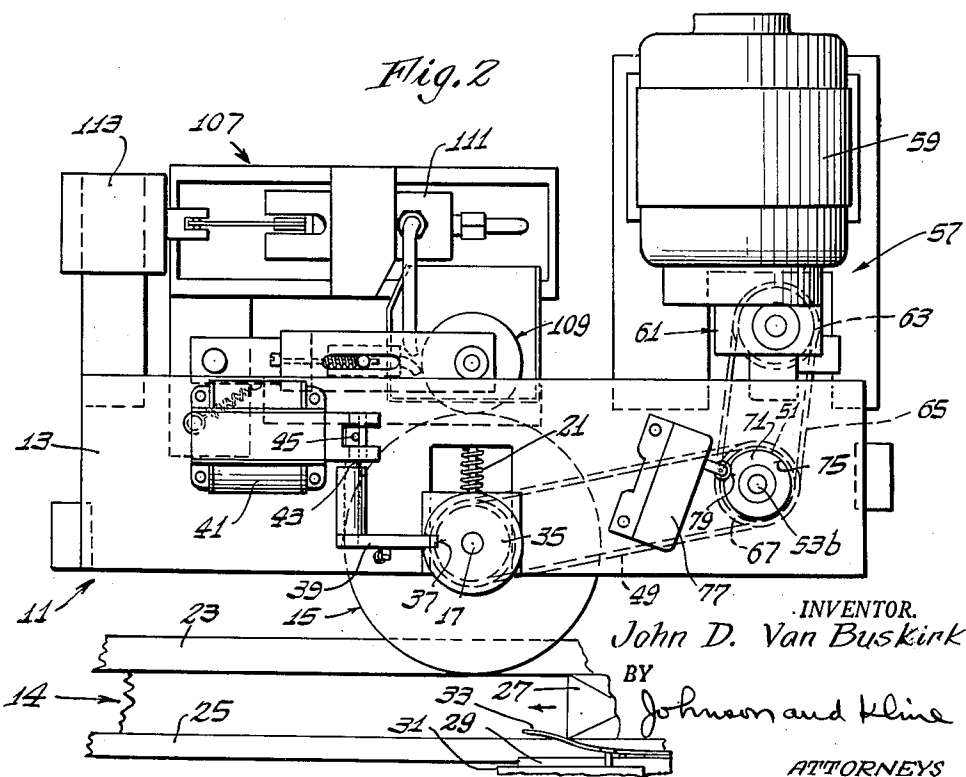


3,092,019

Filed Nov. 23, 1956

2 Sheets-Sheet 1



INVENTOR.
John D. Van Buskirk
BY
Johnson and Kline
ATTORNEYS

June 4, 1963

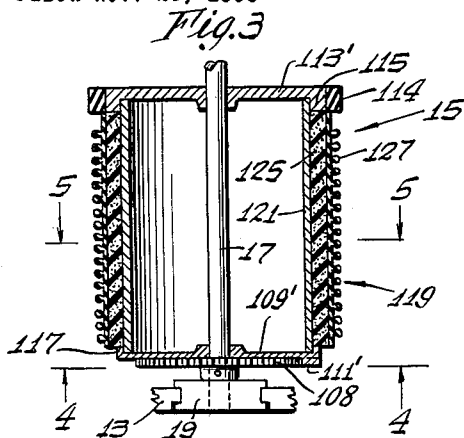
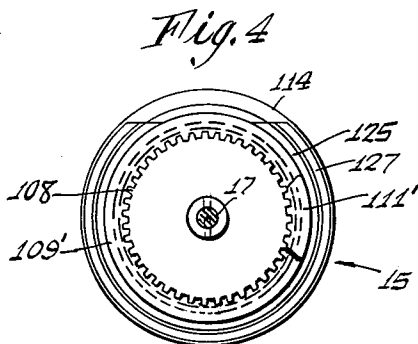
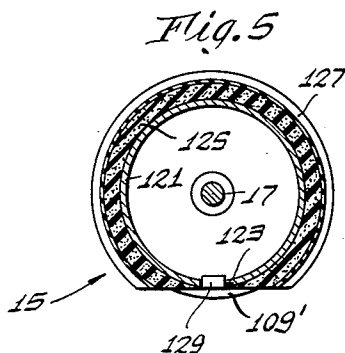
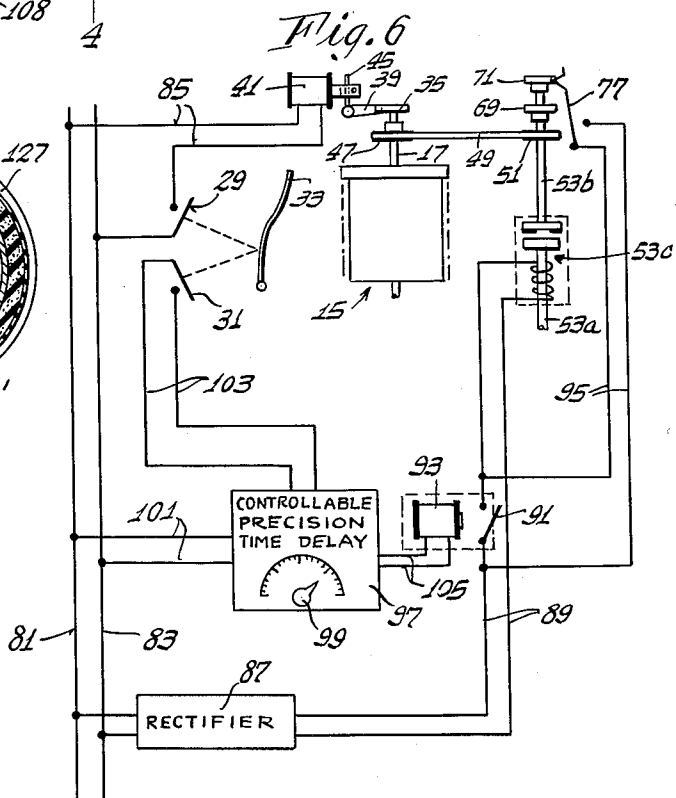
J. D. VAN BUSKIRK

3,092,019

ARTICLE MARKING

Filed Nov. 23, 1956

2 Sheets-Sheet 2



INVENTOR.
John D. Van Buskirk
BY
Johnson and Kline
ATTORNEYS

1

3,092,019

ARTICLE MARKING

John D. Van Buskirk, Southport, Conn., assignor to Van Buskirk & Co., Incorporated, Bridgeport, Conn., a corporation of Connecticut

Filed Nov. 23, 1956, Ser. No. 624,058

7 Claims. (Cl. 101—35)

This invention relates to marking or printing on packages or other articles, and more particularly to apparatus and methods of employing rotary printing or marking means for marking a series of similar articles and actuated in response to movement past such means of the articles to be printed or marked.

It has been known heretofore to provide for the marking of articles or packages by means of rotary printing drums, and the registration of the mark has in some cases been sought to be controlled by normally maintaining the drum in a predetermined rest position between printings and causing the same to be picked up and frictionally operated by the article to be marked as it is driven past the drum by suitable conveying means. For many purposes this arrangement has proved effective, especially when carried out with appropriate controls, as shown in my prior applications, Serial No. 320,463 filed November 14, 1952, now U.S. Patent No. 2,834,284, and Serial No. 443,927, filed July 16, 1954, now U.S. Patent No. 2,870,702.

However, there are some situations in which the driving of the printing drum by contact with the article to be printed does not prove to be fully effective. As an example, when it is desired to place printing at a location closely adjacent the leading edge of an article and even more especially when it is desired to print substantially the full face of the article so that no space is provided for driving contact other than with the type surface, the impression is sometimes marred by slippage and the like.

It is accordingly one object of the present invention to provide for the making of impressions on an article moving past a rotary printing drum in such a way that printing quality can be maintained regardless of the relative area or placement of the mark.

