Sept. 6, 1955 F. A. HATTMAN 2,716,941

MACHINES FOR MARKING CYLINDRICAL ARTICLES

Filed Sept. 15, 1950 4 Sheets-Sheet 1

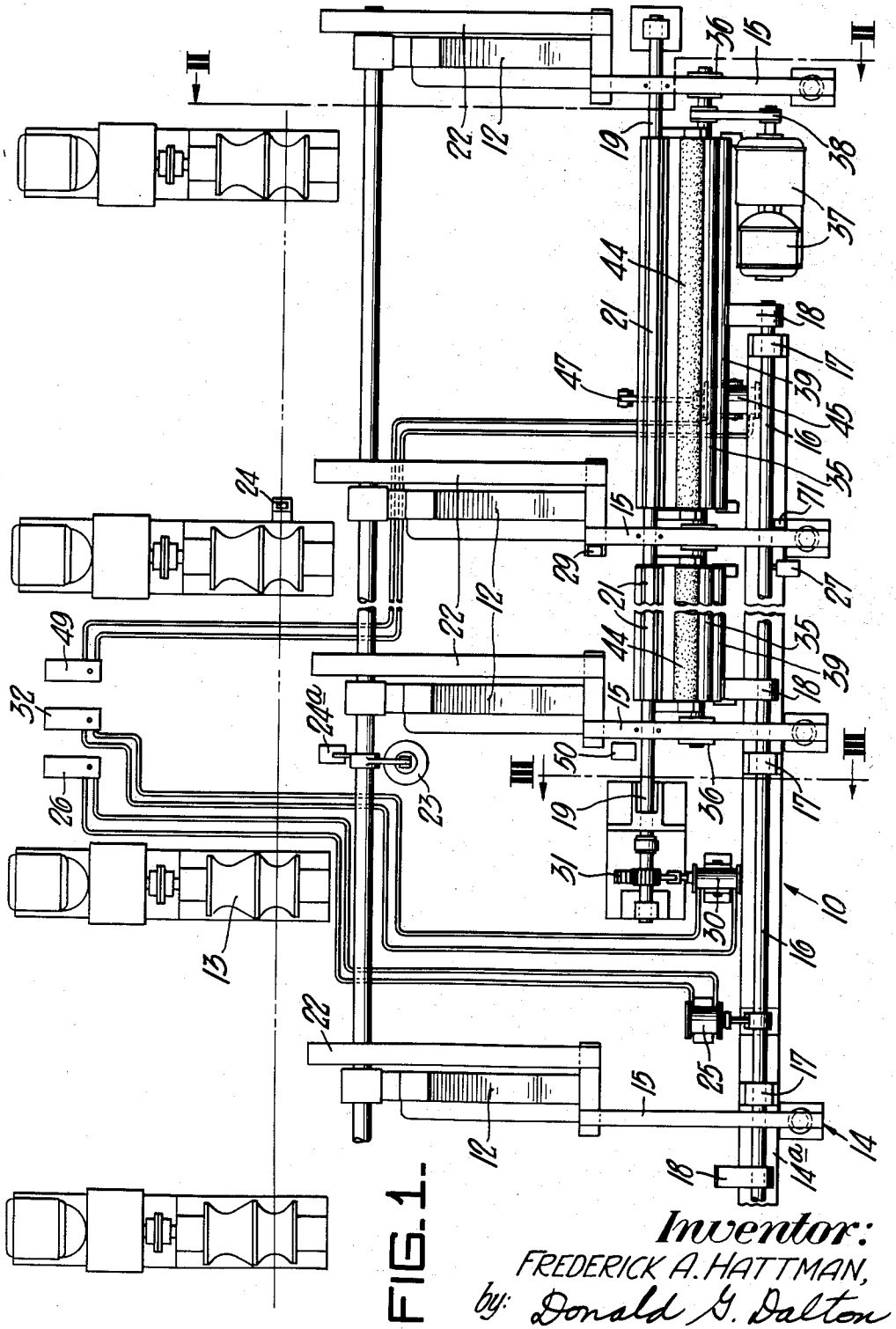


FIG. 1.

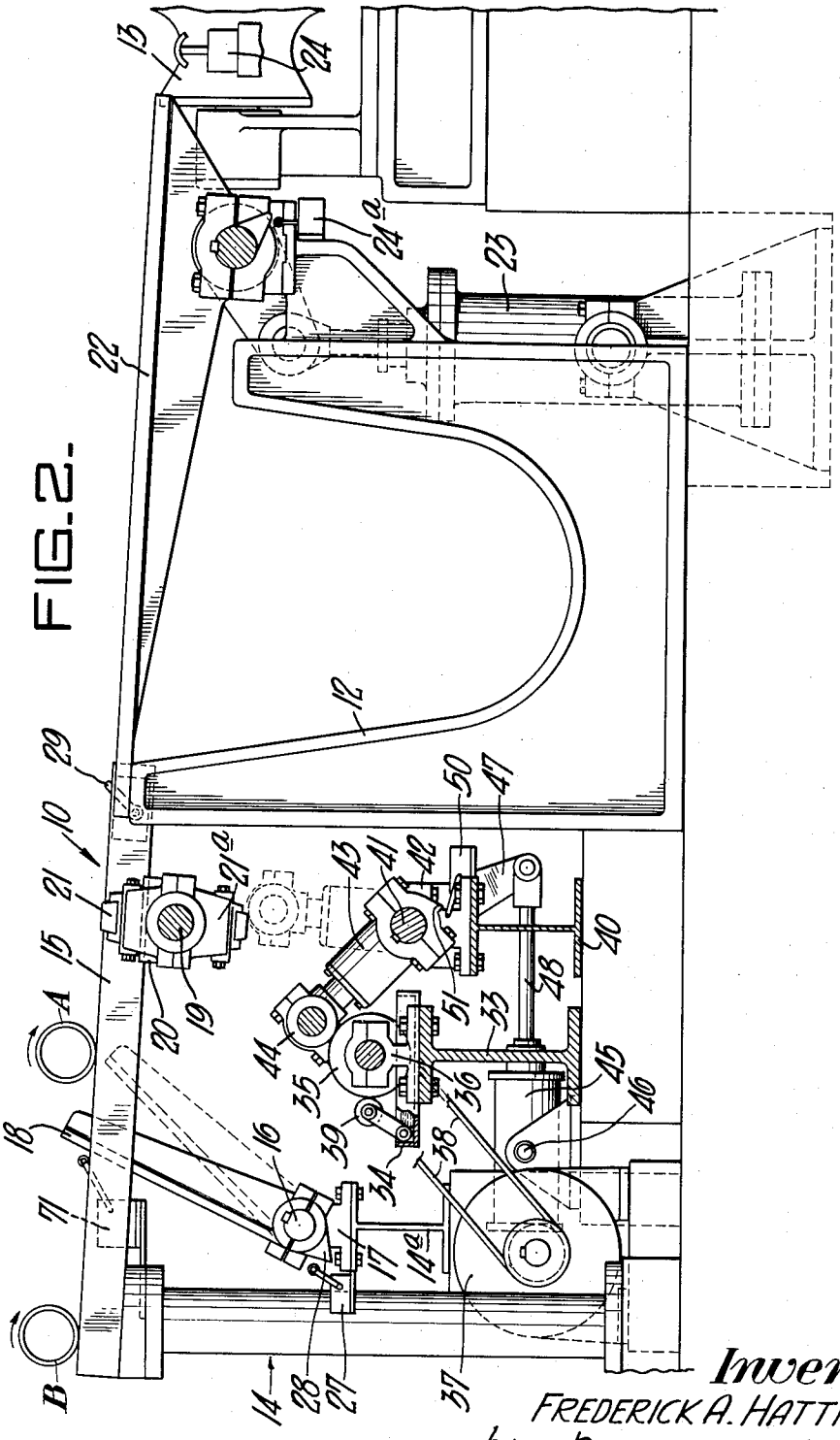
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MACHINES FOR MARKING CYLINDRICAL ARTICLES

