

Dec. 3, 1963

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MARKING APPARATUS

3,112,690

Filed Oct. 26, 1961

2 Sheets-Sheet 1

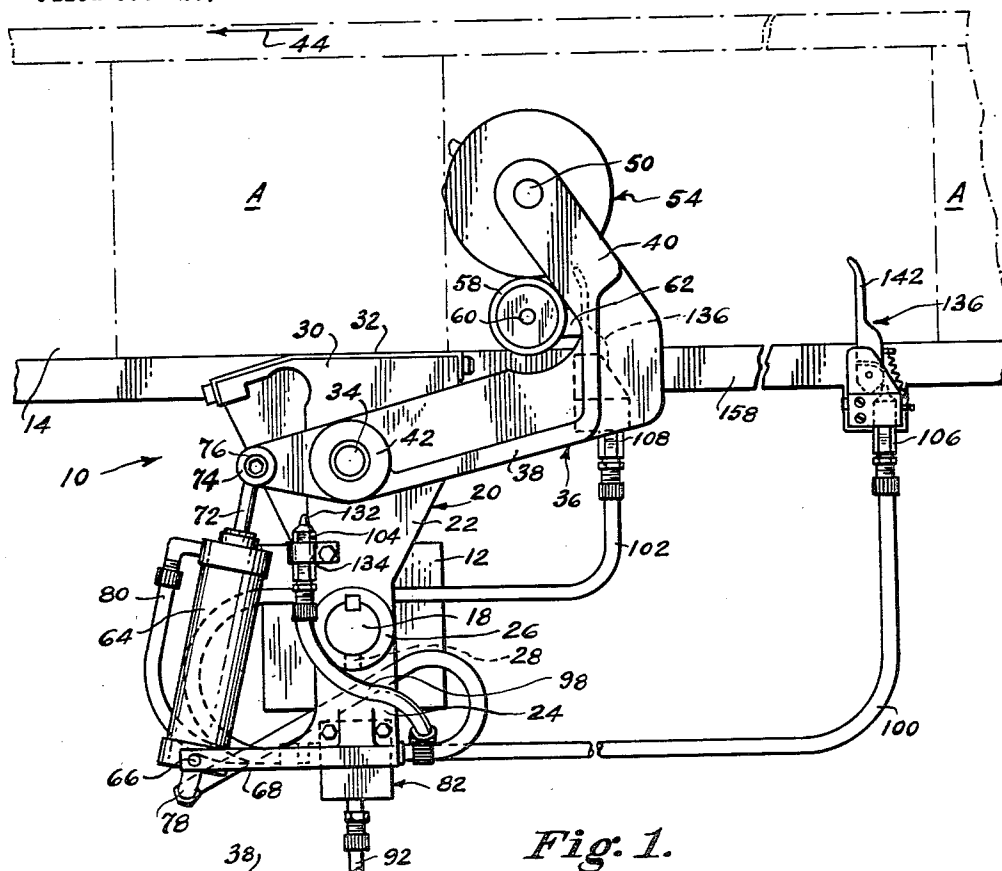


Fig. 1.