According to the present invention the foregoing object is achieved by providing a rotary printing drum having a stationary home position and means for driving the drum at a surface speed substantially the same as that of the article, together with means for initiating action of the drum at the precise instant necessary to make it reach article speed by the time that printing contact begins and also to place the mark at the desired location with a high degree of exactness. In this connection I have discovered that an electromagnetic clutch device, tripped by means actuated by the article to be marked, and making the driving connection which alters the condition of the printing drum from one of immobility at home position to one of rotary motion at substantially article surface speed, has special properties insofar as securing accurate results are concerned. In many cases it is desired to place a mark in precise registry with the outline of the article or other preformed indicia on the article, under conditions such that the slightest deviation from the prescribed position would be clearly noticeable and would mar the effect. I have found that with my improved organization, including such article tripped electromagnetic clutch device, the ultimate in accuracy of registration can be achieved. In fact, by application of the principles of the present invention it has even been found possible to test exactness of registration by rerunning and overprinting an article previously marked on the machine, with results of such high quality that the fact of the subsequent running cannot be

2

determined by visual inspection, except possibly by comparison of color density of the mark in some instances.

A feature of the present invention is the provision of means whereby the location of the mark along the article in the direction of movement can be readily and conveniently adjusted to the exact location desired without the necessity for effecting any mechanical change in the equipment.

Another object of the present invention is the provision of an improved printing drum having a demountable type-carrying part whereby changeover of the type between runs can be effected in a matter of seconds.

Additional objects, features and advantages will appear hereinafter as the description proceeds.

In the drawings:

FIGURE 1 is a front elevation of a printing head designed for use in accordance with the present invention, and illustrating alternate power drives.

FIG. 2 is a top plan of the device of FIG. 1, but showing the same positioned relative to a conveyor, an article carried by the conveyor, and a pair of feeler-operated switches associated therewith in a controlling relation.

FIG. 3 is an axial section of the printing drum shown in FIGS. 1 and 2.

FIG. 4 is a section taken substantially on line 4—4 of FIG. 3.

FIG. 5 is a section taken substantially on line 5—5 of FIG. 3.

FIG. 6 is a schematic view of the printer of the present invention including a wiring diagram.

Referring to the drawing, the present invention is concerned with a printing head 11 including a frame 13 which rotatably supports a printing drum 15 which is carried drivingly connected to a shaft 17. Preferably the shaft 17 is rotatably supported in bearing blocks 19 which are slidable on the frame 13 and urged to a forward position by springs 21 to provide a certain amount of resiliency to the drum mounting which will allow for unevenness in the surface of the article being marked or slight inaccuracy in the positioning of the frame 13 relative to the article path.

The frame 13 is mounted adjacent a conveyor 14 which carries articles past the same in contact with the printing surface of drum 15. For convenience, the conveyor is illustrated in FIG. 2 as including a pair of guide rails 23 and 25 between which is propelled an article 27 by any suitable means (not shown). Mounted adjacent the path of the article 27, at any suitable location, are a pair of electrical switches 29 and 31 arranged to be closed by a feeler 33 whenever the latter is in contact with an article 27, and whose connections and operation will appear hereinafter as the description proceeds. The drum shaft is shown in FIGS. 1 and 2 in rest or home position. At one end of the shaft is a disk 35 having a notch 37. A locking member 39 occupies this notch 37 and locks the drum in home position when appropriate. The locking member or tongue 39 is operated by a solenoid 41 through a shaft 43 and an arm 45 to remove tongue 39 from the notch 37 whenever the solenoid is energized.

Means are provided for rotating the printing drum and include a sprocket 47 on the drum shaft 17 driven through a chain 49 which encircles a driving sprocket 51. The driving sprocket 51 is secured to the driven section 53b of countershaft assembly 53 which includes the driving section 53a, the driven section 53b, and a connecting electromagnetic clutch 53c. The driving section 53a receives its power from any suitable source and is continuously rotated thereby at a speed sufficient to provide the printing drum with a surface speed substantially equal to that of an article being moved by the conveyor 14. Two alternative forms of driving the shaft section 53a are both illustrated in FIG. 1, and while both could be

used together as shown, it will be understood that in the normal course of affairs either one or the other would be employed alone.

One power-supplying device is illustrated as a flexible shaft 55 which may be connected to the drive for conveyor 14 at any suitable point (not shown) to take off power at the desired rotary speed indicated above.

