

670643

SPRUSON & FERGUSON

AUSTRALIA

PATENTS ACT 1990

PATENT REQUEST: STANDARD PATENT

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

[70,71] Applicant(s)/Nominated Person(s):

The Goodyear Tire & Rubber Company, incorporated in Ohio, of 1144 East Market Street, Akron, Ohio, 44316-0001, UNITED STATES OF AMERICA

[54] Invention Title:

Apparatus and Method for Marking a Rubber Article with a Message Readable by a Light Scanning Device

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[31] Appl'n No(s):

998,290

Details of Basic Application(s):

[33] Country:

US

[32] Application Date:

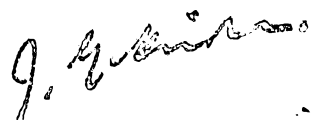
30 December 1992

Basic Applicant(s): Robert John Gartland and Gary Thomas Belski

DATED this FIFTEENTH day of NOVEMBER 1993

The Goodyear Tire & Rubber Company

By:



Registered Patent Attorney

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NOTICE OF ENTITLEMENT

I, Carl Henry Krukow, of THE GOODYEAR TIRE & RUBBER COMPANY of 1144 East Market Street, Akron, Ohio 44316-0001, United States of America, being authorized by the Applicant(s)/Nominated Person(s) in respect of an application entitled:

APPARATUS AND METHOD FOR MARKING A RUBBER ARTICLE WITH A MESSAGE READABLE BY A LIGHT SCANNING DEVICE

state the following:

The Applicant/Nominated Person has, for the following reasons, gained entitlement from the actual inventor(s):

The Applicant/Nominated Person is the assignee of the basic applicant(s)/
inventors.

The Applicant/Nominated Person is entitled to rely on the basic application listed on the Patent Request as follows:

The Applicant/Nominated Person is the assignee of the basic applicants.

The basic application(s) listed on the Patent Request is the application first made in a Convention Country in respect of the invention.

Dated this *20th* day of *July* 19*93*

THE GOODYEAR TIRE & RUBBER COMPANY

By *Carl H. Krukow*
Carl H. Krukow, Administrator
International Section



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LABELLING CURABLE RUBBER ARTICLES

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(56) Prior Art Documents
EP 517062

(57) Claim

1. An apparatus for producing a cured rubber tire having a graphic message readable by a scanning unit, said apparatus containing:

a green tire building device having a tire label printer capable of printing a graphic message in response to tire builder input to an electronic means, said printer having a means to hold a thermal transfer ribbon and to advance said ribbon in response to said electronic means to transfer a heat transferable graphic from ribbon to a substrate, a means to sever or cut said substrate to produce a label having a graphic message thereon, means to locate the label on said green tire, a tire curing apparatus to receive said green tire with label to cure the green tire to yield a cured tire having a message thereon, and means to read light reflected from said message on cured tire.

5. A method of labelling an article comprising the steps of making a label at an article build station by advancing a transfer ribbon through a print head, activating a means that controls the advance of the transfer ribbon to advance the transfer ribbon, advancing said ribbon thereby, and directing an activation means to control the print head to print an operator determinable message on a substrate and then sever said substrate to give a label, placing said label on an article, curing said label to said article to give an article labelled with a message, then reading the label to discover the message.

APPARATUS AND METHOD FOR MARKING A RUBBER ARTICLE WITH
A MESSAGE READABLE BY A LIGHT SCANNING DEVICE

Technical Field

5 The invention herein resides in the art of
marking cured substrate, such as a rubber tire, with a
code, preferably a bar code, marking readable with a
light or laser scanning device, said marking being
capable when properly marked to furnish a history of
10 the article from its so-called "birth to grave".
Also, the message on the label or insignia cured to
the plastic or rubber substrate can serve to identify
the cured plastic or rubber and afford a logo such as
may be used with the article alone or with the message
15 or insignia.

Background - Art

Heretofore indicia or decorations, including
logos, have been applied to the sidewall of tires.
20 For example, white sidewalls have been applied to
tires, special identifying or grading codes have been
placed on the sidewall of a tire for purpose of
indicating grade, uniformity, identification of
source, as well as decorations and the like have been
25 used.

