

Sept. 5, 1967

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3,339,484

ELECTROSTATIC CODE PRINTING OR ETCHING MEANS

Filed July 20, 1965

3 Sheets-Sheet 1

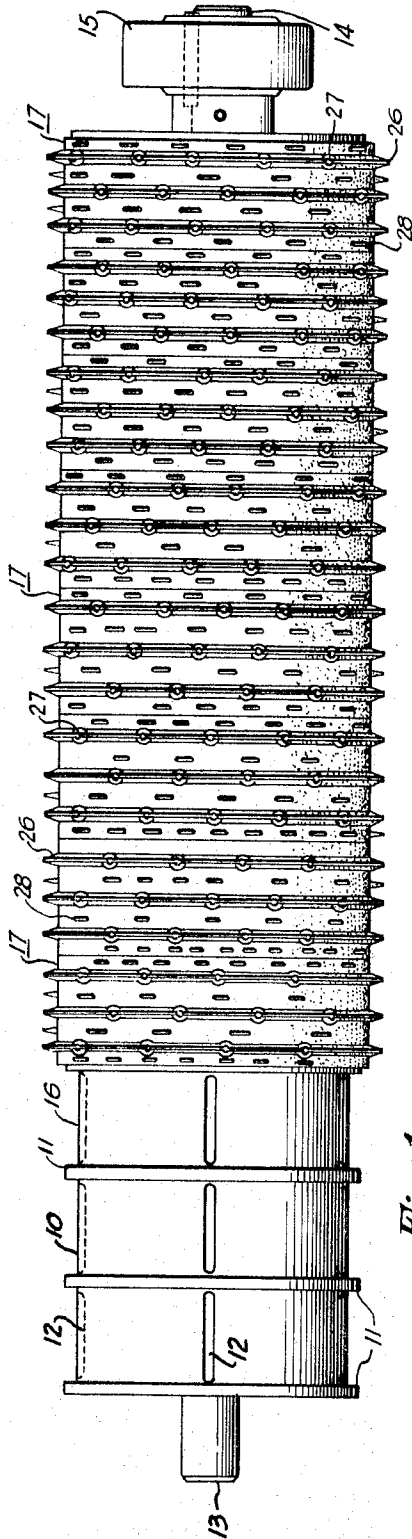


Fig. 1.

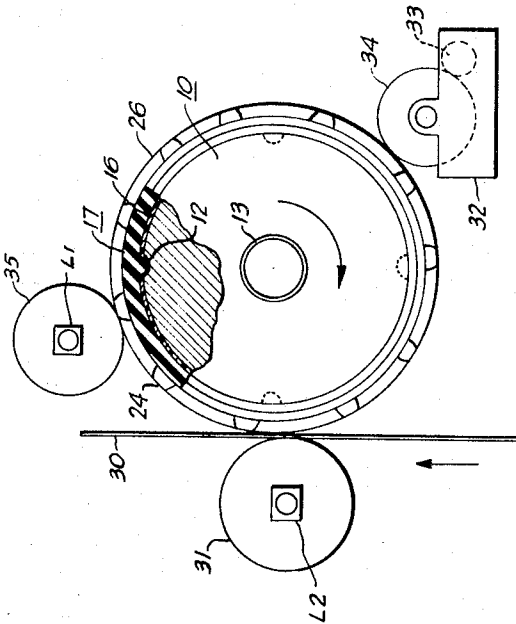


Fig. 2.

