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Navi et al.

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[45] **June 12, 1973**

[54] **ARTICLE CONTROLLED BOTTOM MARKING APPARATUS**

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[52] **U.S. Cl.** **101/35**, 101/DIG. 3, 198/165

[51] **Int. Cl.** **B41f 17/16**

[58] **Field of Search** ..... 101/35, DIG. 3; 198/165

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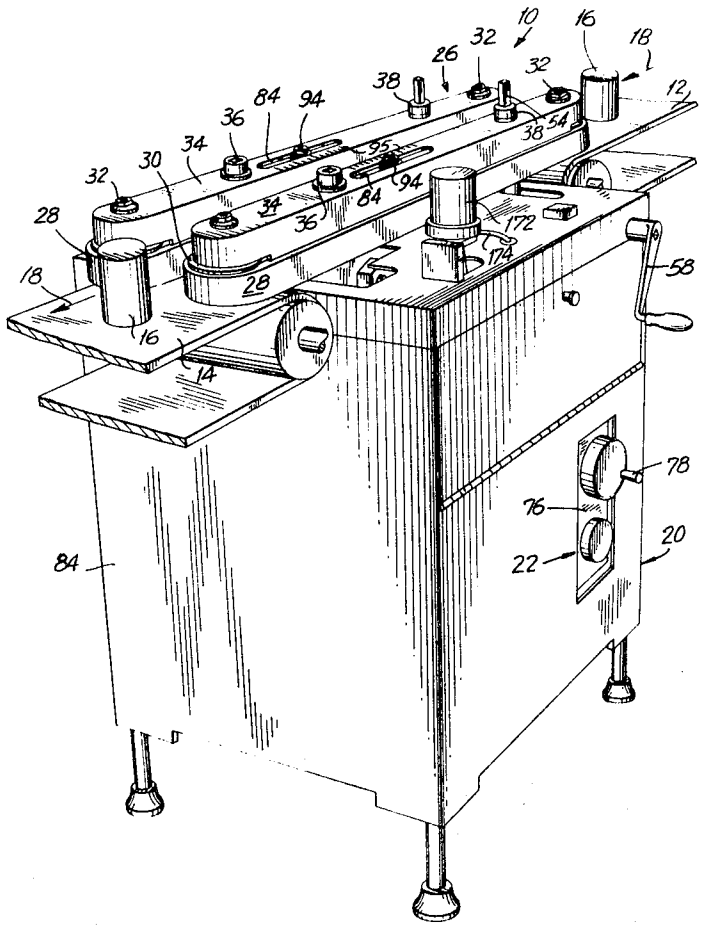
[57] **ABSTRACT**

An apparatus for imprinting on the bottom surface of a plurality of objects carried along a path wherein said objects are carried along a portion of said path by a pair of spaced moving belt means positioned in said path. The objects are detected by sensing means selectively displaceable along said path which produce a detection signal when an object to be imprinted passes thereby. Print means positioned below and intermediate the pair of moving belt means is adpated for actuation in response to said detection signal to effect imprinting on said object bottom surface.