Generally, tires are marked using inks and paints
that are commercially available. These marks are
applied by stamping, stenciling, labeling or painting
onto the tire with or without curing. Unfortunately,
30 these markings on the tire may be washed off or
smeared by abrasion. Also, the methods used
heretofore were costly and were subjected to producing
identifying indicia subjects to being disturbed,
damaged or marred in use.

35 There is need in the art for simpler, inexpensive
methods for imparting indicia to tires, especially

with said indicia exhibiting high clarity, resolution, and preferably the indicia can be coded at the point of manufacture to carry its history from birth to grave as desired in the art with improved resistance to destruction, distortion and higher clarity.

Summary of the Invention

It is the object of the present invention to overcome or substantially ameliorate the above disadvantages.

There is disclosed herein an apparatus for producing a cured rubber tire having a graphic message readable by a scanning unit, said apparatus containing:

a green tire building device having a tire label printer capable of printing a graphic message in response to tire builder input to an electronic means, said printer having a means to hold a thermal transfer ribbon and to advance said ribbon in response to said electronic means to transfer a heat transferable graphic from ribbon to a substrate, a means to sever or cut said substrate to produce a label having a graphic message thereon, means to locate the label on said green tire, a tire curing apparatus to receive said green tire with label to cure the green tire to yield a cured tire having a message thereon, and means to read light reflected from said message on cured tire.

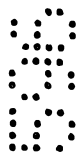
There is further disclosed herein a method of labelling an article comprising the steps of making a label at an article build station by advancing a transfer ribbon through a print head, activating a means that controls the advance of the transfer ribbon to advance the transfer ribbon, advancing said ribbon thereby, and directing an activation means to control the print head to print an operator determinable message on a substrate and then sever said substrate to give a label, placing said label on an article, curing said label to said article to give an article labelled with a message, then reading the label to discover the message.

In a preferred embodiment the graphic bar code label is optically interpreted with a bar code reader. The bar code reader consists of a scanning device and decoder logic. The scanner emits a light beam and detects light reflection. The dark bars absorb the light and, thus, the absence of electrical signal, the light spaces reflect lights and generates an electrical signal. The electrical signal duration determines the width of the bars and spaces. The decoder logic subjects the signal to a comprehensive decoding algorithm which determines code type accuracy and validity. The scanned data can then be transmitted and/or stored. There is also two types of bar code readers, a visible laser scanner that detects a bar code based on light reflectance and an infrared scanner that reads a bar code based on the detection of carbon black or a similar pigment. The graphic label is adhered to an uncured or cured substrate such as a tire, a building bladder or other rubber articles by placing the graphic label on the curable substrate, preferably in a mold and effecting cure by pressure and heat or other curing conditions to cause the label to adhere to the cured article such as a tire.



2a

Thus, the cured substrate with the label with the graphic message is produced by using thermal transfer techniques. A typical technique which may be used is as follows. The ribbon in contact

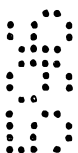


with the substrate are passed between print head and pressure roll. The print head is composed of a grid of elements that are computer controlled to precisely heat and cool. The ribbon and label stock passes by
5 the print head and the ink can be selectively heated with this operation being synchronized by computer operation. A combination of heat and pressure is applied to the ribbon in contact with the substrate which causes the ink to liquefy and transfer from the
10 ribbon web to the label structure. When the ribbon is stripped away, the ink is left where heating occurred on the substrate material. The label is placed on a cured or curable article and the label and substrate are subjected to curing conditions to effect transfer
15 of the label to the cured substrate which may now contain the message in solely, alphanumeric, bar codes, human readable characters, and logos or mixtures of them. The bar code message is normally printed as a series of vertical bars and spaces of
20 varying widths to supply the message in readable form with the light reflected from the series of varying width bars and spaces.

The bar code itself is preferably a binary code with information encoded in the relative widths of
25 bars and spaces in a printed pattern which is an optically read language. Bar codes are read by sweeping a small beam of light across the bar code. The light source may be a light pen with on light emitting diode/photo diode or a handheld and fixed
30 laser scanner that uses a mechanically or electronically scanned light beam.