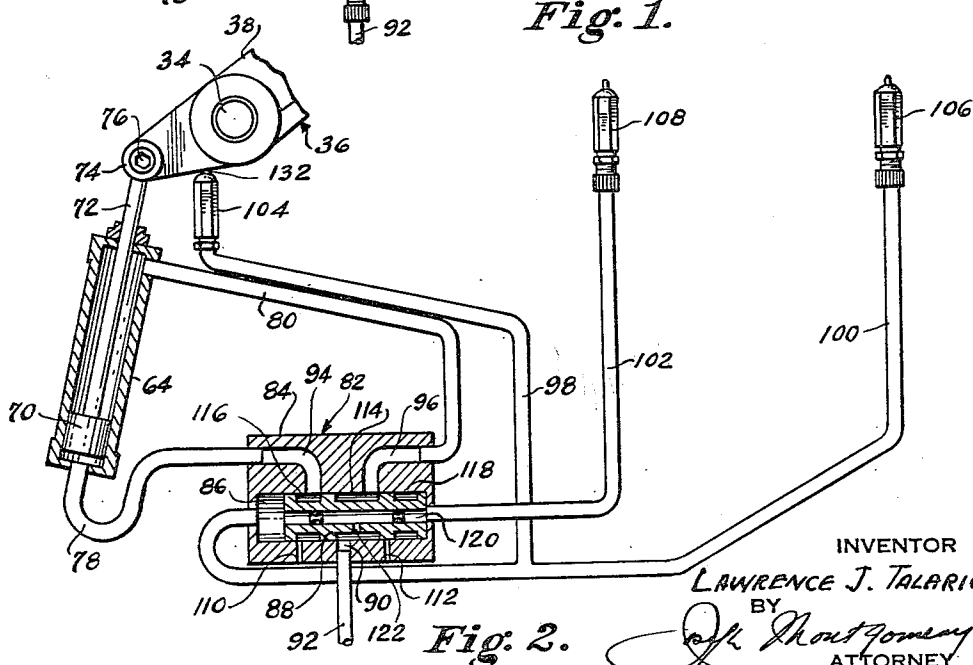


Fig. 2.

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3,112,690

MARKING APPARATUS

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Filed Oct. 26, 1961, Ser. No. 147,942

6 Claims. (Cl. 101—35)

This invention relates generally to marking apparatus and is particularly directed to improvements in apparatus for automatically marking a side surface and the back end surface of each of a succession of boxes, cartons and the like conveyed, in spaced apart relationship, past the marking apparatus.

Marking apparatus has been heretofore proposed for performing the above described function, for example, as disclosed in United States Letters Patent No. 2,834,288, or in United States Letters Patent No. 2,880,669, both of which have been assigned to the assignee of the present application, but such existing apparatuses have certain functional disadvantages which it is desirable to avoid. More specifically, the marking apparatus disclosed in United States Letters Patent No. 2,880,669 is actuated its operation, upon a driving force frictionally transmitted from the conveyed box, carton and the like which is to be marked, and this frictional transmission of the driving or operating force tends to be unreliable, particularly when the conveyed box or carton is moving at a relatively high speed. The marking apparatus disclosed in United States Letters Patent No. 2,880,669 is actuated by an electrically energized solenoid and has proven to be relatively expensive to manufacture, as well as being unsuitable for use in an explosive or other environment in which electrical apparatus cannot be conveniently employed. Further, when it is desired to mark a side surface and the back end surface of each of a succession of conveyed boxes or cartons by a marking apparatus of the existing types mentioned above, and, at the same time, to mark the other side surface and the front end surface of each conveyed box or carton by a marking apparatus of the kind disclosed fully in United States Letters Patent No. 2,834,287, which is also assigned to the same assignee as the present application, the marking apparatuses employed for marking the back end and side surfaces and the front end and side surfaces, respectively, of each box or carton are made up of wholly different components and sub-assemblies so that the manufacturer of such marking apparatus must bear the obviously relatively high cost of producing numerous different parts, components and sub-assemblies, and of maintaining adequate supply of replacement or spare parts, components and sub-assemblies.

Accordingly, it is an object of the present invention to avoid the above-mentioned disadvantages of the existing or previously proposed marking apparatuses for applying markings to a side surface and the back end surface of each of a succession of boxes, cartons and the like conveyed past the marking apparatus.

More specifically, it is an object of the invention to provide a relatively simple and inexpensive marking apparatus for reliably performing the above stated function, and which is constructed from numerous parts, components and sub-assemblies of the same type as those included in the marking apparatus for applying markings to the front end and a side surface of each of a succession of conveyed boxes or cartons, as disclosed in United States Letters Patent No. 2,834,287.

In accordance with an aspect of this invention, a marking apparatus for marking a side surface and the back end surface of each of a succession of boxes or cartons conveyed, in spaced apart relationship, past the marking

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apparatus comprises a marking wheel provided with a locking or latching device and being rotatably mounted on the free end of an arm which is pivoted, adjacent its other end, on a supporting structure disposed at one side of the conveyor carrying the boxes or cartons to be marked, all as disclosed in United States Letters Patent No. 2,834,287, but with the pivoted arm extending from its vertical pivoting axis generally in the direction opposed to the direction of movement of the conveyed boxes or cartons, and with the swinging of the pivoted arm for moving the marking wheel into and out of the path of the conveyed boxes or cartons being effected by suitably controlling the supplying of fluid under pressure, for example, compressed air, to an actuating cylinder having a piston reciprocable therein and provided with a rod which is connected to the pivoted arm.