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FIG. 2.



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MACHINES FOR MARKING CYLINDRICAL ARTICLES

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FIG. 3.

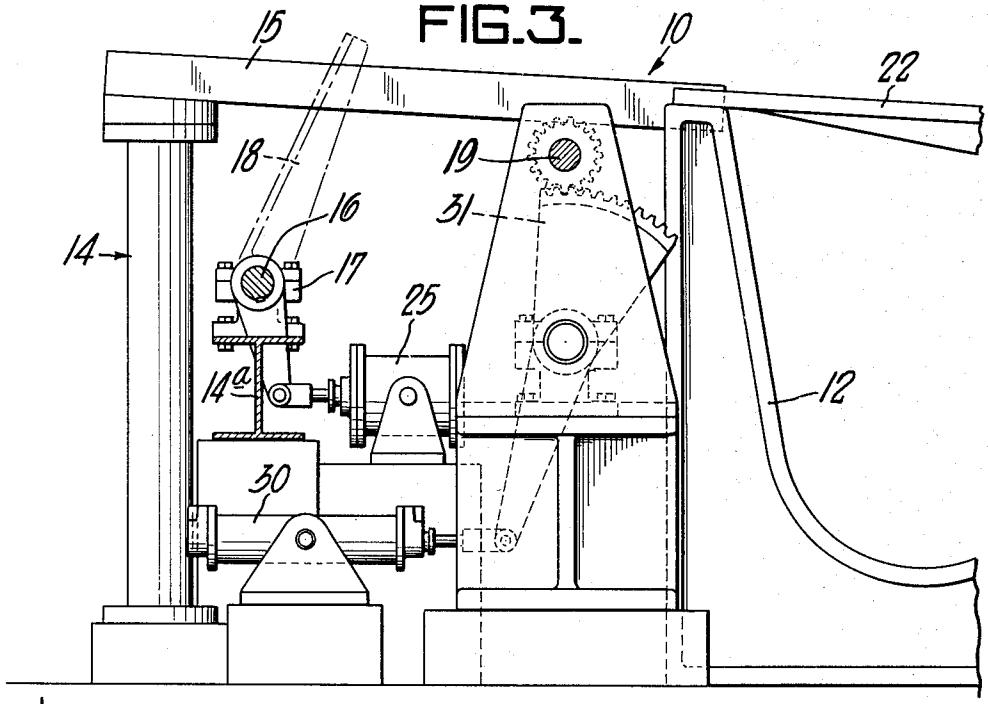
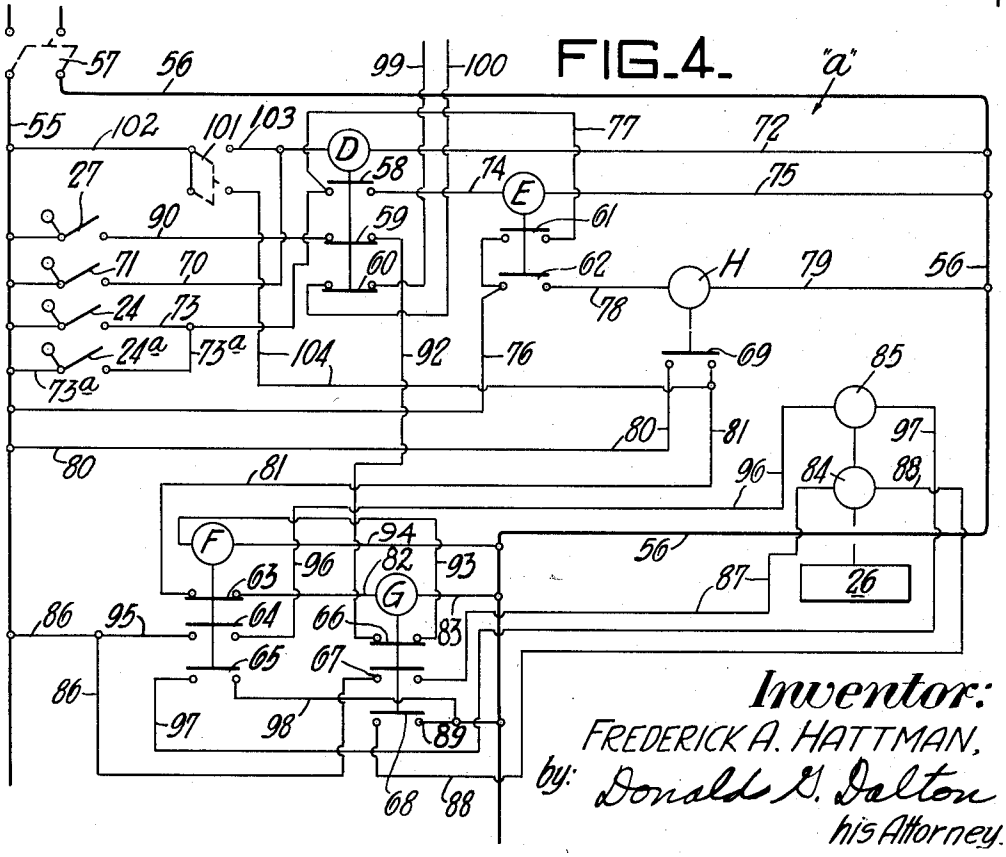


FIG. 4.