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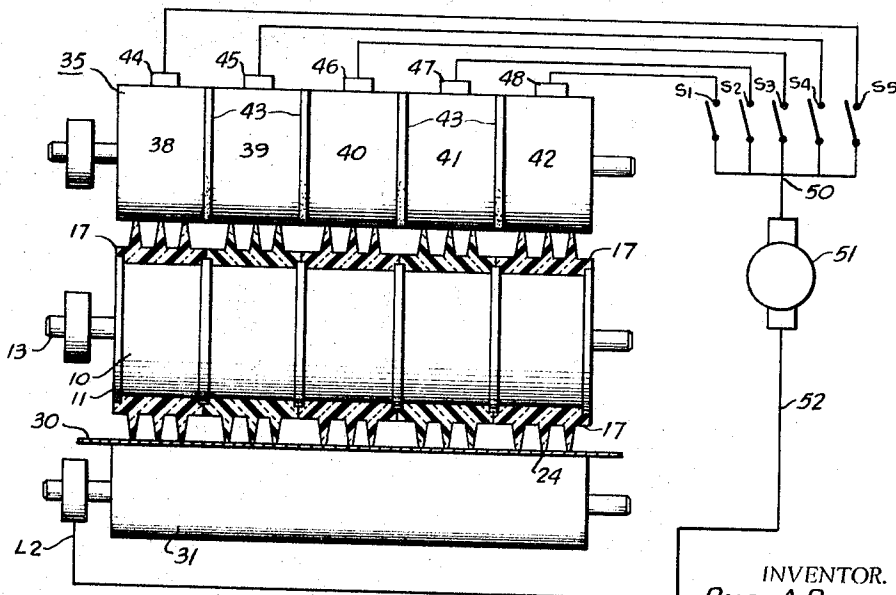
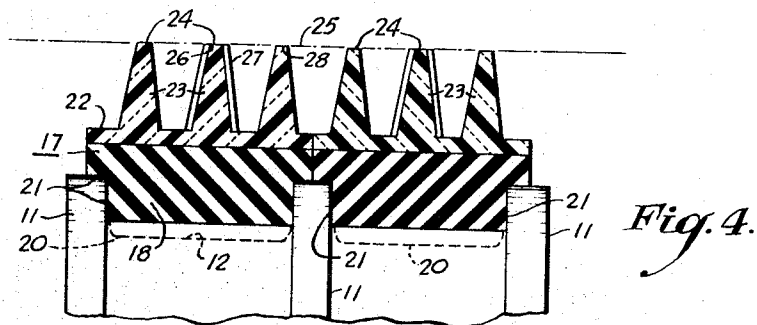
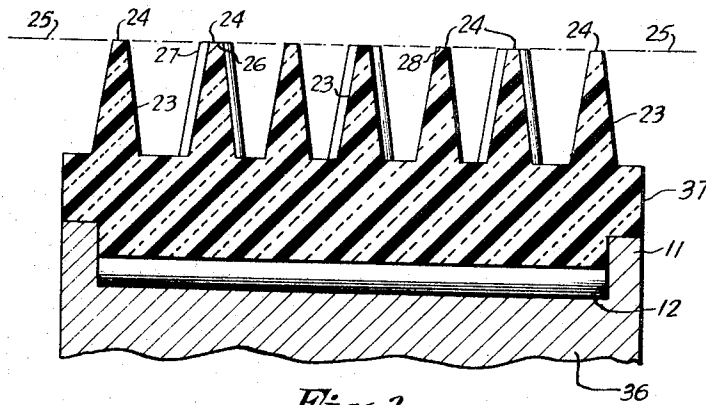
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ELECTROSTATIC CODE PRINTING OR ETCHING MEANS

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3 Sheets-Sheet 3

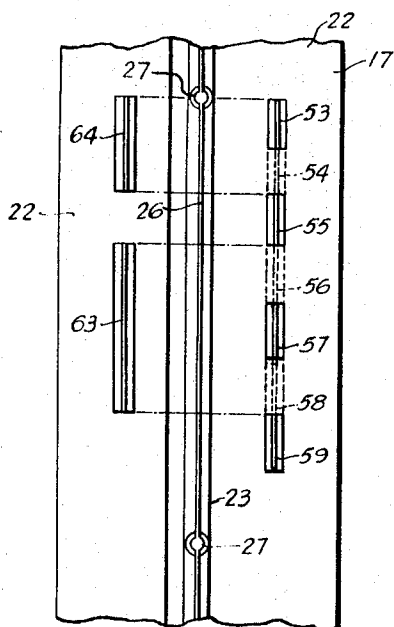


Fig. 6.