18 Claims, 8 Drawing Figures



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SHEET 1 OF 5

FIG. 1

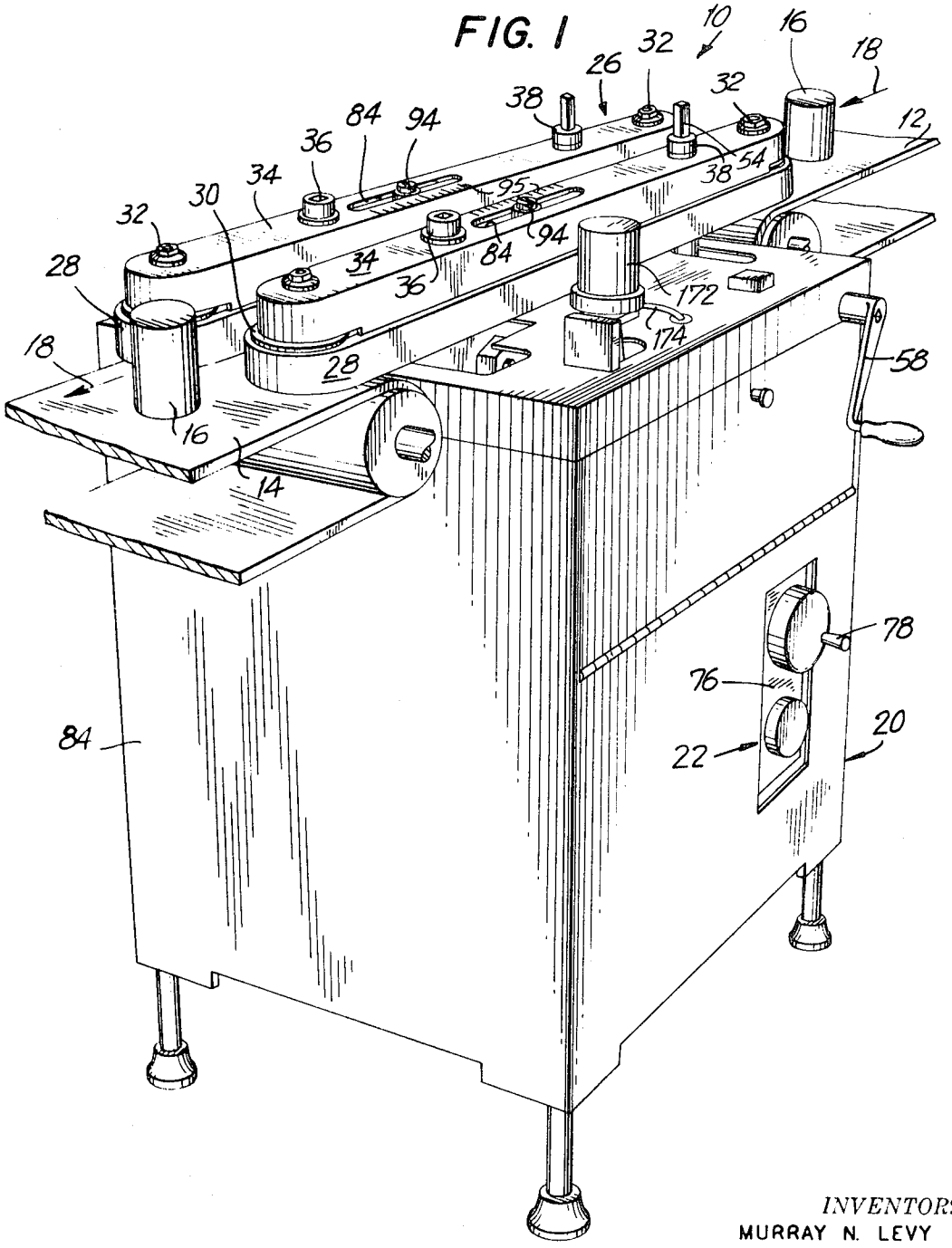

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FIG. 2

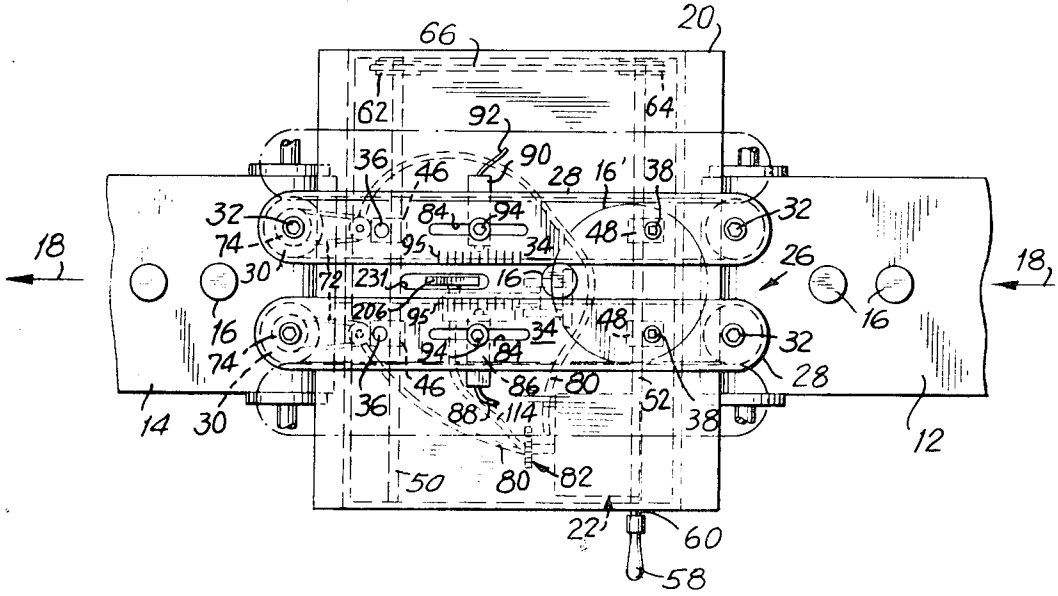
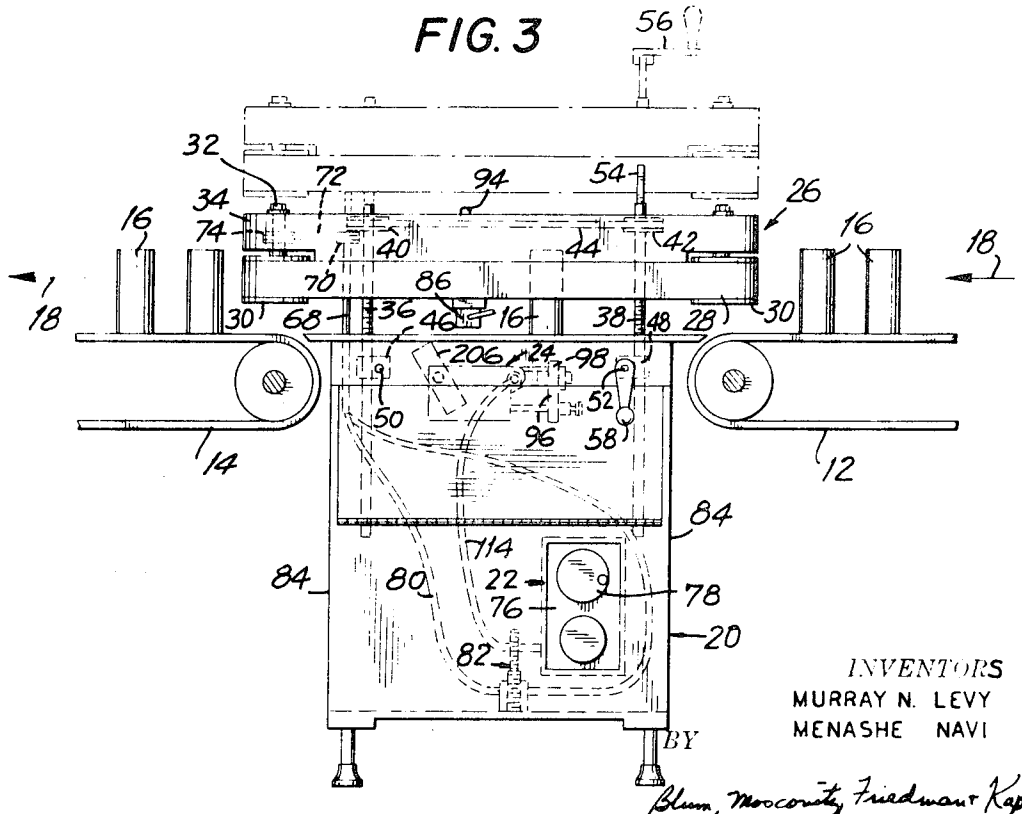