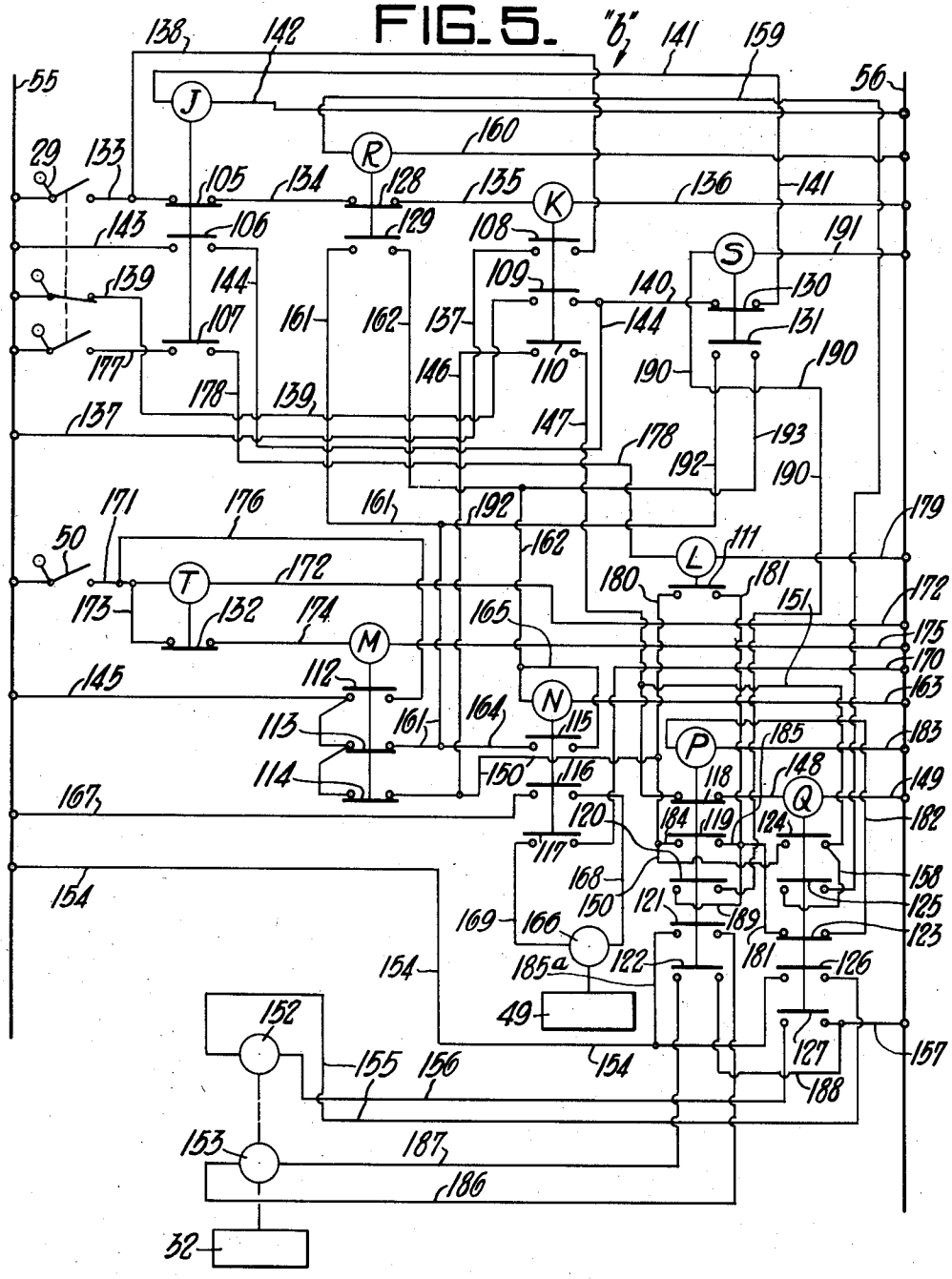
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MACHINES FOR MARKING CYLINDRICAL ARTICLES

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FIG. 5.



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MACHINES FOR MARKING CYLINDRICAL ARTICLES

Frederick A. Hattman, Hubbard, Ohio, assignor to United States Steel Corporation, a corporation of New Jersey

Application September 15, 1950, Serial No. 185,047

6 Claims. (Cl. 101—40)

This invention relates to improved machines for marking cylindrical articles, such as pipes.

The present disclosure illustrates the machine as used for marking pipes during their manufacture, as for example with a manufacturer's trade-mark. The disclosure illustrates the machine as situated to receive unmarked pipes from a hydro-test machine and to discharge the marked pipes either to a distributing conveyor or to a reject cradle. However, this particular use is illustrative only and is not intended to limit the scope of the invention, since obviously marking machines similarly constructed could apply markings to many other types of cylindrical articles and could be installed in many other environments.

An object of the invention is to provide improved marking machines which operate automatically; that is, in which cylindrical articles feed, receive their markings and discharge in properly spaced relation automatically.

A further object of the invention is to provide improved marking machines which receive cylindrical articles in pairs, automatically hold one of the articles back while the other passes through and receives its marking, and then automatically release the article held back so that this latter article also passes through and receives its marking.

A further object of the invention is to provide marking machines which have the foregoing improved characteristics and which automatically supply marking fluid (paint or ink) to the marking element after each article is marked.

A further object of the invention is to provide marking machines which have the foregoing improved features and are of simple mechanical construction, electrically controlled, and in which the electrical control readily can be interlocked with other equipment in a plant layout, such as a pipe hydro-test machine and a distributing conveyor, to regulate introduction of articles.

In accomplishing these and other objects of the invention, I have provided improved details of structure, a preferred form of which is shown in the accompanying drawings, in which:

Figure 1 is a plan view of my improved marking machine;

Figure 2 is a transverse section therethrough taken along the plane of line II—II of Figure 1, showing parts in elevation;

Figure 3 is a similar section taken along the line III—III of Figure 1;

Figures 4 and 5 together constitute a schematic diagram of the electrical control system of the machine.

The drawings show a marking machine **10**, constructed according to the present invention and followed in this example by a pipe reject cradle **12**, and a distributing conveyor **13**. The marking machine includes a frame **14**, the top of which is formed of a series of sloping rails **15**. A transverse shaft **16** is rotatably mounted in bearings **17** on a cross-beam **14***a* of the frame and carries a plurality of arms **18** that normally occupy a

raised position in which they project above rails **15**. A second transverse shaft **19** is rotatably mounted in bearings **20** on the underside of rails **15** and carries a pair of diametrically opposed marking heads **21** and **21***a*, one of which (**21**) occupies an exposed position in a plane slightly above the upper faces of the rails, for applying markings to a pipe as it rolls thereover and the other of which occupies a position for recoating with marking fluid. In the usual operation the machine which precedes the marking machine in the plant layout, in this example a hydro-test machine, not shown, introduces pipes A and B in pairs to the marking machine, one pipe being introduced on each side of arms **18**. These arms hold back the second pipe B while the first pipe A rolls over the exposed marking head **21** and thus receives a marking.