The other power-supplying device, and the one presently preferred, is indicated generally by reference numeral 57 and includes an electric motor 59 driving, through suitable gearing 61, a sprocket 63, a chain 65, and a sprocket 67 on countershaft section 53a. The gearing 61 and sprocket sizes are calculated to give a surface speed of drum 15 which is as nearly as possible the exact rated surface speed of an article being moved by the conveyor 14. This speed need not be absolutely exact for most purposes with printing drums of normal peripheral sizes. It has been found that in most cases the mark is perfect so far as normal visual inspection is concerned if the speed difference does not exceed about ten parts in one hundred with the conveyor having whatever speed advantage may exist. In this way it has been found possible to use stock gears and sprockets and still obtain sufficiently similar speeds for exceptional printing quality. It should be pointed out that in this situation both the conveyor 14 and the drum 15 will normally be electrically powered, and that if ample motor size is allotted to each function, and the electric power drawn from about the same supply circuit location, voltage fluctuations, if any, will affect both parts of the system equally so that adequate mechanical synchronization will be had under all supply voltage conditions. With an arrangement as described it is possible to provide for any one machine a number of printing heads which are instantaneously interchangeable, since merely plugging or unplugging the power cable is all that is required beyond manipulation of such fastener as may be used to hold the frame 13 in place. It will be understood, of course, that any suitable quick-acting readily releasable fastening means may be used to secure the frame 13 to a suitable base such as a fixed portion of the frame (not shown) of conveyor 14.

Attention should be called to the arrangement of countershaft assembly 53, printing drum shaft 17 and the connecting driving means 47, 49, 51. It will be seen that by providing the shafts in a parallel arrangement and making the direction of motion of bearing blocks 19 approximately tangent to a circle centered on the countershaft assembly 53 so that the degree of mesh between sprockets 47 and 51 and chain 49 is not substantially altered during movement, the printing drum is free to make slight compensating movements, but its drive can be continuous during such slight movement, and the clutch 53c for making and breaking the drive connection can be immobile but still accurately control the operation of the slightly shiftable printing drum.

At the upper end of countershaft portion 53b are cams 69 and 71. While they are shown in this position for construction convenience it will be understood that any location providing a rotary speed equal to that of the printing drum will serve the purpose. The cam 69 serves to open and close an electrical switch 73 once each revolution in connection with the inking function in a manner which will presently appear. The cam 71 is shown as having a circular peripheral portion 75 which holds an electrical switch 77 closed during most of its rotation, but provides a local deviation corresponding to the home position of drum 15, here shown as a notch 79, allowing the switch 77 to open when the drum 15 is in home position. As will presently appear, cam 71 and switch 77 provide the main elements of a mechanically maintained electrical holding circuit which assures continued energization of clutch 53c in all positions of drum 15 except the home position, whereby the drive to the drum through clutch 53c will be maintained in all non-home positions, thus

always returning the drum to home position regardless of the time of termination of other drive controlling influences thereon.

In FIG. 6 are illustrated in detail some of the parts heretofore described, in relation to the electrical devices and connections which control the operation. The main alternating current supply consists of conductors 81 and 83, and it can be seen that the switch 29 controls the energization of solenoid 41 therefrom by way of a circuit 85. A rectifier 87 converts the power in supply lines 81, 83 to direct current for feeding the electromagnetic clutch 53c by way of a circuit 89. Making and breaking of this circuit is under control of a switch 91 of the relay 93, or under control of switch 77 which is in a parallel circuit 95 bypassing the switch 91.

A controllable precision time delay mechanism 97 is also provided for operating relay 93. One form of delay mechanism 97 which is generally illustrated in the drawing and which is presently commercially available consists of an electronic time delay mechanism having a manually settable control element 99. The delay mechanism draws its power from the supply lines 81, 83 via a circuit 101 and provides rectification and voltage regulation as part of its component parts. A trip circuit 103 from the time delay mechanism 97 is connected with feeler switch 31 and when the latter is closed it sets in motion the timing operation of the mechanism 97 which thereupon, via a control circuit 105, energizes the relay 93 after the predetermined time period has elapsed. Although illustrated for convenience as an ordinary solenoid relay, the relay 93 is preferably a fast-acting relay tube of a type commercially available, and the relay 93 and circuit 105 will normally be furnished assembled on the same chassis as the time delay device itself. By adjusting the manual control element 99, the time elapsing between the closing of switch 31 and the closing of switch 91 of relay 93 can be accurately predetermined substantially in microsecond increments.