FIG. 3



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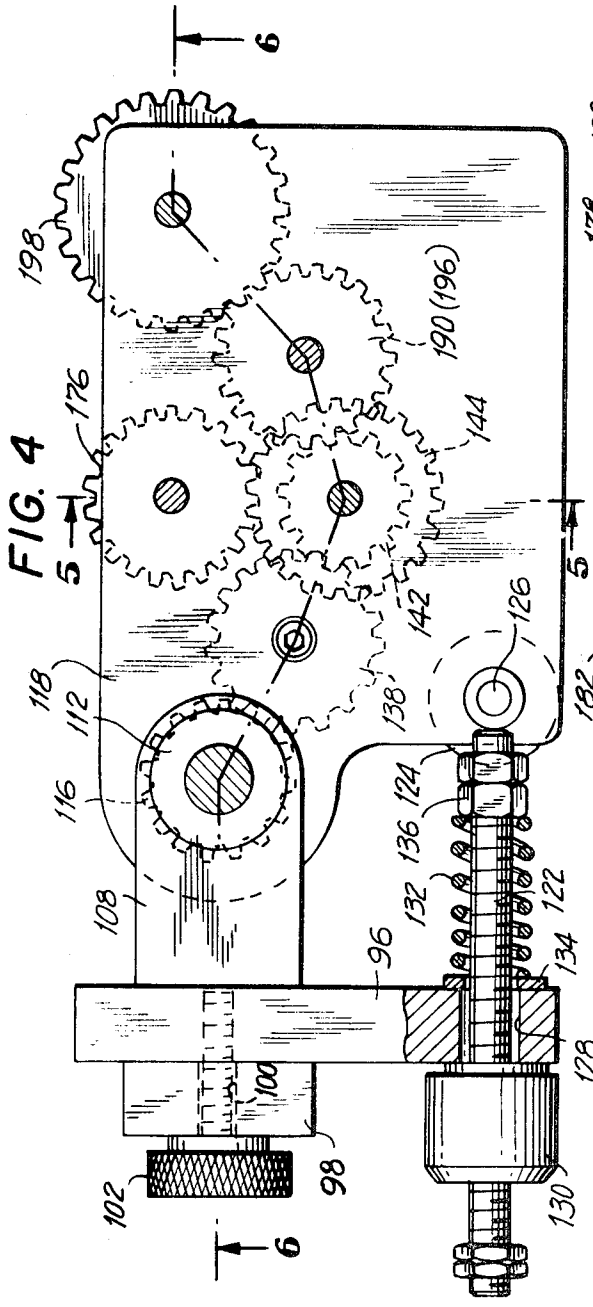