The reject cradle **12** has a sloping gate **22** across its top approximately in the same plane as the top of rails **15**. Marked pipes, which the hydro-test machine has found acceptable, roll across this gate and on to the distributing conveyor **13**. The reject cradle has a manually controlled operating mechanism **23**, with which the operator of the hydro-test machine raises the gate to drop into the cradle marked pipes which the hydro-test machine has found unacceptable (Figures 1 and 2). The distributing conveyor has a normally open limit switch **24** and the reject cradle a normally open limit switch **24***a* which, as hereinafter fully shown, are connected in parallel. When an acceptable pipe reaches the distributing conveyor or else when the gate opens to drop an unacceptable pipe, one or the other of these switches closes momentarily, and completes a circuit for momentarily dropping arms **18** and allowing the second pipe B to pass through the machine in the same fashion as the first pipe A. The reject cradle and the distributing conveyor can be of any usual or desired construction, apart from their electrical interlock with the marking machine, and therefore are not shown or described in further detail.

The mechanism for raising and lowering arms **18** includes a double-acting fluid pressure cylinder and piston **25**, which is supported adjacent the cross-beam **14***a* and the piston rod of which is connected with shaft **16** through any suitable linkage (Figures 1 and 3). The mechanism also includes a solenoid operated four-way valve **26** for admitting fluid pressure to this cylinder. Whenever one of the limit switches **24** or **24***a* closes momentarily, it operates said valve to move the piston to the position in which it lowers the arms and thus allows the pipe to roll down the rails. A normally open limit switch **27** is mounted on cross-beam **14***a* alongside shaft **16** (Figures 1 and 2). This shaft carries a cam **28** which momentarily closes said switch whenever the arms are lowered. Whenever switch **27** closes momentarily, it operates valve **26** to raise the arms.

After each pipe passes the exposed marking head **21** or **21***a*, shaft **19** rotates a half revolution to expose the other marking head and to position the former marking head for recoating. Rails **15** carry a limit switch **29** beyond the marking head and across which the pipes roll to effect this movement. The mechanism for turning shaft **19** includes a double-acting fluid pressure cylinder and piston **30**, the piston rod of which is connected with the shaft through any suitable linkage, such as a pivotally mounted lever and gear segment **31** (Figure 3). The mechanism also includes a solenoid operated four-way valve **32** for admitting pressure to this cylinder. The stroke limits of the piston are such that the marking head **21** occupies its exposed marking position when the piston rod is fully retracted, and the other marking head **21***a* occupies its exposed marking position when the piston rod is fully extended.

Frame **14** includes a second cross-beam **33** which car-

ries a trough 34 containing a supply of marking fluid (Figure 2). A coating roll 35 is rotataby mounted in bearings 36 on said beam and dips into said trough. A motor 37 continuously drives this coating roll through a belt 38 and pulleys. Beam 33 carries wiper rolls 39 which regulate the amount of fluid the coating roll picks up from the trough. The frame includes a third cross-beam 40 which carries another rotatable shaft 41 in bearings 42. Shaft 41 has radially projecting arms 43 which carry a coating transfer roll 44. The shaft and arms normally occupy a position in which the transfer roll contacts the coating roll and picks up marking fluid. After shaft 19 rotates 180° to reverse the marking heads, shaft 41 automatically rotates clockwise to wipe the transfer roll 44 across the lower or unexposed marking head and thus to recoat this marking head.

The mechanism for operating the transfer roll includes a double-acting fluid pressure cylinder and piston 45 pivoted to bearings 46 on frame 14. Shaft 41 carries a crank arm 47 which is pivotally connected to the piston rod 48 of said cylinder and piston. The mechanism also includes a solenoid operated, spring return four-way valve 49 for admitting fluid pressure to this cylinder, Figure 1. The piston normally occupies a projected position as shown in Figure 2. After the circuit reverses the marking head 21, it automatically energizes the solenoid of valve 49 to move this valve to the position in which it admits pressure to cylinder 45. The piston and piston rod thereupon move into the cylinder and thus turn shaft 41, its arms 43 and the transfer roll 44 clockwise. Beam 40 carries a normally open limit switch 50 and shaft 41 a cam 51. After the shaft and its arms complete their clockwise movement and the transfer roll 44 coats the marking head, cam 51 momentarily closes switch 50, which releases the operating solenoid of valve 49. The spring of this valve returns it to the position in which it admits fluid to cylinder 45 to return shaft 41, arms 43 and the transfer roll 44 to their normal positions.

Figures 4 and 5 show in detail a preferred electric circuit for operating the machine. The circuit conveniently can be described in two parts, (*a*) that which operates shaft 16 and its arms 18 and (*b*) that which operates shaft 19 and its marking heads and shaft 41 and its transfer roll 44. Both parts of the circuit are connected to lines 55 and 56, which in turn are connected to any suitable outside power source through a main switch 57.

Part "a"

Part "*a*" of the circuit includes four relays D, E, F and G and a timer relay H. Relay D has one set of normally open contacts 58 and two sets of normally closed contacts 59 and 60. Relay E has two sets of normally open contacts 61 and 62. Relay F has one set of normally closed contacts 63 and two sets of normally open contacts 64 and 65. Relay G likewise has one set of normally closed contacts 66 and two sets of normally open contacts 67 and 68. Timer relay H has one set of normally open contacts 69.

A conductor 70, which contains a normally open limit switch 71, connects line 55 with one end of the coil of relay D. A conductor 72 connects the other end of the coil of relay D with line 56. Switch 71 is situated adjacent one of the arms 18 and it closes and remains closed whenever these arms hold a pipe B (Figure 2). Closing of switch 71 energizes relay D. A conductor 73, which contains the normally open limit switch 24 on the distributing conveyor 13, connects line 55 with one contact of the normally open set 58 of relay D. A conductor 73*a*, which contains the alternate normally open limit switch 24*a* on the reject cradle, connects line 55 and conductor 73 beyond switch 24. A conductor 74 connects the other contact of set 58 with one end of the coil of relay E. A conductor 75 connects the other end of the coil of relay E with line 56. Thus when relay D is energized and its contacts 58 close, they condition a current path to the coil of relay E, and, when a pipe or the reject gate closes switch 24 or 24*a*, this current path is completed and relay E is energized.

A conductor 76 connects line 55 with one contact of each of the normally open sets 61 and 62 of relay E. A conductor 77 connects the other contact of set 61 with conductor 73, whereby closing of contacts 61 of relay E seals in the relay. The current path is from line 55, via conductor 76, contacts 61, conductor 77, contacts 58, conductor 74, the coil of relay E, and conductor 75 to line 56. A conductor 78 connects the other contact of set 62 with one end of the coil of timer relay H. A conductor 79 connects the other end of this coil with line 56. Thus closing of contacts 62 of relay E energizes timer relay H and the latter commences timing. This timer relay times out after an interval sufficient for pipe A to clear the distributing conveyor, whereupon its normally open contacts 69 close.

