within a lock 37 extending from the frame 22 and adaptable for engagement with a projection 38 (Fig. 7) extending from the printing plate P'. The latch 36 (Fig. 2) is pivoted to a rocker arm 39 which is operable by a solenoid coil 40. Spring 41 operating upon the rocker arm 39 normally retains the latch 36 in engaging relation with the projection 38 on the printing plate P'. As the printing plate P' is rotated it engages with soft rubber inking rollers 42 and 43 (Fig. 2) immediately preceding its contact with the surface of the tube T. These rollers obtain a coating of ink from an ink spreader roll 44 against which a further roller 45 contacts for the purpose of assisting in the distribution of the ink along the surface of the roller 44. An ink box 46 contains a rotating roller 47, and a roller 48 intermittently engages with the roller 47 and also intermittently engages with the spreader roll 44 for the purpose of transmitting the ink from the roller 47 to the roller 44.

Roller 44 is mounted on the shaft 26, and accordingly rotates continuously during the operation of the machine. Also attached to the shaft 26 is a sprocket 49 which meshes with a chain 50 which, in turn, drives a sprocket 51 keyed to shaft 51' for rotating the ink roller 47 keyed to the same shaft. The chain 50 also meshes with a sprocket 52 mounted on a shaft 53 which carries a cam 54. The purpose of the cam 54 is to cooperate with a cam arm 55 keyed to a shaft 56 which has extending therefrom on the front side of the apparatus an arm 57 upon which the ink transmitting roller 48 is rotatably mounted. A spring 58 normally maintains the cam arm 55 against the cam 54 thus providing means for mechanically and intermittently moving the ink transmitting roller 48 (Fig. 2) from contact engagement with the ink roller 47 to contact engagement with the ink spreader roll 44.

The marking device V is keyed to a shaft 59 rotatably mounted in a frame 60 and is provided with projections 61 and 62 for producing indentation marks on the surface of the tube stock T for indicating the location of the end of an inner tube length and the location of the position for the valve stem. The marking device V is driven at the same number of revolutions per minute as the printing plate P'. The drive is effected through a sprocket 63 keyed to the shaft 33 of the printing plate carrier 27 and a sprocket 64 keyed to the shaft 59 and driven by a chain 65 meshing with both of said sprockets 63 and 64.

The electric switch control mechanism E is electrically connected to the magnetic clutch 34 and printing plate stop solenoid 40. This electric circuit is broken at a predetermined point in the travel of the printing plate P' and marking device V for the purpose of stopping the plate P' and the marking device V at a definite point in their paths of rotation and when they are out of contact with the tube stock T and also for the purpose of disengaging the magnetic clutch 34. The break in the circuit is effected by a sprocket 66 (Fig. 1) secured to the shaft 59 and which drives a chain 67 meshing with a sprocket 68 keyed to a shaft 69 which cooperates with the control mechanism E.

The circuit is made after the tube stock T has been moved a predetermined distance from the respective preceding contact positions of the printing plate P' and the marking device V for the purpose of releasing the stop 36 and engaging the clutch 34 and thereby rotate the plate P' again in contact with the tube T. The circuit is made through a second drive which cooperates with the electric switch control mechanism E. This drive comprises a variable speed unit 70 driven from the variable speed unit 17 through pulleys 71 and 72, and belt 73. Motion is transmitted from the variable speed unit 70 to a reduction unit 74 by way of sprockets 75 and 76, and chain 77. A hand operating means such as a wheel 78 provides means for adjusting the variable speed unit 70 and thereby change the relation of the intermittent movements of the printing plate P' and the marking device V with respect to the movement of the tube stock T. From the reduction unit 74 a shaft 79 ex-

tends in proper position to cooperate with means for controlling the time cycle of the magnetic clutch 34 and the solenoid 40. The shaft 79 rotates continuously during the operation of the conveyor C. It carries a cam 81 (Figs. 4 and 5) which operates the electrical contacts within the control box E in timed relation to the movement of the conveyor C.