The label to be generated by the operator at his work station may include a message which indicates the current history of the specific cured article being formed. Said current history indicating its numerical sequence in the manufacturing process, and in some cases, its individual components. Thus, this invention provides apparatus for making a label from label stock and ribbon which the operator can use a keyboard via a computer to control the printing of the message including logos if desired, and securing or cutting the label in the desired lengths. Then the operator can place the label on the uncured substrate, preferably so that message transfer to the cured article is inverted but still be readable in the normal manner as by a scanner device or visual eye contact on the finished product.

Thermal transfer technology enables the user to print on-site, on-demand, variable information in human-readable and bar code form in acceptable quality and quantity. If the article to which the message is being transferred to is black, then the ink on the



ribbon should be white or silver or any reflective type color. The thermal transfer equipment can then be programmed for the reverse printing of bar codes such that upon application to a black substrate, the printed white or silver bars would act as the reflective spaces between the non-printed black bars of the substrate backing for appropriate scanning capability.

10 Description of Drawings

For a complete understanding of the objects, techniques, apparatus structure and the method of placing an indicia and cured substrate with said indicia being readable by a scanner device in response to reflective light or electromagnetic radiation, reference should be had to the following detailed description and drawing wherein:

Fig. 1 is a block diagram of my novel method and apparatus.

Fig. 1A is a schematic view of the apparatus for preferably performing various steps of the method.

Fig. 1B is a schematic sectional view showing a thermal transfer printing step under heat/pressure.

Fig. 1C is a sectional view of the curing station showing the protective substrate being removed.

Fig. 1D is a sectional view of the station where the bar code scanning occurs.

Figs. 2A-2B are plan views showing various forms of the finished messages may take.

Fig. 2C is another view of a label showing an opaque message for use on a contrasting object.

Figs. 3A-3E are detail views showing steps required for forming a label and application to a green rubber object.

Figs. 4A-4C are schematics sectional view showing steps required for attaching a label to a cured object.

Figs. 5A-5B are detail views similar to Fig. 3C and Fig. 3E showing a label may emboss a green object.

Best Mode For Carrying Out The Invention

Referring now to the drawing Fig. 1A, numerical 11 designated schematically one embodiment of the apparatus for practicing this invention. A thermal transfer printer 13 melts the ink 12B off a ribbon 12 onto the substrate 14. These types of printers produce excellent images and does not require specially treated substrates. The label stock 14 can be paper, plastics such as Mylar or rubber films. The numerical 12 designates a roll of ribbon on a support 12A that feeds to and through the printer assembly 13. The numerical 14 designates a roll of label stock on a support 14A that also feeds to and through the printer assembly. In response to an electronic message generated by the operator's activation of the keyboard 15 of a computer. The activation of the keyboard can be wired to send an electronic signal directly to the motor (not shown) of the printer assembly to cause the ribbon drive to advance the ribbon and substrate. The ribbon is advance due to tension on the ribbon from rotation of the drive wheels on rolls. Preferably, it is constructed so the activation of the keyboard by striking various keys to cause the computer 16 to synchronizely activated via the drive motor and the ribbon drive to advance the ribbon with the substrate through the printer. The computer activates the printer print head to print on the ribbon the indicia of the message typed by the operator. This message can be printed at any stage in manufacture and use of the article with a message thereon. A combination of

heat and pressure is applied to the ribbon in contact with the substrate, which causes the ink 12B to liquefy and transfer from the ribbon web to the label substrate. When the ribbon is stripped away from the label structure, ink is left where heating occurred on the label material. Preferably, as the label substrate with the message thereon exits the print head 13, the computer can then cause the cutting member 17 to contact an anvil to cut the substrate to give a label 18 of the desired length.

In the heat pressure station 19, the label is inverted and placed on a curable substrate 20 and the curable substrate with the label 18 is cured in the customary way in the heat pressure station 19 such as a tire mold or related mold.

The cured substrate with the label cured or adhered thereto as shown by numerical 21 can be read either visually or by use of a scanning device 22. The scanning device 22 preferably emits a light or related electromagnetic radiation which strikes the label and is reflected back to be read by the scanner.

Thermal transfer ribbons consists of at least two major elements, a carrier film and the transfer ink layer. The roll 12 of ribbon is preferably a laminate of desired width and thickness for securing it to the substrate. The laminate usually comprises a carrier or backing sheet of a polyester typically Mylar, Tedlar, High Density Polyolefin or other film or sheet materials about 4.5 microns (0.18 mils) to 5.7 microns (0.22 mils) and the ink layer.