In accordance with another aspect of the invention, the supplying of the fluid under pressure to the actuating cylinder of the marking apparatus is controlled by the successive conveyed boxes or cartons so that, upon a box or carton reaching a predetermined position with respect to the marking apparatus, the pivoted arm is angularly urged toward the path of the conveyed box or carton so as to contact the marking wheel initially with a side surface of the box or carton for applying the desired markings first to such side surface and then to the back end surface of the box or carton, whereupon the pivoted arm is automatically displaced angularly to an inoperative position at the side of the path of the conveyed boxes or cartons so as to avoid interference with the movement past the marking apparatus of the next conveyed box or carton. Further, the control of the supply of fluid under pressure to the actuating cylinder by the successive conveyed boxes or cartons is arranged so that, in the event that the spacing between adjacent conveyed boxes or cartons is inadequate to permit the completion of a marking operation, the pivoted arm is either maintained in its inoperative position out of the path of travel of the conveyed boxes or cartons, or is prematurely returned to such inoperative position, thereby to prevent jamming of the pivoted arm and the marking wheel carried thereby between such inadequately spaced apart adjacent boxes or cartons on the conveyor.

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

FIG. 1 is a top plan view of a marking apparatus embodying the invention, and being shown in the condition thereof immediately before the completion of a marking operation;

FIG. 2 is a schematic view of a pneumatic or compressed air control system employed in the marking apparatus of FIG. 1, and being shown in the condition thereof at the completion of a marking operation;

FIG. 3 is a top plan view similar to that of FIG. 1, but showing the condition of the marking apparatus immediately before the commencement of a marking operation;

FIG. 4 is an enlarged detail view, partly broken away and in section, of one of the box or carton actuated control valve assemblies included in the apparatus of FIGS. 1 and 2, with an actuating finger of such assembly being shown in full lines in its normal position and, in broken lines, in a displaced position to which it is moved by engagement with a conveyed box or carton; and

FIG. 5 is a detail view similar to that of FIG. 4, but illustrating the action of the actuating finger during the

return of the latter from its displaced position to its normal position.

Referring to the drawings in detail, and initially to FIG. 1 thereof, a marking apparatus embodying the present invention is there illustrated and generally identified by the reference numeral 10. The apparatus 10 includes a support base 12 which is suitably mounted to one side of a conveyor 14 forming no part of the present invention and being of conventional construction so as to move successive rectangular boxes, cartons and the like, as indicated at A, along a horizontal rectilinear path.

A standard or post 18 extends upwardly from the base 12 and a horizontal support arm generally identified by the reference numeral 20 is secured on the post 18 in a vertically adjusted position. The support arm 20 includes portions 22 and 24 extending in opposite directions from a hub or collar 26 slideable on a post 18 and being releasably clamped or secured relative to the latter, for example, by a set screw 28. The portion 22 of the support arm extends toward the conveyor 14 and the major portion of its free end edge 30 is parallel to the path of travel of the boxes and carries a bearer strip 32 along which the successive boxes slide during marking of the latter.

A bolt 34 forming a pivot extends upwardly from the support arm portion 22 adjacent the free end of the latter, and an arm, generally identified by the numeral 36 is pivotally mounted on the bolt 34 for swinging in a horizontal plane. The pivoted arm 36 includes two angularly related, integral portions 38 and 40, and the arm portion 38 is formed with a boss 42 at a location which is adjacent to and spaced from the free end of portion 38 and having a suitable bushed bore receiving the bolt 34. Thus, the pivoted arm 36 is supported adjacent one end and extends generally in the direction opposed to the movement of the conveyed boxes, as indicated by the arrow 44 on FIG. 1, with the arm portion 40 being bent relative to the arm portion 38 in the direction toward the conveyor 14 to project into the path of travel of the boxes A when the arm 36 is in the position shown on FIG. 1.

At its free end, the arm portion 40 is bifurcated to provide two spaced legs between which a fixed vertical axle 50 extends. A marking wheel 54 is rotatably mounted on the axle 50 and supports a marking element or elements on its periphery. Since an inked impression or marking is to be applied to the successive conveyed boxes or cartons, an inking roller 58, which is preferably of the kind having an internal ink reservoir feeding ink to a surrounding felt or other absorbent pad, is rotatably mounted on a shaft 60 extending upwardly from a lever arm 62 which is pivotally mounted on arm portion 40 and spring urged in the direction for effecting rolling contact of inking roller 58 with the marking element or elements carried by wheel 54.