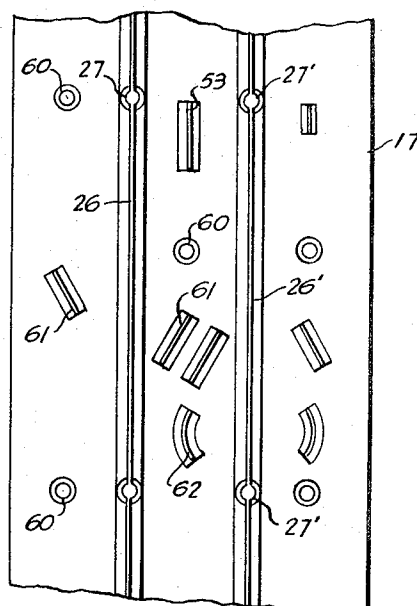


Fig. 7.

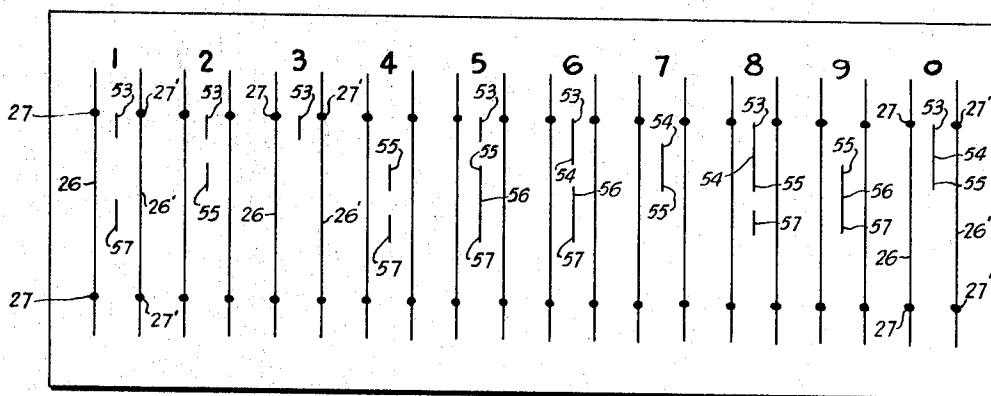


Fig. 8.

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ELECTROSTATIC CODE PRINTING OR ETCHING MEANS

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12 Claims. (Cl. 101—219)

This invention relates generally to the marking of the surface of continuously moving strip material and more particularly to printing or etching the surface of the moving strip material for the purpose of identifying the same.

The problem frequently arises in the tin plate industry as to the identity of tin plate goods after they have been fabricated and used as well as to the identity of the original manufacturer of the tin plate and the tin plate line of that manufacturer.

Several different modes have been employed for marking the steel strip that is to be tinned prior to the tinning operation. Paints and inks used for printing are unsuitable for such marking because they may show through the tin plate or the tin plate does not bond or amalgamate with the steel base material. Bases and acids are employed to etch the surface of the steel to such a very slight degree that it can be covered by the tin plate. However, of necessity it must be impossible to identify the product or the company who manufactured the product through tin plate coating. Any markings readable through the tin plate coating would make the product unusable.

This invention utilizes the advantages of the invention disclosed in Reissue Patent 25,681 and is an improved advancement thereof.

The principal object of this invention is the provision of method and apparatus for marking a traveling strip such as strip tin plate base material with a code that determines the manufacturer. In case of bleeding through the mark is a blemish rather than a legible character.

Another object is the provision of a method for marking the manufacturer and the plant and also the line and the date on which the product was made which marking is not readable through the tin plate and requires the tin to be removed to be visible.