This carrier sheet has an ink face coating of a suitable transfer stock such as any suitable thermoplastic elastomer, for example, a rubber, a hydrogenated styrene-butadiene block copolymer, a carnauba wax, an ester wax, or a suitable dry film ink. The coating usually has a thickness which is

substantially less than that of the backing sheet face.

5 A method of printing a graphic message on a plastic or rubber substrate comprising activating an electronic system to advance a thermal transfer ribbon to a printer and electronically directing said printer to print a graphic message, severing or cutting said substrate to generate a label with a heat transferable message thereon, placing said label on a curable
10 plastic or rubber substrate, curing said label on the curable plastic or rubber substrate, and later reading said graphic message.

The message on the printed label may consist of various groups of letters, numbers, logos and bars
15 codes. The bar code itself is preferably a binary code with information, numbers, letters and symbols encoded in the widths of bars and spaces in an established pattern. The nature of one message is shown encoded in Fig. 2C. The logo of Goodyear is
20 shown with a series of vertical bars 23 and spaces 24 with the width of the bars and spaces being adjusted to reflect the light so a message may be read. Also, the message of Fig. 2A has the number 03260108 to show other forms the message may take.

25 In a preferred embodiment of this invention where reverse printing of bar codes and/or mirror printing of other insignia are being used, a silver ink printed transfer ribbon gives unique results with black substrates such as a rubber stock loaded with carbon
30 black. In this case, it is advantageous to have the printed silver ink bars act as the reflective spaces between the non-printed bar formed by the black loaded rubber backing material. Referring to Fig. 2C, the dark inks may be used for reverse printing on light or
35 non-carbon black stocks.

It should be appreciated that the printing inks used in this invention are available commercially including silver colored ink.

Although the silver inks have been disclosed
5 herein, it should be appreciated that the white inks made with white pigments, such as titanium oxide, may be used, too.

The logo can be printed on heat resistant Mylar film whose gauge can range from 1 mil to 20 mils thick
10 using well known thermal transfer printing techniques and subsequently attached to a tire sidewall or position on a green tire prior to curing the article. The inked markings transfers directly to the rubber during heat application by a temperature controlled
15 platen or curing. The label exhibits excellent dimensional uniformity on the finished part while the same Mylar film is protecting the heated platen surface or mold itself from the ink and protects the ink from platen/mold residue. The Mylar film can be
20 removed or left on for surface protection.

An important concept for application is the mirror image printing of any insignia such that in using a white or silver ink thermal transfer ribbon; when transferred to a black surface, the
25 distinguishing marks or logo are human readable.

Thermal printing techniques were successfully employed for label fabrication. For this purpose, the thermal transfer ribbons used are constructed of a polyester film carrier web that is coated on one side
30 with a pigmented wax-based or resin-based ink. At the print head of the equipment, the ribbon is in constant contact with the label stock such as Mylar film. A combination of heat and pressure is applied to the ribbon which causes the ink to liquify and transfer
35 from the polyester web to the label structure.

By design of the equipment, the inks flows from one dot to another resulting in very uniform lines and extremely crisp lines. The ink returns to its harden state immediately upon removal of the heat and
5 pressure. When the ribbon is stripped away, ink is left where heating occurred on the label material or substrate. Thermal transfer printing devices can also be used for text and graphics applications since high density, sharp, crisp imaging is feasible. These
10 units are suitable for centralized label production or on-demand printing in the factor at the operator's work station.

Particularly suitable for this label making is a personal computer having software that includes bit
15 image data transfer. The preparation of graphics for inclusion in the bar code label consists of the following steps: (1) the image is read by an electronic scanner whose electronic signal is transferred to a computer such as a MacIntosh® IIci to
20 store and display the graphics; (2) the scanned image is stored in a TIFF file format for use in an IBM PC computer; (3) PC Paintbrush program is loaded in the IBM® PC computer and the file in TIFF format is saved to a PCX file format; (4) this PCX file is then
25 converted into a hexadecimal format and subsequently transposed a negative image into a positive image.