A conductor 80 connects line 55 with one contact of set 69. A conductor 81 connects the other contact of set 69 with one contact of the normally closed set 63 of relay F. A conductor 82 connects the other contact of set 63 with one end of the coil of relay G. A conductor 83 connects the other end of said coil with line 56. Thus closing of contacts 69 of timer relay H energizes relay G. The current path is from line 55, via conductor 80, contacts 69, conductor 81, contacts 63, conductor 82, the coil of relay G, and conductor 83, to line 56.

At this point in the operation switch 71 remains closed, since the second pipe B still rests against it; the first pipe A has rolled over the marking head 21, and either has arrived on conveyor 13 and closed switch 24 or else operation of gate 22 has closed switch 24*a*; relays D and E are energized and sealed in, timer relay H and relay G are energized, but relay F has not yet acted.

Four-way valve 26 has a pair of operating solenoids 84 and 85. Energization of solenoid 84 operates the valve to admit pressure to cylinder 25 to lower arms 18. Energization of solenoid 85 operates the valve to admit pressure to cylinder 25 in the opposite direction to raise arms 18. When neither solenoid is energized, the valve of course remains in the position to which it was last moved and holds the arms in that position.

A conductor 86 connects line 55 with one contact of the normally open set 67 of relay G. A conductor 87 connects the other contact of set 67 with one end of solenoid 84. A conductor 88 connects the other end of solenoid 84 with one contact of the normally open set 68 of relay G. A conductor 89 connects the other contact of set 68 with line 56. When relay G is energized and its contacts 67 and 68 close, they energize solenoid 84 and thus lower the arms 18. The current path is from line 55, via conductor 86, contacts 67, conductor 87, solenoid 84, conductor 88, contacts 68 and conductor 89 to line 56. Thereupon the second pipe B rolls down the rails across the marking head.

When the pipe B rolls away from limit switch 71, this switch opens and breaks the current path to the coil of relay D, whereupon this relay is de-energized and returns to its normal position. Contacts 58 of relay D open and break the current path to the coil of relay E, whereupon this latter relay also is de-energized and returns to its normal position. Contacts 62 of relay E open and break the current path of the coil of timer relay H, whereupon the timer relay also is de-energized and returns to its normal position. Contacts 69 of the timer relay open and break the current path to the coil of relay G, whereupon this relay also is de-energized and returns to its normal position. Opening of contacts 67 and 68 of relay G breaks the current path to solenoid 84, and thus releases the force which has been holding valve 26 in the position in which it admits pressure to cylinder 25 for holding down arms 18.

A conductor 90 connects line 55 with one contact of the normally closed set 59 of relay D, and contains limit

switch 27, which is situated on cross-beam 14*a* adjacent shaft 16. A conductor 92 connects the other contact of set 59 with one contact of the normally closed set 66 of relay G. A conductor 93 connects the other contact of set 66 with one end of the coil of relay F. A conductor 94 connects the other end of this coil with line 56. When arms 18 are down, cam 28 on shaft 16 momentarily closes limit switch 27 and thus energizes relay F. The current path is from line 55, via conductor 90, contacts 59, conductor 92, contacts 66, conductor 93, the coil of relay F and conductor 94, to line 56.

A conductor 95 connects conductor 86 with one contact of the normally open set 64 of relay F. A conductor 96 connects the other contact of set 64 with one end of solenoid 85. A conductor 97 connects the other end of said solenoid with one contact of the normally open set 65 of relay F. A conductor 98 connects the other contact of set 65 with conductor 89. Energizing relay F and closing of its contacts 64 and 65 energizes solenoid 85 and moves valve 26 to the position in which it admits pressure to cylinder 25 to raise arms 18.

Since switch 27 closes only momentarily, relay F and solenoid 85 are energized only momentarily. Thus the force which holds the valve in this position is released so that the valve can move to its other position when relay G and solenoid 84 are energized, as already explained. Closing of contacts 63 of relay F conditions the current path to relay G and closing of contacts 66 of relay G conditions the current path to relay F, so that it is not possible to energize both relays F and G and both solenoids 84 and 85 at one time. When the second pipe B or gate 22 of the reject cradle closes limit switch 24 or 24*a*, arms 18 do not move since switch 71 is open, there being no pipe behind the arms to hold it closed.

The normally closed contacts 60 of relay D are for the purpose of interlocking the marking machine with whatever machine precedes it in the plant layout, in the present example the hydro-test machine. Conductors 99 and 100 are connected to these contacts and extend to the hydro-test machine and prevent its delivering pipes to the marking machine unless relay D is de-energized and these contacts closed. Therefore as long as arms 18 hold a pipe B and limit switch 71 is closed, the hydro-test machine cannot deliver another pair of pipes to the marking machine.

Sometimes pipes may be delivered singly to the marking machine, and on such occasions it is desirable to retain arms 18 in their lowered position, since they are not needed for holding back a second pipe. For thus holding the arms down, the circuit includes a normally open two pole switch 101. A conductor 102 connects line 55 with one side of each pole of said switch. A conductor 103 connects the other side of one pole with one end of the coil of relay D (via conductor 70). A conductor 104 connects the other side of the other pole with one contact of the normally closed set 63 of relay F (via conductor 81). Closing switch 101 holds relay D energized and its contacts 59 open, thereby preventing energization of relay F and solenoid 85. Closing this switch also energizes relay G and solenoid 84, thus holding valve 26 in the position in which the arms are down. The current path to relay G is from line 55, via conductor 102, switch 101, conductors 104 and 81, contacts 63, conductor 82, the coil of relay G, and conductor 83, to line 56. At such times the interlock with the hydro-test machine is of course disconnected, so that the machine can deliver pipes even though contacts 60 are open.

Part "b"

Part "*b*" of the circuit includes seven relays J, K, L, M, N, P and Q, and three timer relays R, S and T. Relay J has one set of normally closed contacts 105 and two sets of normally open contacts 106 and 107. Relay K has three sets of normally open contacts 108, 109 and 110. Relay L has one set of normally open contacts 111. Relay M has one set of normally open contacts 112 and two sets of normally closed contacts 113 and 114. Relay N has three sets of normally open contacts 115, 116 and 117. Relay P has one set of normally closed contacts 118 and four sets of normally open contacts 119, 120, 121 and 122. Relay Q has one set of normally closed contacts 123 and four sets of normally open contacts 124, 125, 126 and 127. Timer relay R has one set of normally closed contacts 128 and one set of normally open contacts 129. Timer relay S has one set of normally closed contacts 130 and one set of normally open contacts 131. Timer relay T has one set of normally closed contacts 132. Switch 29, hereinbefore referred to and which is situated just beyond the marking head, is a three pole switch and has two normally open poles and one normally closed pole.