FIG. 4

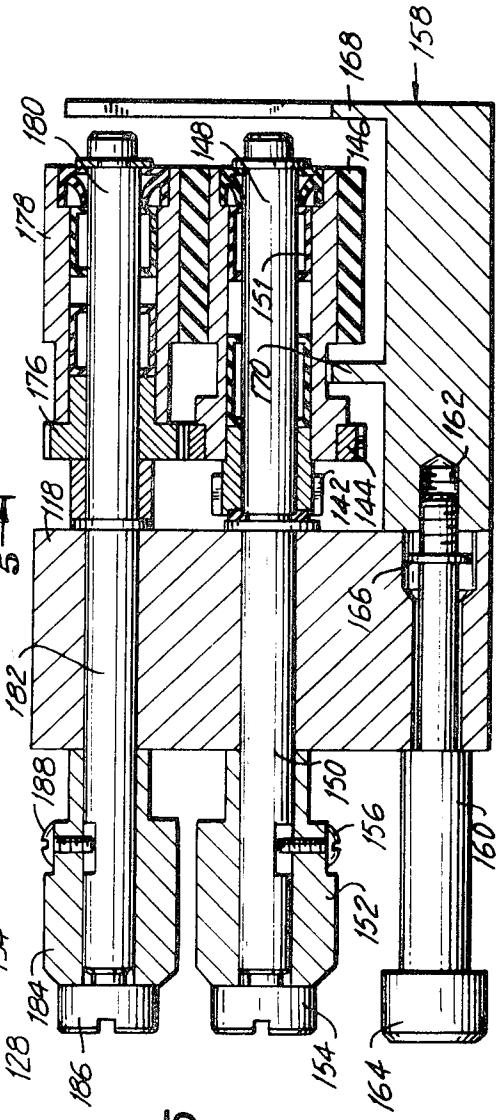

FIG. 5

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FIG. 6

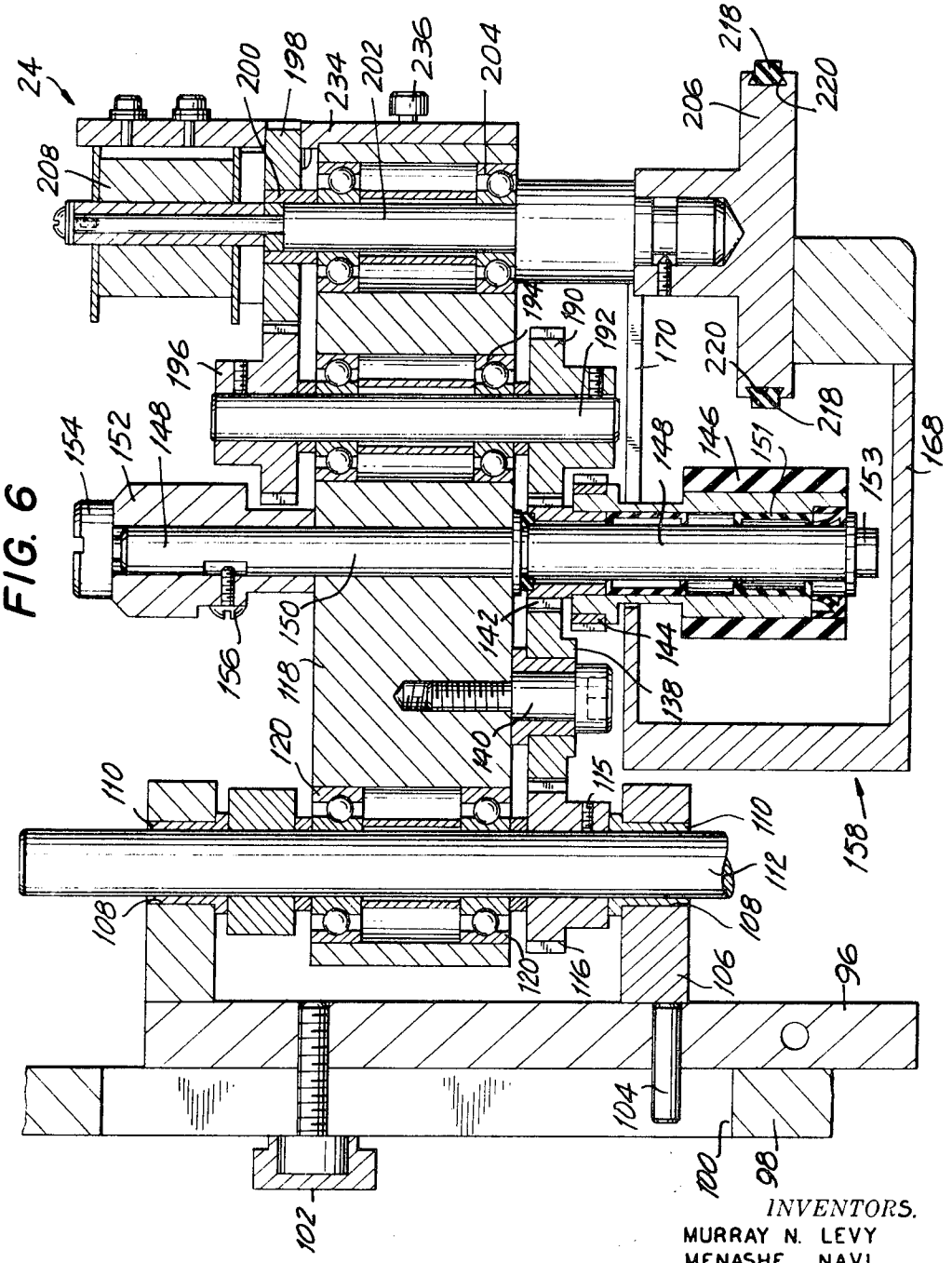

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FIG. 7

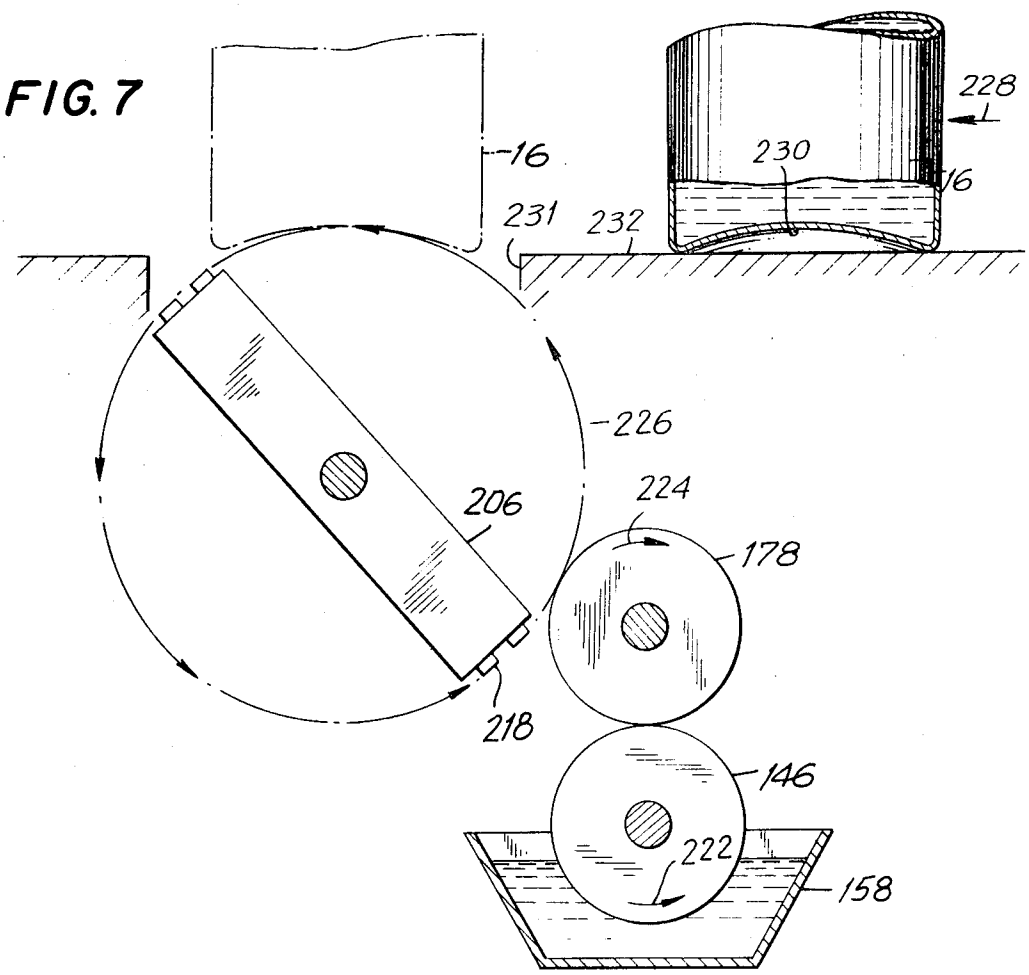
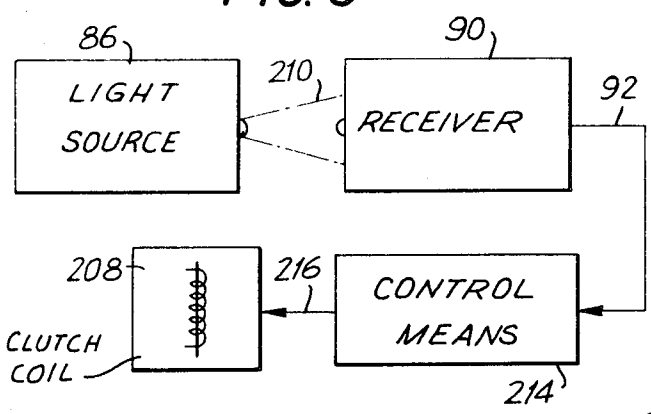