This transposed hexadecimal graphic file is sent via the IBM® PC computer to the Zebra® 130 thermal transfer printer (having 512K RAM) for MEMORY storage.
30 The equipment has a high resolution printhead preferably 8 dot/mm density which can yield superior graphics and bar code outputs. Finally the ZPL® (Zebra Programming Language) format is sent from the IBM® PC computer that include commands to call up the

graphics and all ZPL[®] statements for text and bar codes for a unique label.

For several applications, this unique label is printed on Mylar film 5 mils thick using a commercially available white (wax base) ribbon with the characters and/or graphics reproduced mirror images and the bar codes reverse printed such that the white bars act as the reflective spaces when applied to a black object (Fig. 2).

This invention may be practiced on so-called green rubber applications or cured rubber applications.

In green rubber application, the steps referring to specific Figures, i.e. Fig. 3A are

1) printing the label identification on the surface of a heat-resistant label material such as Mylar film with the characters reproduced as mirror images and bar codes reverse printed;

2) Fig. 3B: positioning the label to an appropriate location on an uncured rubber article such as a green tire of Fig. 3B: or in a mold with the ink surface facing the rubber surface; and

3) curing the green rubber article such as a tire in a heated mold i.e. in Fig. 3C for a specified period of time and temperature such that the bar code ink is selectively transferred and bonded

to the outer surface of the rubber article.

In the cured rubber application, the steps are as shown in Fig. 3A again:

- 1) printing the label identification on the surface of a heat-resistant label material such as Mylar film with the characters reproduced as mirror images and bar codes reverse printed;
- 2) then as seen in Fig. 3B positioning the label to a cured rubber article such as a cured tire with the ink surface facing the rubber substrate; and now referring to Fig. 4A-4C:
- 3) effecting the transfer of the ink by the uniform application of heat (250°F - 300°F) and pressure (300-500 psi) for a short time (15-30 seconds) such as by the use of a heated iron.

It is believed that the heat resistant Mylar film stabilizes the insignia information during transfer such that a precise label is obtained on the tire or rubber product. The film also protects the heated platen or mold surface from any contamination. The ink that is used in the thermal printing process is the same ink that is transferred to the tire or rubber product after the application of heat. The same

capability is possible with text, graphics and bar codes.

5 The unique labels can be printed using a
conventional thermal transfer printing techniques and
utilizing a heavy pigmented, light color
(white/silver) thermal transfer ribbon. The use of a
heat resistant substrate such as Mylar film remains
undistorted in processing (printing and transfer) and
its contrast is unchanged during end use application.
10 Labels can be printed at the tire building station or
other areas upon demand which eliminates inventory and
logistics problems with preprinted labels or mix-ups
during transport to the application point. Practicing
this technique result in sharp, crisp well defined
15 logos of distinguishing markings on a rubber surface
with its method of application being relatively simple
and versatile.

20 This invention intends that the label may be
updated at any time during its life, for instance,
when the tires are brought in to be recapped.

25 While certain representative embodiments and
details have been shown for the purpose of
illustrating the invention, it will be apparent to
those skilled in this art that various changes and
modifications may be made therein without departing
from the spirit or scope of the invention.

The claims defining the invention are as follows:

1. An apparatus for producing a cured rubber tire having a graphic message readable by a scanning unit, said apparatus containing:

a green tire building device having a tire label printer capable of printing a graphic message in response to tire builder input to an electronic means, said printer
 5 naving a means to hold a thermal transfer ribbon and to advance said ribbon in response to said electronic means to transfer a heat transferable graphic from ribbon to a substrate, a means to sever or cut said substrate to produce a label having a graphic message thereon, means to locate the label on said green tire, a tire curing apparatus to
 10 receive said green tire with label to cure the green tire to yield a cured tire having a message thereon, and means to read light reflected from said message on cured tire.

2. The apparatus of claim 1 wherein the ribbon is a heat resistant polyester film whose gauge is up to 1 mil with a silver or white pigmented ink coating.

3. The apparatus of claim 1 wherein the substrate is a heat resistant polyester
 15 film whose gauge is from 1 to 20 mils thick.

4. The apparatus of claim 1 wherein the label is placed on said green tire to effect a mirror image transfer of the graphics on the label to the rubber article and reverse transfer of a bar code to the rubber article.