The electrical contact means within the control E (Figs. 4 and 5) comprises a rocker arm 82 having a cam contacting member 83 at one end, and at the other end a contact point 84 is provided which is insulated from the rocker arm 82. In alignment with the cam contacting member 83 is a spring 85 cooperating with a bracket 86 attached to the electric control box E for the purpose of maintaining the cam contacting member 83 normally in engagement with the cam 81. A second rocker arm 87 carries an electrical contacting member 88 in alignment and for cooperation with the contact member 84. Contact member 88 is also insulated from the rocker arm 87. A cam contacting member 89 extends from the rocker arm 87 and is adapted for association with a cam 90 attached to the shaft 69. A spring 91 acting against a bracket 92 secured to the box E is associated with the opposite end of the rocker arm 87 and normally maintains the cam contacting member 89 in engagement with the cam 90. Means such as conventional wires 93 within the conduits 94 are connected with a source of electrical energy, and with the magnetic clutch 34 and solenoid 40.

In the operation of the apparatus the conveyor C (Fig. 1) is ordinarily driven continuously, and a correct peripheral speed between the printing plate 24 and the conveyor C is obtained and maintained by adjustment of the variable speed unit 17 through means such as a hand adjusting wheel 17'.

The variable speed unit 70 is adjusted by the hand wheel 78 to cause the printing plate P' and the marking device V to be intermittently rotated into and out of contact with the tube stock T at properly spaced positions along the tube as may be required for a particular inner tube length. When the desired adjustments are made the conveyor is set into operation.

Ordinarily all of the printing rollers and ink supplying rolls rotate continuously, as well as the sprocket 32 mounted on the shaft 33. The shaft 33, however, is rotated by means of the sprocket 32 and only at such times as the magnetic clutch 34 is energized. This occurs when the cam 81 (Fig. 4), through cooperation of the rocker arm 82, permits the contact point 84 to engage with the complementary contact point 88. In this manner an electric circuit is completed for energizing the magnetic clutch 34 and solenoid 40. The solenoid 40 operates to withdraw the latch 36 (Fig. 2) from engagement with the printing plate P', thus freeing it for rotary movement when the magnetic clutch 34 which is secured to the shaft 33 simultaneously engages with the continuously moving sprocket 32.

As the printing plate P' rotates in a clockwise movement, with reference to Fig. 2, it engages with the inking rollers 42 and 43 and also engages with the inner tube surface 25 for impressing a label 95 thereon, such as shown in Fig. 7.

It will be noted that as the shaft 33 rotates so also does the sprocket 63 located thereon, thus setting into motion the shaft 59 which carries the marking devices consisting of the arm pointers 61 and 62. The same periodic movement also rotates the cam shaft 69 which carries the cam 90. The cam 90 normally supports the electrical contact point 88 in engagement with the complementary contact point 84, but the cam contour is such that upon every revolution the circuit between the contact points 88 and 84 is broken. Immediately upon the break in the circuit the magnetic clutch 34 and solenoid 40 is de-energized and the magnetic clutch disengages the sprocket 32 and the latch 36 (Fig. 2) through the action of the spring 41 is actuated to engage with the lug 38 (Fig. 7) extending from the printing plate P', thus insuring that the plate P' will stop at a definite position and at a predetermined relation with the tube stock T.

As the cut-away portion of the cam 90 engages with the cam contacting member 89, the circuit contacting point 88 drops away from the complementary contact point 84 for a short interval, after which it is again elevated in position by the momentum of the cam operating mechanism. The cam 90 then ceases rotation and maintains the contact point 88 in its normal elevated position. While the cam 90 is being so actuated, cam 81 is also in process of operation and actuates the contact point 84 in such manner that, while the contact point 88 is being elevated to its normal position by the cam 90, the contact point 84 is likewise elevated to prevent engagement of the contact points 84 and 88 during this portion of the cycle of operation. In other words, cam 81 which rotates continuously operates to complete an electric circuit between contact points 84 and 88, while the intermittent rotating cam 90 operates to break the circuit between the contact points. Therefore, in the manner outlined the printing plate P' is brought into engagement with the surface of the inner tube stock T in accurately timed relation and in permissible adjustable periodicity.

The printing plates P' are made with the same arc of curvature and are therefore interchangeable with one another, and due to the intermittent movement of the plates each plate may be used regardless of the timed relation between the plate P' and the conveyor C.

While I have shown and described certain preferred embodiments of my invention, it will be understood that modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. In an apparatus for printing a surface, comprising a printing plate, means for continuously moving said surface in cooperative relation with said plate, means for successively rotating said plate into and out of contact with said surface, mechanism driven by the rotation of said plate for stopping the movement of said plate at a predetermined point in its path of travel when out of contact with said surface, and mechanism driven independently of the rotation of said plate for starting the movement of said plate at the end of a predetermined movement of said surface from the preceding position of contact.