In FIGS. 1 and 2 is generally illustrated an inking mechanism 107 including in inking roller 109 making inking contact with the type on the printing drum 15, a pump 111, and a pump operating solenoid 113. The solenoid 113 is in circuit with the switch 73 which periodically energizes the same. However, inasmuch as the preferred form of the inking mechanism actually shown forms no part of the present invention, reference is had to my copending application, Serial No. 596,329 filed July 6, 1956, for a showing of the same in detail.

In operation, articles 27 are fed to the printing point in a spaced series by the conveyor 14. As an article approaches the printing point it first strikes the feeler 33 thereby closing switches 29 and 31. Closing switch 29 energizes solenoid 41 thereby withdrawing tongue 39 from notch 37 and unlocking the printing drum 15. Closing of switch 31 energizes the trip circuit 103 of the delay mechanism 97 so that a short, accurately measured interval later, as determined by the setting of control element 99, relay 93 is energized, closing its switch 91 and thereby energizing the electromagnetic clutch 53c. Thereupon countershaft part 53b commences to rotate with the continuously rotating countershaft part 53a and rotation of the printing drum 15 is initiated. The printing drum is quickly accelerated to article surface speed and rolls the printed mark onto the adjacent face of the article as it is moved along by the conveyor 14.

It will be noted that as soon as the countershaft part 53b starts to rotate, switch 77 is closed by cam 71, so that energization for the clutch 53c is assured regardless of when the switch 91 opens, and rotation of the printing drum 15 continues at least until it reaches home position again. Normally, prior to this time, the marked article 27 will have passed beyond the feeler 33 so that solenoid 41 will have become deenergized and tongue 39 will have dropped against the upper surface of locking wheel 35. Furthermore, switch 31 will have been

5

opened, as will also switch 91 of relay 93, so that when the drum 15 finally reaches home position, notch 79 in cam 71 permits switch 77 to open, thus breaking all circuits to the clutch 53c to stop the drive to the printing drum. Simultaneously tongue 39 drops into notch 37 to lock the printing drum precisely in home position to await the initiation of another cycle by the next article 27 of the series.

In order to place the mark at the exact location desired along the article, it is necessary merely to run through several test articles, making a slight adjustment of the manual control element until the desired printing position is achieved. Thereafter, so long as this setting is maintained, and the type on the printing drum remains in the same location, the mark will be made at exactly the desired point on each article.

In order to make changeover from one printing job to another extremely rapid, I have provided an improved printing drum 15 having an inexpensive type-carrying part which can be quickly withdrawn from the balance of the drum, or as quickly replaced. This avoids actual separation of the type from the drum and makes it possible to hold the type in precisely the same location used in making the time delay setting, so that, if the setting of manual control element 99 is recorded, it is possible to repeat a printing similar to a previous one without running the test articles through, even though other printings with different settings have intervened.

The improved printing drum 15 is shown in detail in FIGS. 3 to 5 and includes, pinned to the shaft 17, a toothed wheel 108. A base disk 109' is rotatable and slidable on shaft 17 and rigidly carries an internally toothed sector 111' which can be moved axially out of mesh with wheel 108 by sliding the disk 109'. The parts can then be reengaged after rotating them through a certain relative angle. This provides a simple means for obtaining the correct angular position of the type on the printing drum in a fairly precise manner, but its use is not normally called for when equipment such as the delay device 97 is employed. The drum 15 also includes a head disk 113' slidable on shaft 17 and which may carry a peripheral tire 114 for driving engagement with the inking mechanism. The adjacent faces of the head disk 113' and base disk 109' have locating and centering means, such as the flanges 115 and 117 respectively, between which is carried a removable body element generally designated 119. The body element 119 consists essentially of a fairly thick-walled, relatively rigid tube 121 which is slotted from end to end as indicated at 123. The slot 123 is wide enough to pass freely the shaft 17 during doffing and donning of the body element 119. On the exterior surface of the body element are mounted suitable type-supporting means, e.g. a resilient blanket 125 and a resilient corrugated base 127 for interlocking with resilient type, having similarly corrugated parts, in a known manner.