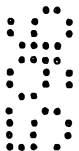
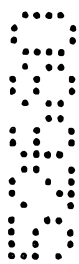
5. A method of labelling an article comprising the steps of making a label at an
 20 article build station by advancing a transfer ribbon through a print head, activating a means that controls the advance of the transfer ribbon to advance the transfer ribbon, advancing said ribbon thereby, and directing an activation means to control the print head to print an operator determinable message on a substrate and then sever said substrate to give a label, placing said label on an article, curing said label to said article
 25 to give an article labelled with a message, then reading the label to discover the message.

6. The method of claim 5 wherein the label is placed on a curable article to offset a reverse printed bar code label to the rubber article and mirror image transfer of the graphics on the label to the article.

7 The method of claim 5 wherein the label is placed on a black curable rubber
 30 article to offset a reverse printed white/silver bar code label to the rubber article, wherein the printed silver/white bars act as the reflected spaces between the non-printed bar formed by black loaded rubber backing material of the rubber article.

8. The method of claim 6 wherein the message is readable by a scanner that is
 35 activated by reflected electromagnetic radiation.

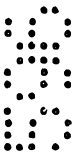
9. The method of claim 8 wherein any reflection of the electromagnetic radiation supplies an electrical input to a computer to store said input and allow said input to be printed in a print form.



10. An apparatus for producing a cured rubber tire having a graphic message readable by scanning unit, substantially as hereinbefore described with reference to the accompanying drawings.

11. A method of labelling an article, substantially as hereinbefore described
5 with reference to the accompanying drawings.

Dated 15 May, 1996
The Goodyear Tire & Rubber Company
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON



APPARATUS AND METHOD FOR MARKING A RUBBER ARTICLE WITH
A MESSAGE READABLE BY A LIGHT SCANNING DEVICE

Abstract

An apparatus (11) and method for supplying a graphic label (18)
5 that is readable with a light scanning device (22) with such label placed
on a rubber article. The graphic bar code label is optically interpreted
with a bar code reader. Thus, the cured substrate (21) with the label
with the graphic message is produced by using thermal transfer
techniques. For this purpose, the ribbon (12) in contact with the
10 substrate (14) passes by a print head (13) and the ink can be selectively
heated with this operation being synchronized by computer operation.
When the ribbon (14) is stripped away, the ink (24) is left where heating
occurred on the substrate material (21). The printed substrate exits and
is cut to produce labels (18) of desired length. The label is placed on
15 a cured or curable article and the label and substrate are subjected to
curing conditions to effect transfer of the label to the cured substrate
(21) which may now contain the message in solely, alphanumeric, bar
codes, human readable characters, and logos or mixtures of them. The bar
code message is normally printed as a series of vertical bars (24) and
20 spaces (23) of varying widths to supply the message in readable form with
the light reflected from the series of varying width bars and spaces.