A conductor 133, which contains one of the normally open poles of switch 29, connects line 55 with one contact of the normally closed set 105 of relay J. A conductor 134 connects the other contact of set 105 with one contact of the normally closed set 128 of timer relay R. A conductor 135 connects the other contact of set 128 with one end of the coil of relay K. A conductor 136 connects the other end of this coil with line 56. When a pipe rolls across switch 29 and momentarily closes its normally open poles, it energizes relay K, and its three sets of normally open contacts close. A conductor 137 connects line 55 with one contact of the normally open set 108 of relay K. A conductor 138 connects the other contact of set 108 with conductor 133 beyond switch 29. Closing of its contacts 108 thus seals in relay K. The current path is from line 55, via conductor 137, contacts 108, conductors 138 and 133, contacts 105, conductor 134, contacts 128, conductor 135, the coil of relay K and conductor 136, to line 56.

A conductor 139, which contains the normally closed pole of switch 29, connects line 55 with one contact of the normally open set 109 of relay K. A conductor 140 connects the other contact of set 109 with one contact of the normally closed set 130 of relay S. A conductor 141 connects the other contact of set 130 with one end of the coil of relay J. A conductor 142 connects the other end of this relay coil with line 56. When energization of relay K closes its contacts 109, they condition a current path to the coil of relay J, and when the pipe rolls clear of switch 29 and its normally closed pole again closes, it completes this current path. The current path is from line 55, via conductor 139, contacts 109, conductor 140, contacts 130, conductor 141, the coil of relay J, and conductor 142, to line 56. A conductor 143 connects line 55 with one contact of the normally open set 106 of relay J. A conductor 144 connects the other contact of set 106 with conductor 140. When relay J is energized and its normally open contacts 106 close, they seal in the relay. The current path is from line 55, via conductor 143, contacts 106, conductors 144 and 140, contacts 130, conductor 141, the relay coil J, and conductor 142 to line 56. Opening of the normally closed set of contacts 105 of relay J de-energizes relay K.

A conductor 145 connects line 55 with one contact of each of the three sets 112, 113 and 114 of relay M. A conductor 146 connects the other contact of set 114 with one contact of the normally open set 110 of relay K. A conductor 147 connects the other contact of set 110 with one contact of the normally closed set 118 of relay P. A conductor 148 connects the other contact of set 118 with one end of the coil of relay Q. A conductor 149 connects the other end of the coil of relay Q with line 56. While relay K was energized and its contacts 110 were closed, it also energized relay Q. The current path was from line 55, via conductor 145, contacts 114, conductor 146, contacts 110, conductor 147, contacts 118, conductor 148, the coil of relay Q, and conductor 149 to line 56. A conductor 150 connects conductor 146 with one contact of the normally open set 124 of relay Q. A conductor

151 connects the other contact of set 124 with conductor 147. Closing of its contacts 124 seals in relay Q. The current path is from line 55, via conductor 145, contacts 114, conductors 146 and 150, contacts 124, conductors 151 and 147, contacts 118, conductor 148, the coil of relay Q and conductor 149, to line 56.

Thus at this point in the operation of part "*b*" of the circuit, the first pipe A has rolled over the marking head 21, past switch 29, which it momentarily closes and then allows to open, and is on its way down the gate 22 or into the cradle 12; relay K is de-energized and in its normal position, relays J and Q are energized and sealed in, and relays L, M, N and P and timer relays R, S and T have not yet acted and remain in their normal positions. However, as hereinafter explained, timer relay R has commenced timing.

Valve 32 has two operating solenoids 152 and 153. When solenoid 152 is energized, the valve moves to the position in which it admits pressure to cylinder 30 for exposing the marking head 21*a* and positioning the marking head 21 for recoating with marking fluid. When solenoid 153 is energized, the valve moves to a position in which it reverses the flow of air to this cylinder and exposes the other marking head 21 and positions the marking head 21*a* for recoating. In the operation hereinafter described, it is assumed that solenoid 153 has been energized, and that the marking head 21 has been in its exposed marking position and marking head 21*a* already recoated.

A conductor 154 connects line 55 with one contact of the normally open set 126 of relay Q. A conductor 155 connects the other contact of set 126 with one end of solenoid 152. A conductor 156 connects the other end of solenoid 152 with one contact of the normally open set 127 of relay Q. A conductor 157 connects the other contact of set 127 with conductor 56. Energizing relay Q thus energizes solenoid 152, which reverses the marking heads and moves marking head 21 to its position for recoating. The current path is from line 55, via conductor 154, contacts 126, conductor 155, solenoid 152, conductor 156, contacts 127, and conductor 157, to line 56.

A conductor 158 connects one contact of the normally open set 124 of relay Q with one contact of the normally open set 125 of this same relay. A conductor 159 connects the other contact of set 125 with one end of the coil of timer relay R. A conductor 160 connects the other end of this coil and line 56. Closing of contacts 124 and 125 energizes the timer relay, which thereupon commences timing. The current path is from line 55, via conductor 145, contacts 114, conductors 146 and 150, contacts 124, conductor 158, contacts 125, conductor 159, the coil of timer relay R, and conductor 160, to line 56. This timer relay is set to time out after shaft 19 rotates a half revolution and moves the marking head 21 fully to its position for recoating. When the timer relay times out and its contacts 128 open, they prevent energization of relay K until the operating cycle is completed.

A conductor 161 connects one contact of the normally closed set 113 of relay M with one contact of the normally open set 129 of timer relay R. A conductor 162 connects the other contact of set 129 with one end of the coil of relay N. A conductor 163 connects the other end of this coil with line 56. When the timer relay times out and its contacts 129 close, they complete a current path to the coil of relay N and energize this relay. The current path is from line 55 via conductor 145, contacts 113, conductor 161, contacts 129, conductor 162, the coil of relay N and conductor 163, to line 56. A conductor 164 connects conductor 161 with one contact of the normally open set 115 of relay N. A conductor 165 connects the other contact of set 115 with conductor 162. When relay N is energized and its contacts 115 close, the relay seals in. The current path is from line 55 via conductor 145, contacts 113, conductors 161 and 164, contacts 115, conductors 165 and 162, the coil of relay N, and conductor 163, to line 56.

Thus at this point in the operation, marking heads 21 and 21*a* are reversed from the position shown in Figure 2; relay K is de-energized and in its normal position, relays J, Q and N are energized and sealed in, timer relay R is energized and has timed out, and relays L, M and P and timer relays S and T have not yet acted and remain in their normal positions.

Valve 49, which admits pressure to cylinder 45 for rotating shaft 41 and moving the coating transfer roll 44 across the unexposed or lower marking head 21 or 21*a*, has an operating solenoid 166. When this solenoid is energized, valve 49 admits pressure to the cylinder and moves the transfer roll across the marking head. When this solenoid is de-energized, the spring return moves the valve back to the position where it returns the transfer roll to the position it normally occupies against the coating roll 35.

A conductor 167 connects line 55 with one contact of the normally open set 116 of the relay N. A conductor 168 connects the other contact of set 116 with one end of solenoid 166. A conductor 169 connects the other end of solenoid 166 with one contact of the normally open set 117 of relay N. A conductor 170 connects the other end of the coil of relay N with line 56. Therefore energizing of relay N and closing of its contacts 116 and 117 energizes solenoid 166. The current path to the solenoid is from line 55 via conductor 167, contacts 116, conductor 168, the solenoid, conductor 169, contacts 117, and conductor 170, to line 56.