It is to be noted that the above described parts and sub-assemblies of the marking apparatus 10 embodying the present invention for applying markings to a side surface and the back end surface of each of the conveyed boxes or cartons are substantially the same as the correspondingly numbered parts and assemblies of the apparatus disclosed in United States Letters Patent No. 2,834,287 for applying markings to the front end surface and a side surface of each of the successive conveyed boxes or cartons, with the sole difference being that the arm 36 of the apparatus being described herein extends from its pivot 34 generally in the direction opposed to the direction of movement 44 of the conveyed boxes or cartons whereas, in the marking apparatus disclosed in the above identified patent, the pivoted arm 36 extends from its pivot 34 generally in the direction of movement of the boxes or cartons to be marked.

In accordance with the present invention, the swinging

movements of the pivoted arm 36 are effected by a fluid pressure operated actuating cylinder 64 pivotally mounted, at one end, on a vertical pin 66 depending from a flange 68 extending upwardly and to one side from the free end of support arm portion 24. Actuating cylinder 64 has a piston 70 reciprocable axially therein and secured to a piston rod 72 which projects from the end of the cylinder remote from its pivot 66. The end of piston rod 72 is in the form of a fork 74 which is pivotally secured, as by a screw 76, extending through the free end of arm portion 38.

Conduits 78 and 80 are suitably connected to the opposite ends of actuating cylinder 64 and are alternately communicated with a source of compressed air and the atmosphere, respectively. It will be apparent that, when compressed air is supplied to cylinder 64 through conduit 80, piston rod 72 is retracted into cylinder 64 and swings arm 36 outwardly into the path of travel of the conveyed boxes or cartons. On the other hand, when compressed air is supplied to actuating cylinder 64 through conduit 78, piston 70 moves within the cylinder to extend the piston rod 72 and thereby effects swinging of arm 36 in the direction withdrawing such arm and the marking wheel 54 out of the path of travel of the conveyed boxes or cartons to the inoperative position illustrated in FIG. 3.

Referring to FIG. 2 of the drawing, it will be seen that a pneumatic or compressed air control system for the marking apparatus 10, as there schematically illustrated, includes a distributing valve 82 which may be of the type that is commercially available from the Mead Specialty Company under the designation Model No. 420. The distributing valve 82 may generally include a body 84 having a bore 86 in which a valve spool 88 is axially slidable. The body 84 may further have a central port 90 opening into bore 86 and connected by a conduit 92 to a suitable source (not shown) of compressed air, and ports 94 and 96 opening into bore 86 at locations spaced oppositely from the center of the latter and being connected to the conduits 78 and 80, respectively. Body 84 of the distributing valve further has ports at the opposite ends of bore 86 connected to branched conduits 98 and 100 and to a conduit 102, respectively, which extend to poppet valves 104, 106 and 108. Finally, body 84 may have vent openings 110 and 112 extending from bore 86 to the atmosphere at locations along the bore between the ports 94 and 96 and the adjacent ends of the bore, respectively.

The valve spool 88 has a central annular recess 114 and auxiliary annular recesses 116 and 118 disposed between central recess 114 and the opposite ends of the valve spool. Spool 88 further has an axial bore 120 extending therethrough and a radial passage 122 opening from axial bore 120 to the central annular recess 114. The annular recesses of spool 88 and the various ports of valve body 84 are dimensioned and relatively located so that, when spool 88 is shifted toward the right in bore 86, for example, to the position illustrated in FIG. 2, port 96 and conduit 80 are placed in communication with port 90 and conduit 92 extending from the supply of compressed air so that the compressed air admitted to actuating cylinder 64 urges arm 36 outwardly into the path of travel of the conveyed boxes or cartons A. With the valve spool 88 in the described position, auxiliary recess 116 thereof communicates conduit 78 with the vent opening 110 so that air within actuating cylinder 64 will not resist movement of piston 70 by the compressed air supplied to the actuating cylinder through conduit 80. On the other hand, when valve spool 88 is shifted toward the left hand end of bore 86, as viewed in FIG. 2, the connections for the conduits 78 and 80 are reversed, that is, compressed air is supplied to the actuating cylinder to conduit 78 while conduit 80 is connected to the related vent opening 112.