FIG. 8



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ARTICLE CONTROLLED BOTTOM MARKING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to printing apparatus for imprinting the bottom surface of containers and the like. In practice, it is frequently desired to imprint the bottom surface of a container or the like with a coded identification, which may represent the date of processing, the batch from which the contents were taken, the machine upon which processing was accomplished, or any desired information. As used herein, "bottom surface," is not limited to the actual bottom surface of the container or the like, but rather, includes any surface of the container or the like which is the lowermost surface when the container or the like is processed by the apparatus according to the invention.

In the art, such bottom marking has been achieved by such diverse means as hand stamping and machines incorporating a lead screw which propels the object to be imprinted past the printing means, while maintaining successive objects in a predetermined spaced relation so as to insure registration of the imprinting with the bottom of each object. The prior art arrangements have been found to be inflexible, complex and unduly expensive. Thus, in the case of the devices provided with a lead screw, the lead screw must be changed if an object of a different size is to be imprinted, a time consuming process. Further, such devices are severely limited in the shape of the objects which can be processed thereby.

By providing a bottom marking apparatus wherein the objects to be imprinted are propelled by a pair of spaced moving belt means, and flexographic printing is effected in response to a sensing means in the path of the object, which sensing means is selectively displaceable along said path, the foregoing disadvantages in the prior art arrangements are avoided.

SUMMARY OF THE INVENTION

Generally speaking, in accordance with the invention, an apparatus for imprinting on the bottom surface of a plurality of objects carried along a path is provided including a pair of spaced moving belt means in said path for carrying said objects along a portion of said path. Sensing means are disposed in said portion of said path for producing a detection signal when each object to be imprinted passes thereby. Print means is positioned below and intermediate said pair of moving belt means and adapted for actuation in response to said detection signal to effect imprinting on the bottom surface of the detected object. Drive means are provided for driving said moving belt means and said print means. Means are provided for selectively displacing said sensing means along said portion of said path for positioning said imprinting on said bottom surface.

Means may be provided for laterally displacing said pair of spaced moving belt means for selectively adjusting the space therebetween. The height of each of said pair of moving belt means relative to said print means may also be adjustable. Cabinet means may be provided for carrying said print means and drive means, said pair of spaced moving belt means being mounted on the top surface of said cabinet means and projecting beyond the sides thereof for cooperation with infeed and take-away conveyor means. The objects to be imprinted may be carried solely by said pair of spaced conveyor means, or may be conveyed along the top surface of said cabinet means.

Said print means may include frame means on which are mounted a rotatable die wheel means and inking means. Means may be provided for resiliently pivotably mounting said frame means so that said frame means is displaceable in response to the engagement of said die wheel against regions of irregular elevation on the bottom surface of the object to be imprinted. Said print means may include a drive shaft positioned on the axis of pivoting of said frame means and means operatively coupling said drive means to said drive shaft and said drive shaft to said die wheel means and inking means. The means for operatively connecting the drive shaft and inking means may be adapted for continuously rotating said inking means. The means operatively interconnecting said drive shaft and said die wheel means may include clutch means for selectively operatively coupling said die wheel means to said drive shaft in response to said detection signal for rotating said die wheel through one cycle to effect printing on the detected object.

Said die wheel means may be formed from a pair of radially projecting arms and a die means mounted on the end of each of said arms. Said inking means may include an inkwell, an ink roll projecting into said inkwell, and a metering roll engaging said ink roll. Said die wheel means is adapted to rotate 180° during each cycle, first engaging said metering roll to receive ink therefrom, and then engaging the bottom surface of the object to be imprinted to effect imprinting.

The means for pivotably mounting said print means may also permit the lateral displacement thereof for positioning of said die wheel means laterally in the space between said pair of moving belt means. Said drive means and moving belt means and print means may be operatively connected by flexible shaft means.

Accordingly, it is an object of this invention to provide a bottom marking apparatus which imprints a plurality of successive objects in response to detection of each of said objects.

A further object of the invention is to provide a bottom marking apparatus adapted to accommodate objects of a wide range of sizes and shapes, and to imprint on the bottom surfaces of such objects, irrespective of the irregular elevation of said bottom surfaces.

Still another object of the invention is to provide a bottom coding apparatus which incorporates flexographic printing techniques to imprint on a plurality of successive objects.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of the bottom coder according to the invention mounted between infeed and take-away conveyors;

FIG. 2 is a top plan view of the bottom marking apparatus of FIG. 1, showing the moving belt means thereof in two positions;

FIG. 3 is a side elevational view of the bottom marking apparatus of FIG. 1 showing the moving belt means thereof in two positions;

FIG. 4 is an in part schematic, and in part sectional side elevational view of the print means of the bottom coder of FIG. 1 showing the mounting and driving gear train thereof;

FIGS. 5 and 6 are sectional views taken along lines 5—5 and 6—6 respectively of FIG. 4;

FIG. 7 is a schematic representation showing the orientation of the object to be imprinted, the die wheel, and the inking means of the arrangement according to the invention; and

FIG. 8 is a schematic diagram of the sensing means according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 – 3, marking apparatus **10** depicted in the drawings is positioned between an infeed conveyor **12** and a take-away conveyor **14** in the path of a plurality of objects such as containers **16.** Said containers are carried in the direction of arrows **18** and are fed to the bottom marking apparatus **10** by infeed conveyor **12** and carried away therefrom by take-away conveyor **14.**