Another object is the provision of a chart for interpreting the uncovered markings after removal of the tin plate.

Another object is the provision of method and apparatus for controlling the application of electrical current to a selected one, many or all of a row of printers operating with a wetted surface to control electroplate printing on the surface of a traveling strip.

Another object is the provision of a method and apparatus to control the flow of current per band of a series of electroplate printing bands and the summation of the current reading is commensurate with the number of bands operating.

Another object is the provision of a printing code including a plurality of printing code lines one including a reference line. This object has many advantages since the reference line and one code line provide one selection of characters or digits and a third code line multiplies the code combinations. The reference line is a guide for the initial point and direction of reading the code.

Another object is the provision of a printing code that has a reference point and adjacent lineal code representations that are readily covered by coatings such as tin plate without fear of coming through.

Another object is the provision of method and apparatus for applying a printer to a surface wetted with a base or acid for applying a voltage through the wetted surface

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from the printing surface of the printer to etch or electroplate the printing on the surface of the traveling strip.

Another object is the provision of a marker having printing surfaces made up on a series of independent bands which printing surface is wetted by a marking material or ink that is either basic or acidic while being rotated in printing engagement with the strip and provided with controlled electrode rolls for passing current through inking surface, which may be that of an elastomer, and to the traveling strip to etch the same by the base or acid inks applied in the printing operation.

Another object is the provision of a printing bank made up of flexible and expansible elastomer material which bank has a body section on a rotary seat that carries the band and is provided on its outer surface with a printing surface means that lies in the common printing cylindrical surface means which printing surface means may be endowed with current carrying properties to electrically apply a current through the printing material on the subject to be printed and electroplate or flash the same on the base material being tinplated.

The body section although not necessary may be provided with locks that engage slots on the rotary seat.

Another object of this invention is the provision of an annular and flexible elastomer band having a body section and a printing face including an outwardly extending section carrying a printing means all of which is an electroconductive elastomer while the body section may be an insulating nonconductive elastomer material but made integral with the electroconductive elastomer material.

Another object is the provision of an elastomer printing band of flexible and expansible elastomer material including a body section and an outwardly extending surface with the printing surface all of which is constructed of an electroconductive elastomer material which permits the control of electric current through the device that supports the elastomer printing band for the purpose of applying etching the surface of the material to be printed.

Another object is the provision of a printing roll that is rotatably supported and completely covered with an insulating acid or base resistant material to make it impervious to actions of the same and which is provided with a plurality of flexible and expansible independent elastomer printing bands locked against movement on the roll and having an indicia in a printing surface which lies within a common cylindrical printing surface for the length of the printing roll and wherein the elastomer printing surfaces of each band being of electrically conductive material to electrically apply the travelling subject with a base, acid or neutral printing ink to be electrically etched on the travelling subject to be printed.

Another object of this invention is the provision of an elastic printing band of electroconductive material that extends around the circumference of the band and is made of electroconductive material to provide a reference line and marks on said line providing starting reference marks together with code mark printing surface means on each side of the line, the band made of electroconductive material and connected to the reference line for the purpose of etching the reference line together with the reference marks or code associated therewith.

Such a code would extend across the full width of the strip or base material for tin plate and carry with it in code the manufacturer. The plant at which the material was made and the line on which the strip was run could also be incorporated. This code would be extended for the full width of the strip and be printed continuously along the strip and a circle two inches in diameter can be identified from this code.

Another object is the provision of a chart which is materially shorter in length than the strip is wide and by placing the same on any small part, the marked code can

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determine at a glance all the indications made by the originally printed code.

Another object is the provision of a small transparent chart having the original code marked thereon which when positioned with regard to a single reference line and selected reference marks on each side thereof will immediately portray the code imprinted.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification without limiting this invention or the claims thereto certain practical embodiments illustrating the principles of this invention wherein:

FIG. 1 is a plan view of a printing roll having a series of printing bands mounted thereon.