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It will be noted that the radial passage 122 of valve spool 83 is always in communication with the port 90 and compressed air supply conduit 92 so that air under pressure is admitted to the opposite ends of bore 86 through axial bore 120 of the valve spool. The above mentioned shifting of valve spool 88 to one end or the other of bore 86 is achieved by alternately releasing the pressure of air at the opposite ends of bore 86. The release of the pressure of air at one or the other end of bore 86 is achieved by actuation of one of the poppet valves 104 and 106 or by actuation of the poppet valve 108.

The poppet or limit valves 104, 106 and 108 may be of a type that is commercially available from the Mead Specialty Company under the designation No. 404. As shown by way of example in FIG. 4, each of the poppet or limit valves may include a hollow valve body 124 suitably connected to the end of the related conduit 98, 100 or 102 and having an air discharge opening 126 at its free end which is normally closed by a ball valve 128 under the influence of a spring 130. An actuating pin 132 extends from the ball valve 128 loosely through the air discharge opening 126 so that the ball valve 128 can be unseated by depressing the pin 132 to permit the escape of air under pressure from the related conduit through the annular clearance around pin 132.

It will be apparent that the actuation of one of the poppet valves 104, 106 or 108 causes a reduction of the air pressure at the related end of bore 86 so that the valve spool 88 shifts axially toward the end of lower pressure.

Since the pressures at the opposite ends of bore 86 balance when all of the poppet valves 104, 106 and 108 are closed, valve spool 88 tends to remain in any position to which it is displaced so that shifting of the valve spool from one end to the other end of bore 86 requires only momentary actuation of one of the poppet valves.

As is seen in FIGS. 1 and 3, poppet valve 104 is secured in a clamp 134 on support portion 22 with its actuating pin 132 located so that it is depressed by the portion 38 of pivoted arm 36 when the latter has swung into the path of travel of the conveyed boxes or cartons to the maximum extent desired, that is, at the end of a marking operation. When actuating pin 132 of poppet valve 104 is depressed by arm portion 38 at the completion of a marking operation, as in FIG. 2, valve spool 88 is accordingly shifted, as described above, to supply compressed air to actuating cylinder 64 through conduit 78 while the opposite end of cylinder 64 is vented to the atmosphere through conduit 80, whereby pivoted arm 36 is swung out of the path of travel of the conveyed boxes or cartons to the inoperative position shown in FIG. 3.

Each of poppet valves 106 and 108 is associated with an actuating assembly which is generally identified by the reference numeral 136 and has the construction shown in detail in FIGS. 4 and 5. Each actuating assembly 136 includes a body 138 in which the related valve 106 or 108 is clamped so that its actuating pin 132 extends between two spaced apart ears 140 projecting from body 138. An actuating finger 142 is pivotally mounted on a pin 144 extending between ears 140 and has a forked end extending toward body 138 and carrying a pivot pin 146 on which a tripping member 148 is rockably mounted. A small spring 150 is interposed between actuating finger 142 and tripping member 148 to urge the latter to the position relative to the actuating finger 142 shown in FIG. 4. The tripping member 148 is rockable from such position only in one direction, that is, in the counterclockwise direction about pin 146, as viewed in FIGS. 4 and 5. Thus, when actuating finger 142 is rocked in the counterclockwise direction, as viewed in FIG. 4, to the position shown in broken lines as 142', tripping member 148 rides against actuating pin 132 of the related poppet valve to open the latter. As actuating finger 142 swings further in the counterclockwise direction beyond the position 142', tripping member 148 again releases the

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actuating pin 132 of the related valve 106 or 108 to permit closing of the latter. On the other hand, during return of actuating finger 142 to the position shown in full lines on FIG. 4 under the influence of a tension spring 152 extending between anchor pins 154 and 156 on actuating finger 142 and body 138, respectively, tripping member 148 rocks relative to the actuating finger 142, as shown in FIG. 5, and merely rides over the actuating pin 132 of the related poppet valve so that the latter remains in its closed position.