As shaft 41 completes its clockwise rotation following the energization of solenoid 166, cam 51 on this shaft closes the normally open limit switch 50. This switch is situated in a conductor 171, which connects line 55 with one end of the coil of timer relay T. A conductor 172 connects the other end of this coil with line 56. A conductor 173 connects conductor 171 with one contact of the normally closed set 132 of timer relay T. A conductor 174 connects the other contact of set 132 with one end of the coil of relay M. A conductor 175 connects the other end of the coil of relay M with line 56. When switch 50 closes, it completes current paths through the coils of both timer relay T and relay M. A conductor 176 connects one contact of the normally open set 112 of relay M with conductor 171. When relay M is energized and its contacts 112 close, they seal in both timer relay T and relay M. The current path through the timer relay is from line 55, via conductor 145, contacts 112, conductors 176 and 171, the timer relay coil, and conductor 172, to line 56. The current path through relay M is from line 55, via conductor 145, contacts 112, conductors 176, 171 and 173, contacts 132, conductor 174, the relay coil, and conductor 175 to line 56.

When relay M is energized, its contacts 113 and 114 open and thereby break the current paths to the coils of relay N and Q respectively. Breaking the current path to relay N opens its contacts 116 and 117 and thus de-energizes solenoid 166, whereupon the spring return in valve 49 returns this valve to the position in which cylinder 45 rotates shaft 41 counterclockwise. The transfer roll thus returns to its normal position against the coating roll. Breaking the current path to relay Q opens its contacts 125, 126 and 127 and thus de-energizes timer relay R and solenoid 152. Valve 32 thus is free to operate cylinder 30 to reverse the marking heads, but this valve does not operate until its other operating solenoid 153 is energized. After these relays and the transfer roll return to their normal positions, timer relay T times out and opens its contacts 132 and thus breaks the current path to the coil of relay M. Thereupon contacts 112 open and break the current path to the coil of the timer relay. Thus both timer relay T and relay M are reset for allowing the next reversal of the marking heads 21 and 21*a* and the next movement of the transfer roll 44.

All this while relay J remains energized, having sealed itself in as already described, but all the other relays

and timer relays are de-energized. When arms **18** release pipe B, this pipe rolls down rails **15**, across the marking head **21***a* and switch **29**. A conductor **177**, which contains the other normally open pole of switch **29**, connects line **55** with one contact of the normally open set **107** (now closed) of relay J. A conductor **178** connects the other contact of set **107** with one end of the coil of relay L. A conductor **179** connects the other end of this coil with line **56**. When pipe B rolls across switch **29**, it momentarily completes a current path through the coil of relay L, which closes its normally open contacts **111**, but does not seal in.

A conductor **180** connects conductor **150** with one contact of the normally open set **111** of relay L. A conductor **181** connects the other contact of set **111** with one contact of the normally closed set **123** of relay Q. A conductor **182** connects the other contact of set **123** with one end of the coil of relay P. A conductor **183** connects the other end of this coil with line **56**. Closing of contacts **111** of relay L completes a current path to the coil of relay P and energizes this latter relay. The current path is from line **55**, via conductor **145**, contacts **114**, conductors **146**, **150** and **180**, contacts **111**, conductor **181**, contacts **123**, conductor **182**, the relay coil, and conductor **183**, to line **56**. A conductor **184** connects conductor **150** with one contact of the normally open set **119** of relay P. A conductor **185** connects the other contact of set **119** with conductor **181**. When relay P is energized and its contacts **119** close, they seal in the relay. The current path is from line **55**, via conductor **145**, contacts **114**, conductors **146**, **150** and **184**, contacts **119**, conductors **185** and **181**, contacts **123**, conductor **182**, the relay coil, and conductor **183**, to line **56**.

At this point in the operation, the second pipe B has rolled over the marking head **21***a*, past switch **29**, which momentarily closes and then opens, and is on its way down the gate **22** or into cradle **12**; relays K, L, M, N, and Q, and timer relays R, S, and T all are in their normal positions, and relays J and P are energized and sealed in. However, timer relay S has commenced timing, as hereinafter explained.

A conductor **185***a* connects conductor **154** with one contact of the normally open set **121** of relay P. A conductor **186** connects the other contact of set **121** with one end of solenoid **153**. A conductor **187** connects the other end of solenoid **153** with one contact of the normally open set **122** of relay P. A conductor **188** connects the other contact of set **122** with conductor **157**. Energization of relay P and closing of its contacts **121** and **122** thus energizes solenoid **153**. The current path to the solenoid is from line **55**, via conductors **154** and **185***a*, contacts **121**, conductor **186**, solenoid **153**, conductor **187**, contacts **122**, and conductors **188** and **157**, to line **56**. Energizing this solenoid again operates valve **32** and reverses the marking heads. Marking head **21** now occupies its exposed position for marking a subsequent pipe A, while marking head **21***a* occupies its position for recoating.

A conductor **189** connects conductor **185** with one contact of the normally open set **120** of relay P. A conductor **190** connects the other contact of set **120** with one end of the coil of timer relay S. A conductor **191** connects the other end of this coil with line **56**. When relay P is energized and its contacts **119** and **120** close, they complete a current path through the coil of timer relay S, whereupon the timer relay commences timing. This current path is from line **55** via conductor **145**, contacts **114**, conductors **146**, **150** and **184**, contacts **119**, conductors **185** and **189**, contacts **120**, conductor **190**, the timer relay coil, and conductor **191**, to line **56**. The normally closed sets of contacts **118** of relay P and **123** of relay Q serve to condition the circuits of the other of these two relays, and prevent both relays being energized at once.

Timer relay S is set to time out after the marking heads have completed their reversal, and marking head **21***a* is fully in its position for recoating. When this timer relay times out, its contacts **130** open and break the current path to relay J, which thus resets itself. A conductor **192** connects conductor **161** with one contact of the normally open set **131** of timer relay S. A conductor **193** connects the other contact of set **131** with conductor **162**. When the timer relay times out and its contacts **131** close, they complete a current path through the coil of relay N. This current path is from line **55** via conductor **145**, contacts **113**, conductors **161** and **192**, contacts **131**, conductors **193** and **162**, the coil of relay N and conductor **163**, to line **56**.

As before, relay N seals itself in and energizes solenoid **166** to move the coating transfer roll across the marking head. The cam **51** on shaft **41** subsequently closes switch **50** and energizes relay M and timer relay T for resetting relays N and P in the same manner as before when they reset relays N and Q. When relay P is de-energized, opening of its contacts **119** and **120** resets timer relay S. When its contacts **121** and **122** open, they de-energize solenoid **153** and release the force which holds valve **32**. When contacts **116** and **117** of relay N open, they de-energize solenoid **166**, and the spring return on valve **49** returns the coating transfer roll to its normal position as before. The machine again is ready to receive two more pipes for marking.