FIG. 2 is a diagrammatic view illustrating the arrangement of the roll of FIG. 1 mounted to etch an upwardly moving strip with parts of the printing roll being in section.

FIG. 3 is an enlarged cross section of an elastomer printing band mounted on an electroconductive roll and which is itself made of electroconductive material.

FIG. 4 is an enlarged sectional view of two elastomer printing bands having a base section of insulating material capped with a printing section of electroconductive elastomer vulcanized thereon.

FIG. 5 is a plan view of the traveling strip backed up with an electroconductive roll with its other side being printed by an electroconductive elastomer printing band each one of which is independently controlled through their engagement with an independent elastomer conducting roll which is energized from a brush for independently controlling each band in its application of etching the strip.

FIG. 6 is an enlarged view depicting the annular printing band with its reference line and reference dots or marks together with the several code markings which with the reference line are made integral of electroconductive elastomer material.

FIG. 7 is an enlarged view of a printing band having two reference lines and different character printing codes thereon.

FIG. 8 is a comparator chart containing the code in forms of the reference lines and marked with the adjacent code lines.

Referring to FIG. 1 of the drawings 10 indicates the printing drum which is provided with a series of annular projecting flanges 11 interrupted by a plurality of transverse locking slots 12. The ends of the drum are provided with the shaft section 13 and 14 one of which is mounted in a bearing 15, the other end being open for the mounting of additional bands. The whole of the surface of this member is preferably coated with an elastomer 16 that is sufficiently strong to support and permit frequent changes of the printing bands 17 each one of which is provided with a separate code as noted herein and is selected as being marked numerically from 1 through 9 and 0. These printing bands 17 as shown in FIGS. 1 and 2 are similar to that shown in FIG. 4 in that they are provided with a base or body section 18 the bore of which is provided with a transverse locking lug 20. Each side of the elastomer printing ring 17 is cut away at 21 for receiving the annular flange 11. The locking slots 12 and the locking lugs 20 are not necessary for printing although preferable in some instances.

The outer surface of the bodies 18 are provided with a full cylindrical surface 22 of elastomer material having electrical conducting properties and on which the outwardly extending sections 23 are formed integral with the band 22 that is also formed integral with the body section 18. The printing surface 24 is provided on the outer end of each of the outwardly extending section 23 and all of which lie in a common cylindrical surface 25 indicated by dotted lines. Each of the outwardly extending sections 23 provide different portions for produc-

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ing different printing indicia. The printing surface indicated at 26 is the reference line and generally extends the full circumference of the printing band 17. The dots or reference points 27 are indicated at spaced positions along the printing line 26 and the different code printing surfaces are indicated by the other outwardly projecting surfaces 23 and are indicated by the reference numeral 28. These codes will be discussed later in detail.

These printing bands 17 as shown in FIGS. 1, 2 and 4 engage the moving untinned metal strip 30 which may pass in any direction across the face of the printer rolls and in FIG. 2 is moving upwardly and one side of which is supported by the back up roll 31 the outer surface of which is preferably coated with an elastomer having current carrying characteristics making it an electrode means which engages the opposite side of the travelling untinned metal strip 30 that is not being printed on or etched at this time. The axis of the back up roll is offset from the axis of the printing roll so the latter will not engage the former if the strip rides to one side. This roll is shown to be connected by the line L1 representing one side of the circuit through the untinned metal strip 30.

The roll 10 with the series of properly selected printing bands 17 engages the one side of the untinned strip 30 and is rotatably supported and preferably driven to be in synchronism with the surface speed of the upwardly moving strip 30. The printing surface 24 of each of the printing bands on the roll 10 are shown to be supplied with an inker indicated at 32 having an inker supply roll 33 engaging a transfer roll 34 which in turn extends across the entire face of the roll 10 to supply an ink or electrolytic marking liquid which in this case would be a base, neutral solution, or an acid carried on the printing surfaces 24 rotating in the direction of the arrow to print on the surface of the moving strip as it travels upwardly as indicated by the vertical arrow. The inker 32 may be replaced by a foam rubber inker that merely engages the surface of the code printing lines 26 and 28.