Accordingly, it will be apparent that the poppet valve 106 or 108 is only momentarily opened during swinging of the related actuating finger 142 in the counterclockwise direction, as viewed in FIGS. 4 and 5, and remains in its closed position during the return clockwise swinging of the actuating finger to the normal position shown in full lines on FIG. 4.

As shown in FIGS. 1 and 3, the actuating assemblies 136 associated with the poppet valves 106 and 108 are mounted on a frame member 158 or the like of the conveyor 14 at successive spaced apart locations along the path of travel of the conveyed boxes or cartons in advance of the location of the base 12 of the marking apparatus, and are arranged so that the actuating fingers 142 of the actuating assemblies normally project into the path of travel and are engaged and rocked out of the path of travel by the successive conveyed boxes or cartons.

During normal operation of the marking apparatus 10, pivoted arm 36 will be in its inoperative position (FIG. 3) as a box or carton approaches the actuating assembly 136 associated with poppet valve 106. Thus, the engagement and rocking of the finger 142 of that actuating assembly by the conveyed box or carton, which momentarily opens poppet valve 106, will have no effect in that it merely tends to move valve spool 88 of distributor valve 82 toward the end of the bore 86 to which it had been previously moved by actuation of valve 104 in causing the return swinging of arm 36 to its inoperative position.

However, when the conveyed box or carton subsequently engages and rocks the finger 142 of the actuating assembly 136 associated with poppet valve 108 to momentarily open the latter, the valve spool of distributor valve 82 will be shifted to reverse the connections of conduits 78 and 80, as previously described herein, and thereby urge arm 36 into the path of travel of the box or carton. As shown clearly in FIG. 3, the actuating assembly 136 associated with poppet valve 108 is located so that, at the moment of its rocking and engagement by a conveyed box or carton, a side surface of the latter will be adjacent the marking wheel 54, whereby the movement of arm 36 into the path of travel of the conveyed box or carton initially effects engagement of marking wheel 54 with the side surface of the box or carton. As the conveyed box or carton moves past marking apparatus 10, marking wheel 54 rolls along the side surface of the box or carton toward the back corner of the latter, and then around such corner and across the back end surface of the box or carton. The movement of marking wheel 54 across the back end surface of the conveyed box or carton is accompanied by further swinging of arm 36 into the path of travel until arm portion 38 engages actuating pin 132 of poppet valve 104 and, as previously described herein, effects return swinging movement of arm 36 back to its inoperative position.

Since marking wheel 54 of apparatus 10 is of the same type as the marking wheel bearing the same number in United States Letters Patent No. 2,834,287, marking wheel 54 includes a locking or latching device which is not illustrated or described in detail herein and may be similar to the locking or latching device identified by the numeral 100 in the above-identified patent. Such locking or latching device is operative to hold the marking wheel 54 in a predetermined rotational position relative to its axle 50 at the completion of a marking operation, and is released

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upon the initial contact of the marking wheel with a side surface of the conveyed box or carton.

In the event that the spacing between adjacent conveyed boxes or cartons is inadequate to permit the safe completion of a marking operation and the return of pivoted arm 36 to its inoperative position so that some danger exists that the marking wheel 54 will be jammed between adjacent boxes or cartons, the box or carton following the one which is being marked will engage and rock the finger 142 of the actuating assembly associated with poppet valve 106 to cause momentary opening of the latter before the normal operation of the poppet valve 104 would occur. Such actuation of the poppet valve 106 will shift the spool of distributor valve 82 to the position for swinging arm 36 out of the path of travel and thereby prevent jamming of marking wheel 54 between the adjacent boxes or cartons with inadequate spacing therebetween.

From the above, it will be apparent that the marking apparatus 10 embodying this invention employs many parts, components and sub-assemblies used in the side and front end marking apparatus of United States Letters Patent No. 2,834,287, and is operative to mark a side surface and the back end surface of each of the successive conveyed boxes or cartons, with such operation being pneumatically controlled in a simple and reliable manner.