The base disk 109' also carries a key 129 which is just the width of slot 123 and serves to fit within the same and thus lock the body element 119 against rotation relative to base disk 109' and shaft 17.

In order to change type using the improved printing drum 15, it is necessary merely to move the head disk 113' in a direction away from the base disk 109' and lift the body element 119 free, allowing the shaft 17 to pass through slot 123 in the process. Another body element 119 having different type thereon can then be inserted by reversing the process. When the body element is substantially in place, its slot 123 is fitted to key 129 and the head disk 113' and base disk 109' are brought together against its ends to center and position the same with respect to shaft 17.

While the printing drum parts in the present showing are so arranged that the force of gravity retains them in assembled position, it will be understood that spring

6

means urging the head disk 113' towards the base disk 109' can also be employed if desired.

For most purposes a circular tire 114 is preferred for driving engagement with the inking mechanism, since the frame 13 can ordinarily be adjusted to a level such that the tire 114 will be above the articles marked and will fail to have frictional contact therewith. If, however, it is desired to make a mark at a low point on a series of tall articles, the inking operation will not be seriously affected, if the head disk 113' is also made with a flattened side for facing towards the conveyor when the drum is in home position, similar to that shown for the body element 119.

From the foregoing description it will be seen that I have devised an improved rotary printer adapted to provide clear and accurate marking of passing articles regardless of the area thereof to be covered and position of the mark, together with improved features providing for extremely rapid changeover and adjustment during use.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. A marking machine for marking on articles as they are moved past the same by a conveyor, which comprises a rotary printing drum having a predetermined, stationary, non-marking home position, and having a notched locking disk rotatable therewith; a locking tongue urged towards the disk and receivable in the notch when the drum is in non-printing home position; drive means for the drum including an electromagnetic clutch having an energizing circuit; a relay controlling the energizing circuit of said clutch; a cam rotatable by the drive means co-ordinately with said drum rotation, and having a local deviation corresponding to home position of the drum; detector means for sensing the presence adjacent said drum of an article to be marked and actuatable thereby to operated condition; electromagnetic means responsive to the operated condition of said detector means for withdrawing said locking tongue from said notch; means responsive to the operated condition of said detector means for acting upon said relay to cause it to close the clutch circuit; and means including a switch operated by a follower cooperating with said cam for bypassing said relay and closing the clutch circuit except when affected by said local deviation when the drum is in home position.

2. A device as claimed in claim 1 in which the means for acting upon the relay includes a switch actuated by said detector means; and a controllable precision electronic time delay mechanism, triggered by actuation of said switch and operative to cause circuit closing actuation of said relay at an accurately measured interval thereafter.

3. In a marking machine, a rotary printing drum assembly comprising a shaft; a base element attached to the shaft against rotary motion thereon and against sliding motion in at least one direction; a head element slidable on the shaft and positioned at a side of the base element away from a direction in which it cannot slide; a readily removable and replaceable body between said elements consisting of a rigid tube having a slot throughout its length of a width to receive said shaft; means on said head and base elements for positioning and centering said body; and means to key said body to said base element against rotation relative thereto.

4. A marking machine for marking articles as they are moved past the same by conveyor means which comprises a rotary printing drum assembly having a predetermined, stationary, non-marking home position and including a shaft; a base element attached to the shaft against rotary motion thereon and against sliding motion in at least one direction; a head element slidable on the shaft and positioned at a side of the base element away

from a direction in which it cannot slide; a readily removable and replaceable body between said elements consisting of a rigid tube having a slot throughout its length of a width to receive said shaft; means on said head and base elements for positioning and centering said body; means to key said body to said base element against rotation relative thereto; means for normally locking said drum assembly in home position whenever attained; driving means continuously rotating at a speed such that when connected to said shaft the drum assembly will have a surface speed substantially equal to the surface speed of an article on said conveyor; means for detecting the presence adjacent the drum assembly of an article to be marked; means responsive to operation of said detecting means by an article for unlocking said drum assembly and maintaining it unlocked during the period of detecting means operation; an electromagnetic clutch for connecting said driving means to said drum assembly; and means responsive to operation of said detecting means by an article for energizing said electromagnetic clutch to effect connection between said driving means and said drum assembly to rotate the same, said means also including a precision time delay device triggered by operation of said detecting means, having a settable control element, and operative to energize said electromagnetic clutch at an interval after said detecting means operation determined by the setting of said control element.