Operation

The operation of the machine can be summarized as follows: A preceding piece of equipment, in this example a hydro-test machine, introduces two pipes A and B to the marking machine, one on each side of its arms **18**, which are in their up position. These arms thus retain pipe B. Pipe A rolls down the sloping rails **15** of the marking machine, across the marking head **21**, where it receives its marking, across switch **29**, and then either to the reject cradle **12** or the distribution conveyor **13**.

As pipe A actuates switch **29**, it operates part "*b*" of the electric circuit, which reverses the marking heads **21** and **21***a*. The former moves to a position for recoating, while the latter moves into a position for marking the next pipe. The coating transfer roll **44** then wipes across the marking head **21** and applies a fresh supply of coating fluid and returns to its normal position.

Subsequently either pipe A operates switch **24** on the distributing conveyor, or else the reject cradle operates switch **24***a*, to operate part "*a*" of the circuit. Arms **18** move to their lowered position and release pipe B and then return to their raised position. Pipe B rolls across the marking head **21***a* and switch **29**. The marking heads again reverse themselves and the marking head **21***a* is recoated. As soon as pipe B leaves the machine, the machine is ready to receive two more pipes.

From the foregoing description it is seen that the machine of the present invention furnishes an automatic means for marking cylindrical articles such as pipes. The machine receives such articles in pairs, and automatically marks them and discharges them in properly spaced relation. The electric operating circuit of the machine conveniently can be interlocked with preceding and succeeding equipment, thus regulating feeding of articles to the machine.

While I have shown and described only one preferred embodiment of the invention, it is apparent that modifications may arise. Therefore, I do not wish to be limited to the disclosure set forth, but only by the scope of the appended claims.

I claim:

1. A machine for marking cylindrical articles comprising a support having a sloping surface along which an article can roll, a shaft mounted on said support for rotation on an axis parallel to the axes of rotation of the

articles, a pair of diametrically opposed marking heads fixed to said shaft, one of said marking heads occupying a position in which an article on said surface can roll across it and receive a marking, the other of said marking heads occupying a position for recoating with marking fluid, drive means for rotating said shaft in half revolution steps and thereby reversing said marking heads, an electric circuit including a switch on said sloping surface adapted to be actuated by an article passing thereover for operating said drive means, rotating said shaft and thus reversing said marking heads, a second shaft rotatably mounted on said support and being parallel to and below said first named shaft, arms fixed to said second shaft, a coating transfer roll rotatably mounted on said arms, means occupying a fixed position for applying marking fluid to said roll, said arms normally holding said roll in a position to receive marking fluid from said last named means and clearing said marking heads, and additional drive means operatively connected with said circuit for rotating said second shaft first in one direction and then in the other after each reversal of said marking heads and thus wiping said roll across the marking head which is in its recoating position and then returning said roll to its normal position.

2. A machine for marking cylindrical articles comprising a support having a sloping surface along which an article can roll, a shaft mounted on said support for rotation on an axis parallel to the axes of rotation of the articles, a pair of diametrically opposed marking heads fixed to said shaft, one of said marking heads occupying a position in which an article on said surface can roll across it and receive a marking, the other of said marking heads occupying a position for recoating with marking fluid, fluid pressure means for rotating said shaft in half revolution steps and thereby reversing said marking heads, an electric circuit including a switch on said sloping surface adapted to be actuated by an article passing thereover for operating said fluid pressure means, rotating said shaft and thus reversing said marking heads, a second shaft rotatably mounted on said support and being parallel to and below said first named shaft, arms fixed to said second shaft, a coating transfer roll rotatably mounted on said arms, a trough fixed to said support and adapted to contain marking fluid, a coating roll dipping into said trough, said arms normally occupying a position in which said transfer roll contacts said coating roll and clears said marking heads, and fluid pressure means operatively connected with said circuit for rotating said second shaft first in one direction and then in the other after each reversal of said marking heads and thus wiping said transfer roll across the marking head which is in its recoating position and then returning said transfer roll to its normal position.

3. A machine for marking cylindrical articles and adapted to receive such articles in pairs comprising a support having a sloping surface along which an article can roll gravitationally, normally raised arms projecting above said surface for holding back one of the articles while the other rolls along said surface, a shaft mounted on said support for rotation on an axis parallel to the axes of rotation of the articles, a pair of diametrically opposed marking heads fixed to said shaft, one of said marking heads occupying a position in which an article on said surface can roll across it and receive a marking, the other of said marking heads occupying a position for recoating with marking fluid, drive means for rotating said shaft in half revolution steps and thereby reversing said marking heads, an electric circuit including a switch on said sloping surface adapted to be actuated by an article passing thereover for operating said drive means, rotating said shaft and thus reversing said marking heads, a second shaft rotatably mounted on said support and being parallel to and below said first named shaft, arms fixed to said second shaft, a coating transfer roll rotatably mounted on said last named arms, means occupying a fixed position for applying marking fluid to said roll, said last named arms normally holding said roll in a position to receive marking fluid from said last named means and clearing said marking heads, additional drive means operatively connected with said circuit for rotating said second shaft first in one direction and then in the other after each reversal of said marking heads and thus wiping said roll across the marking head which is in its recoating position and then returning said roll to its normal position, and a second electric circuit including a switch adapted to be actuated by the article for lowering said first named arms below the surface of said support and thus releasing an article held thereby.

4. A machine for marking cylindrical articles comprising a support having a sloping upper surface along which the articles can roll gravitationally, stop means carried by said support adjacent the higher portion of said sloping surface and adapted to move between raised and lowered positions and normally occupying its raised position in which it projects above said sloping surface, said sloping surface being adapted to receive articles which are placed thereon from above in spaced apart pairs on opposite sides of said stop means, said stop means being adapted initially to hold back the second article while the first rolls down said sloping surface, marking means carried by said support across which articles can roll and receive a marking, motive means on said support for raising and lowering said stop means, and actuating means for said motive means located in the path of articles beyond said marking means, said motive means being adapted to lower said stop means below said sloping surface and thus release the second article after the first article passes said actuating means.

5. A machine as defined in claim 4 in which said operating means includes a piston and cylinder connected to said stop means, and said actuating means includes a solenoid operated valve connected to said cylinder, an electric switch located in the path of the articles, and a circuit connecting said switch and said valve.

6. A machine as defined in claim 4 in which said marking means includes a pair of marking heads rotatably mounted on said support, one of said marking heads occupying a position in which an article on said sloping surface can roll across it and receive a marking, the other of said marking heads occupying a position for recoating with marking fluid, means for reversing the positions of said marking heads after passage of an article over one of them, and means for recoating each marking head after it moves to its recoating position.

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