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

What is claimed is:

1. Apparatus for marking a side surface and the back surface of each of a series of spaced apart rectangular articles conveyed successively past the apparatus; said apparatus comprising an arm having a marking wheel rotatably mounted at one end, means swingably supporting said arm at the other end thereof for swinging movement into and out of the path of travel of the conveyed articles from and to an inoperative position alongside said path of travel where said arm extends generally in the direction opposed to the movement of the articles, fluid pressure operated actuating means connected to said arm and operative alternatively in first and second directions to swing said arm in the directions from and to said inoperative position, respectively, means for supplying fluid under pressure to said actuating means including valve means which is actuable to cause said actuating means to alternatively operate in said first and second directions, and control means for said valve means including a first control element engageable by a conveyed article moving past the apparatus to cause said valve means to effect operation of said actuating means in said first direction so that said marking wheel rolls along a side surface of the article and across the back surface of the latter during swinging of said arm from its inoperative position, a second control element engageable by said arm upon a predetermined angular displacement of said arm from said inoperative position to cause said valve means to effect operation of said actuating means in said second direction for returning said arm to its inoperative position upon completion of the marking of a conveyed article, and a third control element disposed adjacent the path of travel of the conveyed articles in advance of said first control element and being engageable by a conveyed article approaching the apparatus to cause said valve means to effect operation of said actuating means in said second direction so that said arm is returned to its inoperative position after starting swinging movement from the latter in the event that the conveyed article being marked is followed too closely by the next conveyed article, thereby avoiding jamming of said

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arm and marking wheel between adjacent conveyed articles.

2. Apparatus for marking a side surface and the back surface of each of a series of spaced apart rectangular articles conveyed successively past the apparatus; said apparatus comprising an arm having a marking wheel rotatably mounted at one end thereof, support means swingably mounting said arm at the other end thereof for swinging movement into and out of the path of travel of the conveyed articles from and to an inoperative position where said arm is disposed alongside said path of travel and extends generally in the direction opposed to the movement of the conveyed articles, an actuating cylinder mounted on said support means and having a piston reciprocable therein and connected with said arm to swing the latter from and to said inoperative position when compressed air is supplied to one end of said cylinder and to the other end of said cylinder, respectively, means for supplying compressed air to said cylinder and including a distributor valve shiftable between first and second positions in which compressed air is directed to said one end and said other end, respectively, of said cylinder, and control means for said distributor valve including a first control element engageable by a conveyed article moving past the apparatus to shift said distributor valve to said first position for causing swinging movement of said arm from its inoperative position, a second control element engageable by said arm upon predetermined angular displacement of the latter from said inoperative position to shift said distributor valve to said second position for causing return swinging of said arm to said inoperative position, and a third control element engageable by a conveyed article in advance of said first control element to shift said distributor valve to said second position for causing return swinging of said arm to said inoperative position in the event that a conveyed article engaging said first control element to cause swinging of said arm from its inoperative position is followed too closely by the next conveyed article.

3. Apparatus as in claim 2; wherein said distributor valve is pneumatically operated to shift between said first and second positions, and each of said first, second and third control elements includes a poppet valve operative to cause pneumatic shifting of said distributor valve to the related position.

4. Apparatus as in claim 2; wherein said distributor valve includes a body having a bore therein with a spool shiftable in said bore between said first and second positions, said body further having an inlet passage for compressed air opening into said bore and first and second outlet passages extending from said bore and connected to said one end and said other end of the cylinder, respectively, said spool directing compressed air from said inlet passage alternatively to said first and second outlet passages in said first and second positions, respectively, of the spool, said valve further having means admitting compressed air to the opposite ends of said bore to act against said spool for shifting the latter in response to a difference between the pressures in said ends of the bore; and wherein each of said first, second and third control elements includes a normally closed valve connected to a related end of said bore and operative, when engaged, to vent said related end of the bore to atmosphere for producing a difference between the pressures in said ends of the bore and thereby shifting said spool selectively to said first and second positions.

5. Apparatus as in claim 4; wherein said valve of the second control element is a poppet valve mounted on said support means and having a projecting actuating pin engageable by said arm to open said poppet valve.

6. Apparatus as in claim 4; wherein said valve of each of said first and third control elements is a poppet valve mounted alongside said path of travel of the conveyed articles and having a normally projecting actuating pin

opening the poppet valve when said pin is depressed; and wherein each of said first and third control elements further includes a pivoted actuating finger urged into said path of travel for rocking by the successive conveyed articles, and a trip member movably carried by said 5 finger to depress said actuating pin of the related poppet valve only during rocking of said finger by an article and to glide over said pin during return of said finger into said path of travel upon release by a conveyed article.

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