5. In a marking machine, a rotary printing drum assembly comprising a shaft; a toothed plate drivingly affixed to the shaft; a base element slidable and rotatable on said shaft at one side of said plate and having thereon a toothed element complementary to the teeth of said plate and engageable therewith to adjustably position said base element about the axis of the shaft; a head element slidable on the shaft and positioned at the side of the base element away from said plate; a readily removable and replaceable body between said elements consisting of a rigid tube having a slot throughout its length of a width to receive said shaft; means on said head and base elements for positioning and centering said body; and means to key said body to said base element against rotation relative thereto.

6. A machine for marking articles as they are moved past the same by conveyor means, which comprises a rotary printing drum assembly having a predetermined, stationary, non-marking home position, said assembly including a readily removable and replaceable type-carrying portion connectable with the remainder of the assembly in a single position only of peripheral orientation; means for normally locking said drum assembly in home position whenever attained; driving means continuously rotating at a speed such that when drivingly connected with said drum assembly the latter will have a surface speed substantially equal to the speed of an article on said conveyor; means for detecting the presence adjacent the drum assembly of an article to be marked; means responsive to operation of said detecting means by an article for unlocking said drum assembly and maintaining it unlocked during the period of detecting means operation; and means, including a settable precision time

delay device triggered by operation of said detecting means, for effecting a driving connection between said driving means and said drum assembly, whereby accurate reruns of a given printing may be made with other printings interspersed but without additional set-up time for each such rerun by removing the original type-carrying portion with the type thereon after the first run and replacing it for each such rerun, and duplicating the time delay setting used during the first run for each such rerun.

7. A marking machine for marking articles as they are moved past the same by a conveyor, which comprises a rotary printing drum having an accurately predetermined, stationary, non-marking home position; means for accurately locking the drum in said position; driving means continuously rotating at a speed such that when connected to said drum the latter will have a surface speed substantially equal to the surface speed of an article on said conveyor; means for connecting said driving means to the drum to rotate the same and including an electromagnetic clutch which when energized effects the driving connection between the driving means and drum; means for detecting the presence of an article to be marked; means responsive to actuation of said detecting means by an article for disabling said locking means; means including a manually settable precision time delay device triggered by the response of said detecting means to an article and operative to initially energize said clutch after a time interval following said article detection accurately predetermined by the manual setting of said time delay device; holding circuit means connected to said clutch and actuated after initial movement of the drum for maintaining said clutch energized after initial movement of the drum and including a switch means rendered to be conducting; means for rendering the switch means non-conductive when the printing drum regains said home position to thereby deenergize said clutch, and means automatically activating said locking means when the drum regains said home position to accurately position said drum for a subsequent printing operation.

References Cited in the file of this patent

UNITED STATES PATENTS

505,172	Norrington	Sept. 19, 1893
1,514,109	Stenstrom	Nov. 4, 1924
1,550,234	Arnold	Aug. 18, 1925
1,583,403	Lien	May 4, 1926
1,906,738	Carroll	May 2, 1933
2,001,890	Rix	May 21, 1935
2,213,426	Anderson et al.	Sept. 3, 1940
2,315,729	Nunnally	Apr. 6, 1943
2,352,802	Ryan et al.	July 4, 1944
2,363,554	Ryan et al.	Nov. 28, 1944
2,471,098	Davies	May 24, 1949
2,636,436	Mann	Apr. 28, 1953
2,741,998	Donald	June 16, 1953
2,761,379	Herschey et al.	Sept. 4, 1956
2,762,176	Knapp et al.	Sept. 11, 1956
2,787,956	Kirby et al.	Apr. 9, 1957
2,870,702	Van Buskirk	Jan. 27, 1959
2,889,767	Hirschey et al.	June 9, 1959