Figures 1A & 1C

FIG. 1

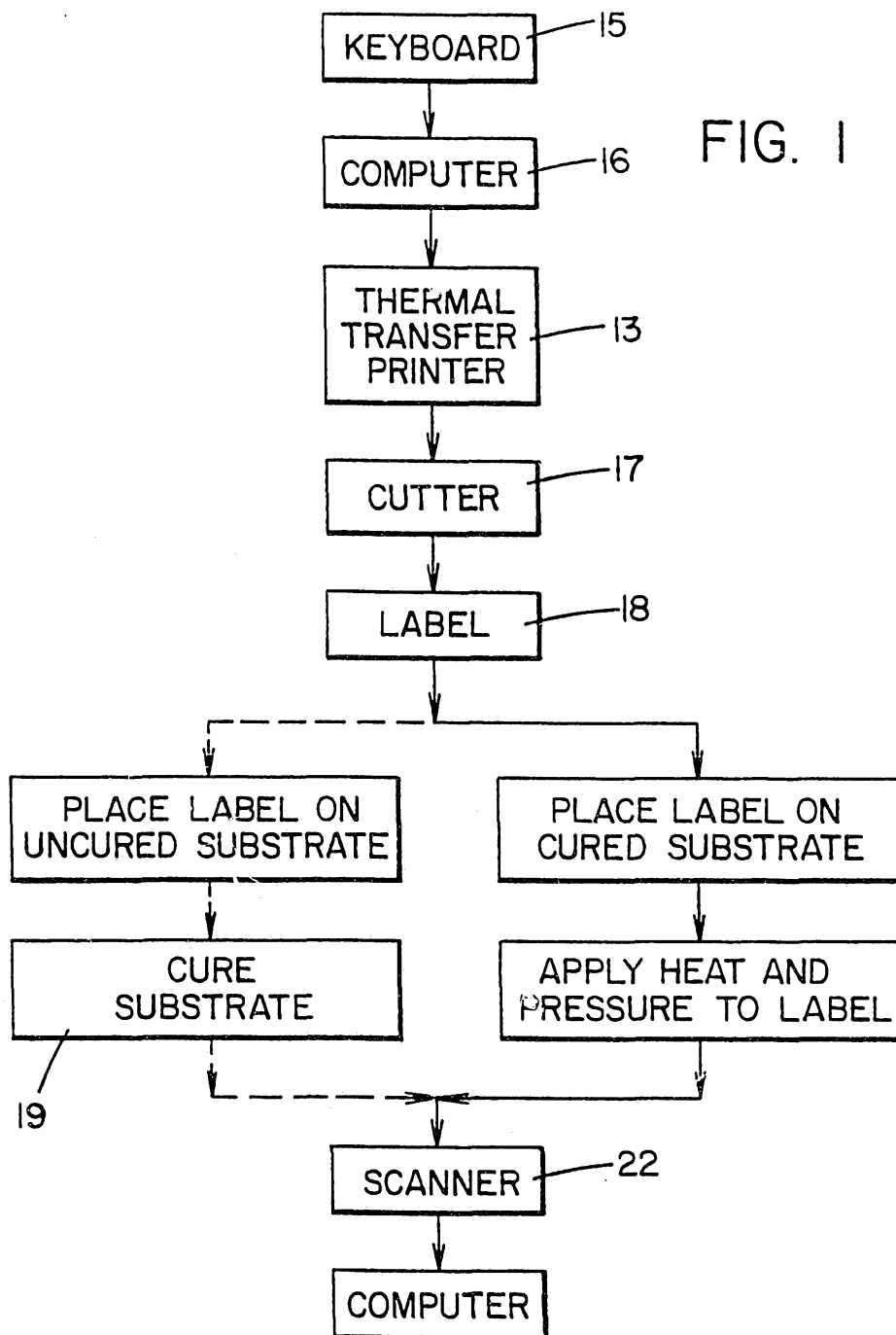


FIG. 1A

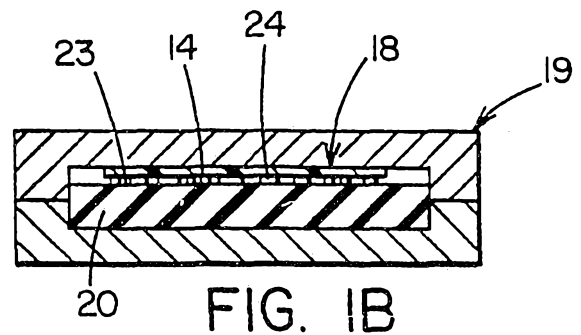
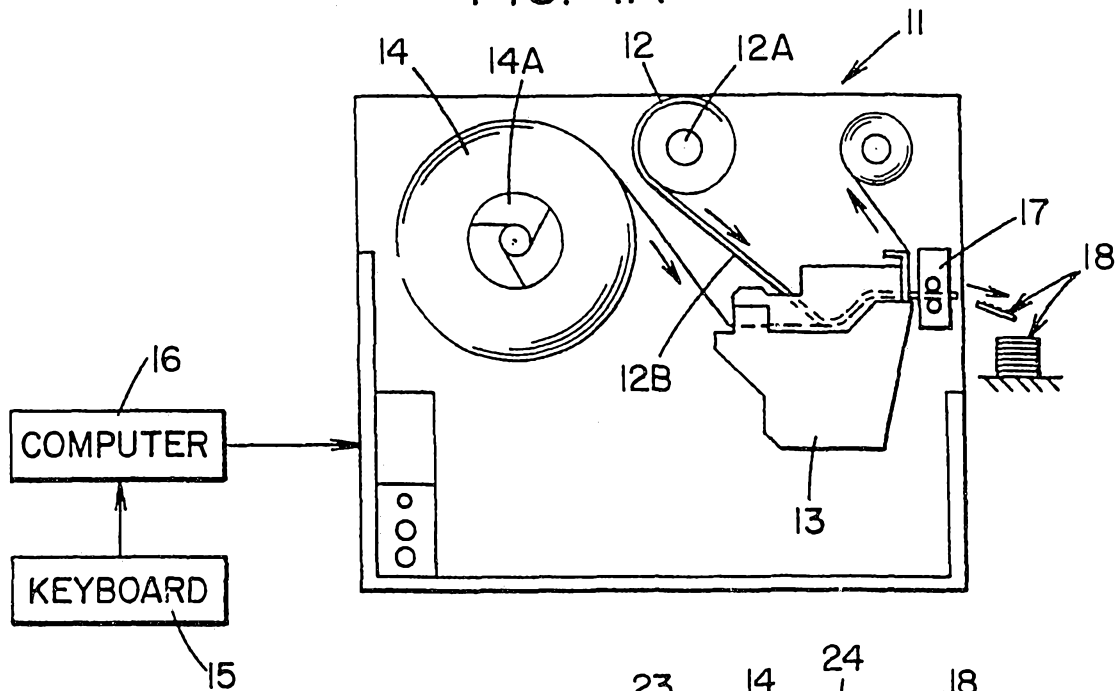