Bottom marking apparatus **10** is formed with a cabinet **20** within which is mounted a drive assembly **22** and a print assembly **24** (FIG. 3). A conveyor assembly **26** is mounted on top of cabinet **20** in the path of containers **16.**

Conveyor assembly **26** consists of a pair of laterally spaced substantially parallel moving belt means, each of which consists of an endless belt **28** respectively rotatably mounted on a pair of rollers **30,** which in turn are mounted by shafts **32** to a belt housing **34.** Each of belt housings **34** are supported on a pair of longitudinally spaced lead screws **36** and **38.** As best shown in FIG. **3,** said lead screws are journaled through each belt housing **34** so that said lead screws may rotate relative to said belt housing while supporting said belt housing. Lead screws **36** and **38** are ganged together by means of pulleys **40** and **42** mounted respectively on lead screws **36** and **38** and a chain **44** joining said pulley. Each of lead screws **36** and **38** pass through correspondingly threaded apertures in vertically fixed blocks **46** and **48.** Said blocks are in turn mounted on lead screws **50** and **52,** as more particularly shown in FIG. **2.** Lead screw **38** is formed with a projecting portion **54** of square cross section adapted to removably receive a handle such as handle **56** shown in dashed lines in Fig.**3.** Said handle provides means for rotating lead screws **36** and **38** for selectively raising and lowering each endless belt **28** and belt housing **34** relative to the vertically fixed blocks **46** and **48.** The conveyor assembly is shown in phantom lines in a raised position in FIG. **3.**

Referring now to FIG. **2,** it is noted that lead screws **50** and **52** are mounted on cabinet **20** so that they may rotate relative thereto in response to a handle **58** removably mounted on a squared projecting portion **60** of lead screw **52.** Lead screws **50** and **52** are ganged together for coordinate rotation by means of pulleys **62** and **64** mounted respectively on lead screws **50** and **52,** which pulleys are joined by a chain **66.** The threaded apertures in the two sets of blocks **46** and **48** associated with each endless belt **28** are threaded in a direction such that, upon the rotation of handle **58,** the spacing between endless belts **28** may be selectively adjusted. FIG. **2** shows said endless belts in phantom lines in an expanded position engaging in enlarged container **16'.**

As best shown in FIGS. **2** and **3,** each endless belt **28** is driven through a drive shaft **68** rotatably mounted on belt housing **34** and having a pulley **70** mounted thereon. Pulleys **70** are joined by chains **72** to pulleys **74** mounted on one of shafts **32,** for the transmission of the rotation of drive shafts **68** to endless belts **28.**

Drive assembly **22** includes a variable speed motor **76** controlled by a speed control **78.** Said variable speed motor is operatively connected to each of the two drive shafts **68** by separate flexible drive shafts **80,** which in turn are driven through gear train **82,** which gear train is directly driven by motor **76.** The use of flexible drive shafts permits the ready adjustment of the positioning of the conveyor assembly without concern for disconnecting or otherwise realigning the drive arrangement. From the foregoing, it is apparent that the conveyor assembly is particularly adapted to be readily set to receive objects of a wide range of sizes and shapes. The ends of the conveyor assembly project beyond the sides **84** of cabinet **20,** thereby eliminating the necessity of any special interface surfaces or devices intermediate the intake and take-away conveyors and the bottom marking apparatus according to the invention. The foregoing arrangement also permits the grasping of the object to be imprinted by the endless belts, so that the bottom of said objects need not be in engagement with the top surface of cabinet **20,** thereby minimizing the possibility of tipping of the containers due to friction, or the wear of said top surface. The arrangement of the endless belts also tend to urge objects to be imprinted into the belt gap even if they are an inch or so off center.

Each of belt housings **34** are formed with a longitudinal slot **84** for mounting the sensing arrangement according to the invention. Said sensing arrangement consists of a light source **86** connected to a source of power by means of electrical cable **88,** and a receiver **90** connected to a control means by means of electrical cable **92** (FIG. **2**). One of said light source and receiver is mounted on each of said belt housings by means of bolts **94** which extend through slot **84.** A scale **95** is provided adjacent each slot to permit the coordinated adjustment of both the light source and the receiver.

Said light source and receiver are positioned in aligned facing relation across the path of containers **16,** so that the blocking of the light passing from the light source to the receiver by a container passing therebetween results in the generation of a detection signal which will be discussed more particularly below. Each of said light source and receiver may be selectively displaced longitudinally along its respective slot **84** by loosening bolts **94.** In this manner, the position at which detection of a container **16** occurs may be selectively controlled.

Referring now to FIGS. **3** – **6,** it is seen that the print assembly **24** is pivotably mounted on a bracket **96,** which in turn is secured to a cross bar **98** (FIGS. **3, 4** and **6**), which cross bar is mounted within cabinet **20.** Cross bar **98** extends laterally of the path of container **16,** and as best shown in FIGS. **4** and **6,** is provided with

a longitudinally extending slot **100** through which mounting bolt **102** extends for securing bracket **96** to said cross bar. A pin **104** also projects from bracket **96** into slot **100** for supporting said bracket. By loosening bolt **102**,it is possible to laterally displace all of print assembly **24** relative to the path of the containers for positioning of the desired imprinting on the bottom surface of said containers.

Bracket **96** is provided with a pair of arms **106** having aligned apertures **108** therethrough. A bearing **110** is received within each of said apertures for rotatably supporting a print drive shaft **112**. Said print drive shaft is operatively coupled to drive assembly **22** through a flexible cable **114** which engages one end of said shaft. Fixed to said shaft by set screw **115** for rotation therewith is a driving gear **116**. A drive housing **118** is also mounted on said shaft through bearings **120** which permit the pivoting of said housing about an axis defined by said shaft.