After the printing surfaces 24 have engaged the strip they travel around and come in contact with an electrode means such as the electrode roll 35 which in turn is connected to the line L1 to complete the electrical circuit. Current passes from the line L1 which may be considered negative potential, through the body or along the printing surface 24 to the arcuate printing positions of the same where they engage the traveling strip 30 and thence travel to the strip 30 to electroplate surface and through the same to the electrode roll 31 and the line L2. Thus the current passing to and through the traveling strip is simultaneous with the deposit of a base, or neutral or acid to the strip and thus electroplates or etches the same in the surface of the strip as it travels at a high and fast rate and without harm to the surface of the strip. If the strip is previously wetted as it passes the printing roll only the electrode roll 31 is necessary and the inker 32 is dispensed with.

This electroplating or etching, of course, will be in accordance with the code on the printing bands 17 mounted on the printing roller 10.

As shown in FIG. 3 the printing band 37 is made of elastomer material that is electroconductive and is mounted on an electroconductive roll 36 which is also supplied with the annular radial flanges 11 together with the slot 12. Here the electric current would be allowed to pass through the roll 36 and the whole of the printing band 37 which is of electroconductive material from whence the current passes directly to the printing surfaces 24 for the purpose of etching the code on the surface of the traveling strip 30 which is tangent to the printing surfaces 24 at the printing cylindrical surface 25.

As shown in FIG. 5 the back up roll 31 has the line L2 connected thereto and the traveling strip 30 is engaged between this backup roll 31 and the tangentially offset printing surfaces 24 of the several elastomer dies 17 on the roll 10. The back up roll 31 in this instance is

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an electrode roll being covered with an elastomer that has current carrying capacity. The second electrode roll 35 as shown in FIG. 5 is made up of a series of sections 38, 39, 40, 41 and 42 which are independent and insulated from each other, there being an insulator 43 therebetween. These elastomer sections 39 to 42 inclusive are electroconductive so that they will conduct current to each one or a selected number of the independent printing bands 17 and these sections in turn are connected by the brush means 44, 45, 46, 47 and 48. Each of these brushes are connected by wires to a corresponding switch S1, S2, S3, S4 and S5 as shown which in turn are connected to the bus line 50, and the DC supply source 51, and the line 52 to L2. Thus the line L1 of FIG. 2 has been replaced by an independent series of switch means to the common line 50 as shown in FIG. 5. In this way one may selectively control the printing of each band or group of bands as the case may be and thereby determine the code to be printed by merely energizing the selected section.

As shown in FIG. 6 the enlarged view of the single band such as illustrated at 17 shows the printing face with the circular or continuous perimeter that is preferably initially formed in a closed loop but may be made in a continuous strip and when pulled around the drum with its opposite ends supplied with a cement may be cemented together for the purpose of completing the band and also for mechanically and electrically connecting the adjacent parts of the body 18 and the upper portion 22 which are respectively of insulating and electroconductive materials. As soon as the ends are brought together in accurate alignment and held for a very few minutes the cement takes hold and permits the band to be released and said band will snap in place on the drum. If necessary, the connected ends may be joined by a conductor.