FIG. 1B

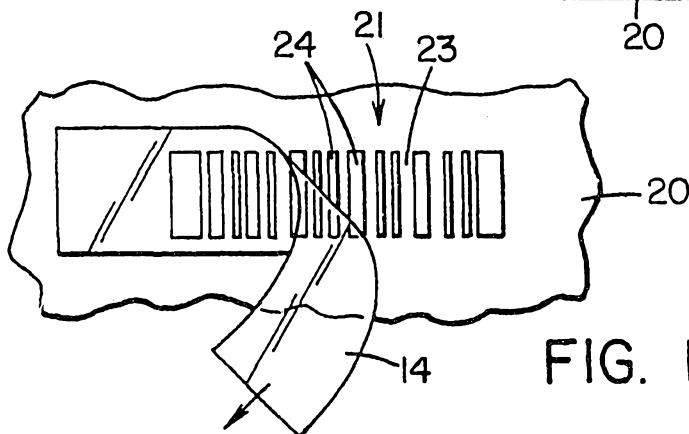


FIG. 1C

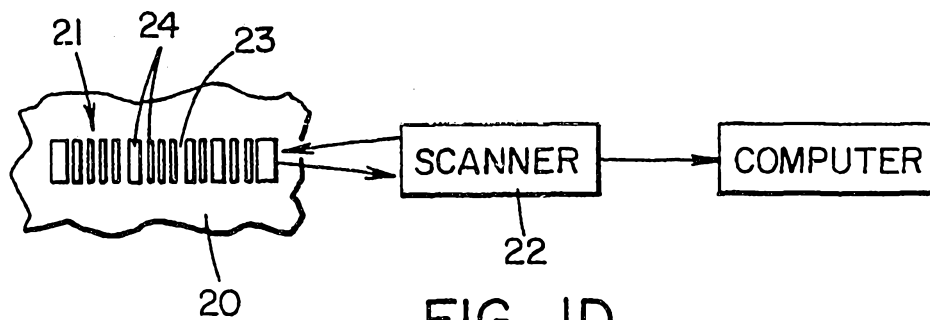


FIG. 1D

FIG. 2A



FIG. 2B

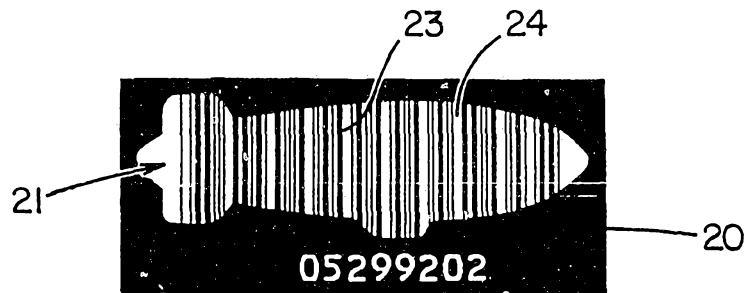


FIG. 2C