As best shown in FIG. **4**, the pivoting of housing **118** about the axis defined by drive shaft **112** is controlled by a threaded rod **122** which is threadably engaged in a fitting **124** which is pivotably mounted by means of pin **126** to print housing **118**. Said threaded rod passes through an aperture **128** in bracket **96** and is retained by a knob **130** formed with a threaded aperture through which said threaded rod extends. A spring **132** is mounted intermediate a washer **134** and nuts **136** to normally bias print housing **118** so that it is positioned in the extreme counter clockwise position as viewed in FIG. **4**. When a downward pressure is applied on the print assembly, as described below, said print housing will pivot in the clockwise direction as viewed in FIG. **4**, against the bias of spring **132**, and will be returned to its original position upon release of the pressure, due to the action of said spring. Aperture **128** is sufficiently wide to permit the skewing of rod **122** during the pivoting of print housing **118**.

By the foregoing arrangement, the print assembly is pivotable without interferring with the transmission of drive to said print assembly, since the axis of pivoting is defined by the print drive shaft. The rotative force of said drive shaft is transmitted through driving gear **116**, to idler gear **138**, which is mounted on shaft **140** to print housing **118**. Said idler gear is operatively coupled to a first inking roll gear **142** which is joined to a second inking roll gear **144** for driving inking roll **146**. Said first and second inking gears and said inking roll are all mounted for free rotation on inking shaft **148** through bearings **151**. These parts are retained on the inking shaft by means of a cap screw **153** secured to one end of said shaft. Inking shaft **148** extends through print housing **118**, the portion **150** thereof being eccentrically mounted within said print housing. The shaft is retained in position by means of a sleeve **152** and a cap screw **154**. When cap screw **154** is released, shaft **148** may be rotated by rotating sleeve **152**, which is coupled to said shaft by a set screw **156**, to adjust the position of the axis of rotation of inking roll **146**, for purposes which will be described below.

As shown in FIG. **5**, inking roller **146** projects into an inkwell **158** which is mounted on print housing **118** by a rod **160**, the end of which is threaded for engagement with a corresponding aperture **162** in the base of inkwell **158**. Rod **160** extends through an aperture in print housing **118** and is formed with a knob **164** at the end thereof to permit easy removal of inkwell **158**. A lock washer **166** is mounted on rod **160** adjacent the threaded portion thereof, so that said rod is retained in the print housing when the inkwell is removed. The ink is retained between walls **168** and **170** of the inkwell, and is fed thereto from a bottle **172** through a tube **174** (FIG. **1**). This continuous feeding arrangement insures a constant desired level of ink in the inkwell during printing. Second inking gear **144** operatively engages with a metering gear **176** which is coupled to a metering roll **178**, said metering roll and metering gear being freely rotatable on a metering shaft **180** formed substantially identically to inking shaft **148**.

Thus, metering shaft **180** is formed with an eccentric portion **182** which extends through print housing **118** and is locked in position by a sleeve **184** and a cap screw **186**, said sleeve being secured to said shaft by a set screw **188**. The eccentric adjusting means for metering roll **178** and inking roll **146** permits the relative displacement of said metering and ink rolls. In this manner, said rolls can be set in and out of engagement, and the degree of engagement can also be strictly regulated. Ink roll **146** is adapted to pick up ink from inkwell **158**, while metering roll **178**, the surface of which is textured, is adapted to pick up a measured thin layer of ink from said ink roll. The nature of the ink is such that it quickly dries when exposed to the air, and accordingly, both the ink and metering rollers are continuously rotated to prevent the drying of the ink thereon.

Referring again to FIG. **6**, the first inking gear **142** is operatively engaged with a second idler gear **190** fixedly mounted on a idler shaft **192** which is journaled through a bearing **194** mounted within print housing **118**. A third idler gear **196** is fixedly mounted to the other end of said idler shaft and is in operative engagement with a die wheel gear **198**. Said die wheel gear is mounted for free rotation on a bearing **200**, which in turn is fixed on a die wheel shaft **202**. Said die wheel shaft is journaled through bearing **204** in print housing **118**, and carries at one end thereof, a die wheel **206**. Die wheel gear **198** is coupled to die wheel shaft **202** through a solenoid actuated clutch **208**. Said solenoid actuated clutch permits the free rotation of die wheel gear **198** in response to the rotation of the drive shaft **114** through the gear train described above, while normally preventing the rotation of die wheel shaft **202** and die wheel **206**.

Solenoid clutch means **208** is operated in response to the detection signal generated by receiver **90** as more particularly shown in FIG. **8**. Specifically, when a container **16** cuts the beam of light **210** between light source **86** and receiver **90**, a detection signal is passed along line **92** from receiver **90** to a control means **214**, which in turn is operatively coupled to the solenoid coil of clutch means **208** through line **216** to actuate said coil in response to said detection signal. When the coil of clutch means **208** is actuated, die wheel shaft **202** is operatively coupled to die wheel gear **198** so that the die wheel **206** is rotated in response to the rotation of drive shaft **112**. Such rotation is limited to an incremental distance, since the coil of clutch means **208** is only momentarily actuated, and the clutch is provided with stops engaged by the armature of the solenoid so that the die wheel **206** rotates only an incremental distance, 180° in the embodiment of the drawings.