The printing surface on this band provides a continuous annular line 26 which has, at uniformly spaced positions, the dots 27. This is the reference line 26 with the reference points 27. This is shown in FIGS. 1, 6 and 7. These reference points must be aligned by means of a chart in order to properly read the code. As illustrated the code markings are shown as a line producing printing elements 53, 54, 55, 56, 57, 58 and 59. The principal elements in this code that may be used independently are every alternate one or 53, 55, 57 and 59. The code may use any one of the principal elements which would provide in itself four distinct code characters. When the code character or element 53 has 54 formed therewith a long symbol is provided. This long symbol may be used in combination with 57 and 59 or in combination with 56 plus 57 or with 58 plus 59. However, each element and code character when made up should, of course, be spaced from the next code character in order to provide a clear reading of the code. In this manner the code may be expanded and as illustrated in FIG. 6 the code character or element 53 is of the first order whereas the combination of 53 and 54 is of the second order and so on, to the seventh order which represents a continuous line from 53 to 59 inclusive.

It will be noted particularly in FIGS. 6 and 7 that the initial code marking 53 is aligned horizontally with the upper reference dot 27; whereas the last space between the code mark 59 and the lower dot 27 is always maintained vacant. In this manner the code may always be readily recognizable and read from this alignment and accordingly on the chart shown in FIG. 8.

Another important feature is the fact that the reference dots 27 and the continuous reference line 26 together with each of the code markings 53 to 59 represent very small or narrow printing surfaces preferably aligned. The reference dots 27 are slightly larger than the reference line and are preferably retained small enough that they will not be distinguishable in case of showing through the tin plate from the strip 30 and in order to read the

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code it is necessary to remove the tin and check the marking with the chart to determine the identity of that particular piece of material.

In the modification of FIG. 7 two reference lines 26 and 26' are provided on the annular band here shown with their reference dots 27 and 27'. Here again the initial mark is similar to that shown in FIG. 6 and is likewise numbered 53 and starts initially in line with the center of the two reference dots 27 and 27'. The next is a small dot which would be similar to 27 although this is a code mark as is marked as 60. The following code mark as indicated at 61 are two sloping parallel lines and the last code character as indicated at 62 is a short arcuate line. These different code characters are merely representative of other types of code marking that can be employed for this purpose.

Referring to FIG. 8 a selected code is printed on a transparent sheet as a comparative chart which is set up to illustrate FIGURES 1 through 9 and 0. Of course, the code employed on each tin plate line may be two or more selected of these numbers or characters to indicate the company; the line of the mill in that company and even a possible date of marking. As illustrated two reference lines 26 are provided for each printing number because this number may occur on either side of the reference. The printing band is not indicated because this is a chart. The characters representing spaces 53 to 59 are also each representative of the first order in seven positions. Any two adjacent positions provide a character of the second order such as 64 as indicated in FIG. 6. Any three adjacent positions represent a character of the third order indicated at 63 in FIG. 6 and so on to the seventh order. Thus the code combines the order with the position yet only a line with a reference point is required to read the same. The selection here employs the code characters 53 and 57 to indicate numbers one to four and third order characters 63 are employed to indicate numbers six, seven, nine and zero. A combination of first and third order characters are used to indicate numbers five and eight. Number one employs characters 53 and 57. Number two employs characters 53 and 55. Number three employs character 53 alone. Number four employs characters 55 and 57. Number five employs the code character 53 of the first order in combination with the code character of the third order of 55, 56 and 57 combined. Number six employs as the combination two second orders the first being 53 and 54 combined and the second being 56 and 57 combined. Seven in turn employs the combination of the second order being 54 and 55 combined whereas eight employs the combination of the third order combining 53, 54 and 55 taken with the first order of 57. Nine employs the third order combining 55, 56, and 57 and zero employs the third order combining 53, 54 and 55.

It is obvious from the foregoing chart that many combinations such as 58 and 59 have not been employed which in combination with the code characters 53 to 57 would greatly increase the number of characters available. The chief advantage here is that this may be limited only to a lineal or line length and the position thereof with respect to a reference point. By the use of these code characters and code characters such as illustrated in FIG. 7 or any other suitable character a simplified marking may be adopted to give the full history which would be etched on the surface of the strip 30 before it is tin plated and with this line etching it would not show through or be otherwise offensive to the interior or exterior of the container made from the finished tin plate product. It would always be necessary to remove the tin plate and apply the chart to read the code and determine the origin and complete history of the product.