2. In an apparatus for printing a surface, comprising a printing plate, means for continuously moving said surface in cooperative relation with said plate, means for successively rotating said plate into and out of contact with said surface, means for stopping the movement of said plate at a predetermined point in its path of travel when out of contact with said surface, means for starting the movement of said plate at the

end of a predetermined movement of said surface from the preceding position of contact, and means for varying the interval of time between each starting movement.

3. In an apparatus for printing a surface, comprising a printing plate, means for continuously moving said surface in cooperative relation with said plate, means for successively moving said plate into and out of contact with said surface, means for successively stopping the movement of said plate at a predetermined point in its path of travel when out of contact with said surface, means for successively starting the movement of said plate at the end of a predetermined movement of said surface after the preceding starting movement, and means for changing the distance moved by said surface between the starting movements.

4. In an apparatus for printing a surface, comprising a rotatable printing plate, a drive for continuously moving an elongated surface in cooperative relation with said plate, a drive driven in synchronism with the aforesaid drive for rotating said plate into and out of contact with said surface, a clutch interposed between said plate and said drive therefor, means responsive to said drive for operating said clutch to connect said drive to said plate in coincidence with the end of a predetermined distance moved by said surface, and means responsive to the rotation of said plate for operating said clutch to disconnect said drive from said plate.

5. In an apparatus for printing a surface, comprising a rotatable printing plate, a drive for continuously moving an elongated surface in cooperative relation with said plate, a drive driven in synchronism with the aforesaid drive for rotating said plate into and out of contact with said surface, a clutch interposed between said plate and said drive therefor, means responsive to said drive for operating said clutch to connect said drive to said plate in coincidence with the end of a predetermined distance moved by said surface, and means for changing the distance traveled by said surface between the positions of contact of said plate with said surface.

6. In an apparatus for printing a surface, comprising a rotatable printing plate, means for continuously moving an elongated surface in cooperative relation with said plate, a drive for rotating said plate into and out of contact with said surface, a stop for arresting the rotation of said plate at a predetermined point, means responsive to said drive for connecting said drive to said plate, means responsive to said drive for moving said stop into inoperative position, said means for connecting said drive and for moving said stop being operated in coincidence with the end of a predetermined distance moved by said surface, mechanism directly driven by the rotation of said plate for causing said drive to be disconnected from said plate, and for causing said stop to be moved into an operative position.

7. In an apparatus for printing a surface, comprising a rotatable printing plate, means for continuously moving an elongated surface in cooperative relation with said plate, a drive including an electromagnetic clutch for rotating said plate into and out of contact with said surface, an electromagnetic stop for arresting the rotation of said plate at a predetermined point, means responsive to said drive for simultaneously energizing said electromagnetic clutch and said electromagnetic stop to cause said drive to be connected with said plate and to move said stop to its inoperative position, and means responsive to the rotation of said plate for deenergizing said electromagnetic clutch and said electromagnetic stop for causing the disengagement of said clutch with said plate and to cause said stop to be moved to its operative position.

8. In an apparatus for printing the surface of inner tubes, comprising a printing plate, means for continuously moving said surface in cooperative relation with said plate, means for successively moving said plate into and out of contact with said surface at positions equally spaced from one another upon said surface, means driven by the movement of said plate for marking the length of such tubes and the position of the valve at equally spaced points on said surface and means for controlling the movement of the plate and said marking means in response to the distance moved by said surface.

9. In an apparatus for printing continuous lengths of rubber tubing, comprising a rotatable printing plate, means for continuously moving the surface of said tubing in cooperative relation with said plate, a drive for rotating said plate into and out of contact with said surface at equally spaced intervals along said surface, means directly driven by a driving connection with said plate for marking the surface of said tube at predetermined equally spaced points, and means for successively starting and stopping said plate in coincidence with the end of predetermined distances moved by said tube after each starting and stopping movement respectively.

10. In an apparatus for printing a surface, comprising a printing plate, means for moving said surface in cooperative relation with said plate, means for successively moving said plate into and out of contact with said surface at positions equally spaced from one another upon said surface, and means for changing the speed of the plate without altering the speed of said surface.

11. In a printing apparatus, means for continuously moving the surface to be printed, means for intermittently moving a printing plate into contact with the surface, means for changing the speed of movement of the plate relatively with respect to the surface to synchronize its speed with the speed of movement of the surface.

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