Die wheel **206** is in the form of a pair of radially extending arms having dies **218** mounted in grooves **220** in the ends thereof. As shown in FIG. **7**, the rest posi-

tion of die wheel **206** is with the dies out of engagement with metering roll **178**. Ink roll **146** is continuously rotating in the direction of arrow **222**, while metering roll **178** is continuously rotating in the direction of arrow **224**. When a detection signal is transmitted by receiver **90** in response to the proper positioning of a container **16**, clutch means **208** is released, and the die wheel **206** rotates in the direction of arrow **226**. Simultaneously, the container **16** is carried in the direction of arrow **228** into the path of the die wheel. Die wheel **218** rotates so that die means **218** first engages metering roll **178** to transfer ink to said die means, and then engages the bottom surface **230** of can **16** to imprint on said bottom surface. The shape of the die wheel permits the imprinting on a concave or other recessed bottom surface, as shown in FIG. **7**. The die wheel returns to a rest position at which the die means **218** assumes a position just passed the point of imprinting, while the other die means is positioned adjacent metering roll **178** for the next imprinting. A slot **231** is formed in the top surface of the cabinet to permit the arms of die wheel **206** to extend therethrough. The flexographic inks preferably used in this process promptly dry and a permanent marking has been achieved. The die means **218** may take any desired shape, including numerical, alphabetical and other indicia. The rest position of die wheel **206**, between each 180° cycle, is also chosen so that the arm nearest the top surface **232** of cabinet **20** is below said top surface so as not to interfere with the containers being carried thereby by the conveyor assembly. While the embodiment of the bottom marking apparatus according to the invention is designed for a 180° rotation cycle of die wheel **206**, said apparatus could also be designed for other incremental rotation cycles including but not limited to 360° and 90°.

Referring again to FIG. **6**, a plate **234** is mounted by bolt **236** to print housing **118** for carrying the solenoid coil of the clutch means.

It will thus be seen that the objects set forth above, and those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. An apparatus for imprinting on the bottom surface of a plurality of objects carried along a path at a printing station on said path, comprising a pair of spaced moving belt means in said path for carrying said objects along a portion of said path in advance of, through and past said printing station; sensing means in said portion of said path for producing a detection signal when each object to be imprinted passes thereby; printing means including a rotatable die wheel positioned below and intermediate said pair of moving belt means and rotatably mounted flexographic inking means mounted below said pair of moving belt means; drive means for continuously driving said moving belt means and said inking means; means for selectively coupling said die wheel to said drive means in response to said detection signal for the incremental advance of said die wheel to effect imprinting on the bottom surface of the detected object, said die wheel being positioned when at rest to be out of engagement with said inking means and being positioned for first engaging said inking means for receiving ink therefrom, and then engaging said bottom surface for imprinting; and means for selectively displacing said sensing means along said portion of said path for positioning said imprinting on said bottom surface.

2. An apparatus according to claim **1**, including means for coordinately laterally displacing said pair of moving belt means relative to said path for selectively adjusting the spacing therebetween.

3. An apparatus according to claim **2**, including means for separately displacing each of said pair of moving belt means normally to said path toward and away from said print means for selectively adjusting the height above said print means at which said objects are engaged by said pair of moving belt means.

4. An apparatus according to claim **2**, including a frame, said moving belt lateral displacement means including a pair of spaced lead screws extending laterally relative to said path and mounted on said frame for rotation relative thereto; means coupling said lead screws for the coordinate rotation thereof; two pairs of blocks each of said blocks having a threaded aperture for receiving one of said lead screws, each of said pair of moving belt means being mounted on a pair of said block means, each of said lead screws extending through the threaded aperture of one block of each of said pairs of blocks, whereby the rotation of one of said lead screws coordinately laterally displaces said pair of spaced belt means.

5. An apparatus according to claim **4**, wherein each of said blocks is formed with a further threaded aperture extending normally to the first threaded aperture therethrough; said apparatus including two pair of further lead screws, one of said further lead screws being received in each of said further threaded apertures, means for coordinately rotating each of said pair of further lead screws; and means for mounting each of said pair of moving belt means on one of said pair of further lead screws while permitting the free rotation of said further lead screws relative thereto, whereby each of said moving belt means may be separately displaced normally to said path toward and away from said print means by the rotation of one of the pair of further lead screws associated therewith.

6. An apparatus according to claim **1**, wherein the ends of said pair of spaced moving belt means projects longitudinally along said path from said apparatus to define the outer extent of said apparatus along said path.

7. An apparatus according to claim **1**, wherein said moving belt means engage each of said objects and carry said objects along said portion of said path so that said objects engage only the printing means and moving belt means of said apparatus.

8. An apparatus according to claim **1**, including means for selectively laterally displacing said print means relative to said path for the positioning of said imprinting relative to said object bottom surface.

9. An apparatus according to claim **1**, including means for resiliently and pivotably mounting said print means so that said print means is normally biased toward said object bottom surface and is pivotably dis-

placeable thereby in response to regions of irregular elevation of said bottom surface.

10. An apparatus according to claim **9**, including a print drive shaft operatively coupled to said print means for providing driving force thereto, and operatively coupled to said drive means for being driven thereby, said drive shaft being positioned on the axis of pivoting of said print means.

11. An apparatus according to claim **1**, wherein said selective coupling means includes a continuously rotating print driving means operatively coupled to said drive means; and clutch means for selectively coupling said rotatable die wheel to said print driving means in response to said detection signal for incrementally advancing said die wheel to effect imprinting on the detected object.

12. An apparatus according to claim **11**, wherein said die wheel is formed with a pair of opposed radially extending arms, and die means mounted on the ends of each of said arms, said clutch means being adapted to permit an incremental rotation of said die means of about 180° in response to each detection signal.

13. An apparatus according to claim **11**, wherein said clutch means is solenoid actuated.

14. An apparatus according to claim **1**, wherein said inking means includes an inkwell, an ink roller extending into said inkwell for receiving ink therefrom; and a metering roll engaging said ink roll for receiving ink therefrom, said die wheel engaging said metering roll befor engaging said object bottom surface.

15. An apparatus according to claim **1**, including flexible cable means for operatively connected said drive means and each of said moving belt means and print means.

16. An apparatus according to claim **1**, wherein said sensing means include a light source positioned on one side of said path and a light sensitive means in facing relation to said source on the opposite side of said path.

17. An apparatus according to claim **16**, wherein each of said light source and light sensitive means are mounted in a longitudinal slot in one of said pair of moving belt means, and including means for selectively clamping each of said light sensitive means and light source in aligned positions in their respective slots.

18. An apparatus according to claim **17**, including scale means positioned adjacent each of said slots for permitting the coordinate positioning of said light sensitive means and light source.

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