I claim:

1. A printing roll for engaging a traveling subject passing in contact therewith comprising a rotary cylindrical roll mounted for rotation to engage the traveling

subject to be printed, a plurality of flexible and expansible independent elastomer printing bands mounted along said roll and locked against movement on said roll, each band having a body section with and at least one outwardly extending section terminating in a printing surface that lies in a common printing cylindrical surface and is provided with printing indicia, means to supply electrolytic marking liquid to the traveling subject, said elastomer printing surfaces being of electrically conductive material to apply their printing on the traveling subject, an electrode means engaging said traveling subject, and a second electrode means to supply an electric current passing with the supplied electrolytic marking liquid to the traveling subject.

2. The printing roll of claim 1 wherein said printing roll is made of electrically conductive material, and said elastomer printing bands are made of electrically conductive material to pass a current through the roll and the printing bands with the printing material to the traveling subject.

3. The printing roll of claim 1 wherein said electrode means engaging said traveling subject is a backup roll engaging the opposite side of said traveling subject.

4. The printing roll of claim 1 wherein said elastomer printing surfaces of electrically conductive material extended arcuately of their printing bands and laterally connect at least one adjacent arcuate printing surface to provide a continuous annular printing surface of the same band to electrically apply their printing on the traveling subject.

5. The printing roll of claim 4 wherein said body section of said printing bands are made of insulating material, and said electrode means is an electrode roll engaging said printing surface to pass current to the electroconductive printing surfaces.

6. The printing roll of claim 1 wherein said elastomer printing surfaces including a continuous annular printing surface of electroconductive elastomer material having laterally spaced indicia.

7. The printing roll of claim 6 wherein said elastomer printing surfaces includes laterally spaced indicia lying in said common printing cylindrical surface in said elastomer band and of electroconductive elastomer material integral with said substantially continuous annular printing surfaces of electroconductive material to supply current simultaneously to said annular and to said laterally spaced printing surfaces.

8. The printing roll of claim 1 wherein each printing surface provides a section that cooperates with the printing surface sections of adjacent elastomer printing bands and they all lie in a common cylindrical printing surface, said annular independent elastomer printing bands substantially covering said roll and their printing surface sections cooperating to register intelligence in the form of a selected code mark with reference marks on the continuously moving strip, and a match chart having the complete series of code mark with reference marks to identify the intelligence of the code formed by the posi-

tion of said printing surface sections of said bands on said drum and its printed reproduction.

9. The marking device of claim 8 wherein said printing surface section and at least one other additional section of each band is connected and is of electroconductive elastomer material to supply current simultaneously while marking.

10. The printing roll of claim 1 wherein said printing surfaces of said elastomer bands consisting of at least one continuous annular reference line, uniformly spaced reference indicia on at least one side of said reference line aligned with one another, at least one code mark on each reference line, said printing surfaces of each band of electroconductive elastomer material and connected laterally to each other.

11. The printing roll of claim 10 characterized in that said printing surfaces of said elastomer bands of electroconductive elastomer material engage said second electrode means to supply current to said traveling object simultaneously while marking.

12. A device for marking a continuously moving metal strip preceding the application of tin plate thereto which includes a rotary drum gripped by a series of selected expandable elastomer printing bands each having at least one annular printing surface with reference points and on one side thereof a specific code to display and print a selected code symbol on the metal strip, a matched chart to identify the selected code symbols on the drum and selected code printed symbols on the metal, an electroconductive elastomer on and connecting at least the printing surfaces of each printing band, means to supply an electric marking liquid to said printing surfaces prior to their engagement with said metal strip, and an electrode means mounted for engagement with said printing surfaces after their engagement with said metal strip, and a second electrode engaging said metal strip to close an electrical current path therethrough to aid in imprinting the code thereon.

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