# United States Patent [19]

**Berg**

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[45] **Feb. 27, 1973**


## [54] METHOD AND APPARATUS FOR DECORATING ARTICLES


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[52] **U.S. Cl.** .....**156/234,** 156/238, 156/240, 156/361, 156/384, 156/540, 156/567

[51] **Int. Cl.**.....**B32b 31/10, B32b 31/20**

[58] **Field of Search**.....156/230, 234, 238, 240, 361, 156/384, 475, 540–542, 566, 567



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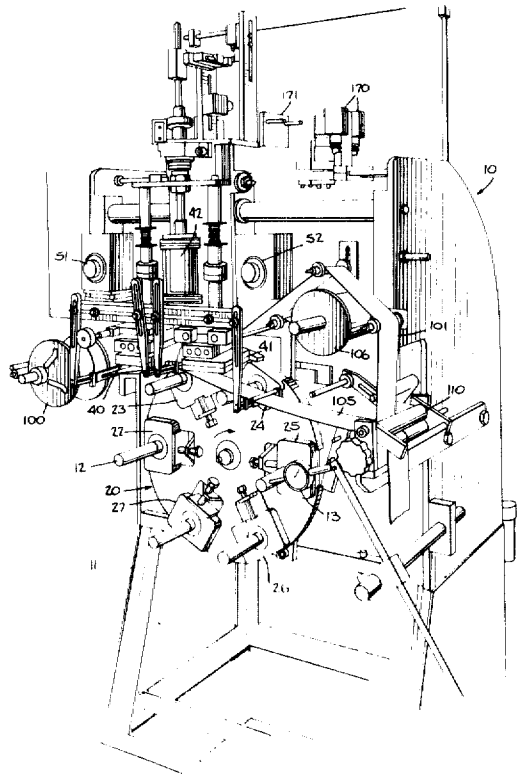
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[57] **ABSTRACT**

A method and apparatus for decorating the outer surface of an article or ware wherein the article is initially positioned on a holding mandrel mounted to a rotary table while at a loading station. The article is subsequently advanced to a decorating station whereat a layer of transfer material is interposed between the article and a printing die. The transfer material is caused to engage the article being decorated with the die being moved across the outer surface thereof whereby a portion of the transfer material is caused to adhere to the article. Further means are provided to register the articles with respect to one another, accommodate surface irregularities on the article, permit uniform decorating of the article, accommodate tapered articles, allow for rapid changeover and adjustment of the machine, permit multi-color decorating, as well as others.


**30 Claims, 14 Drawing Figures**

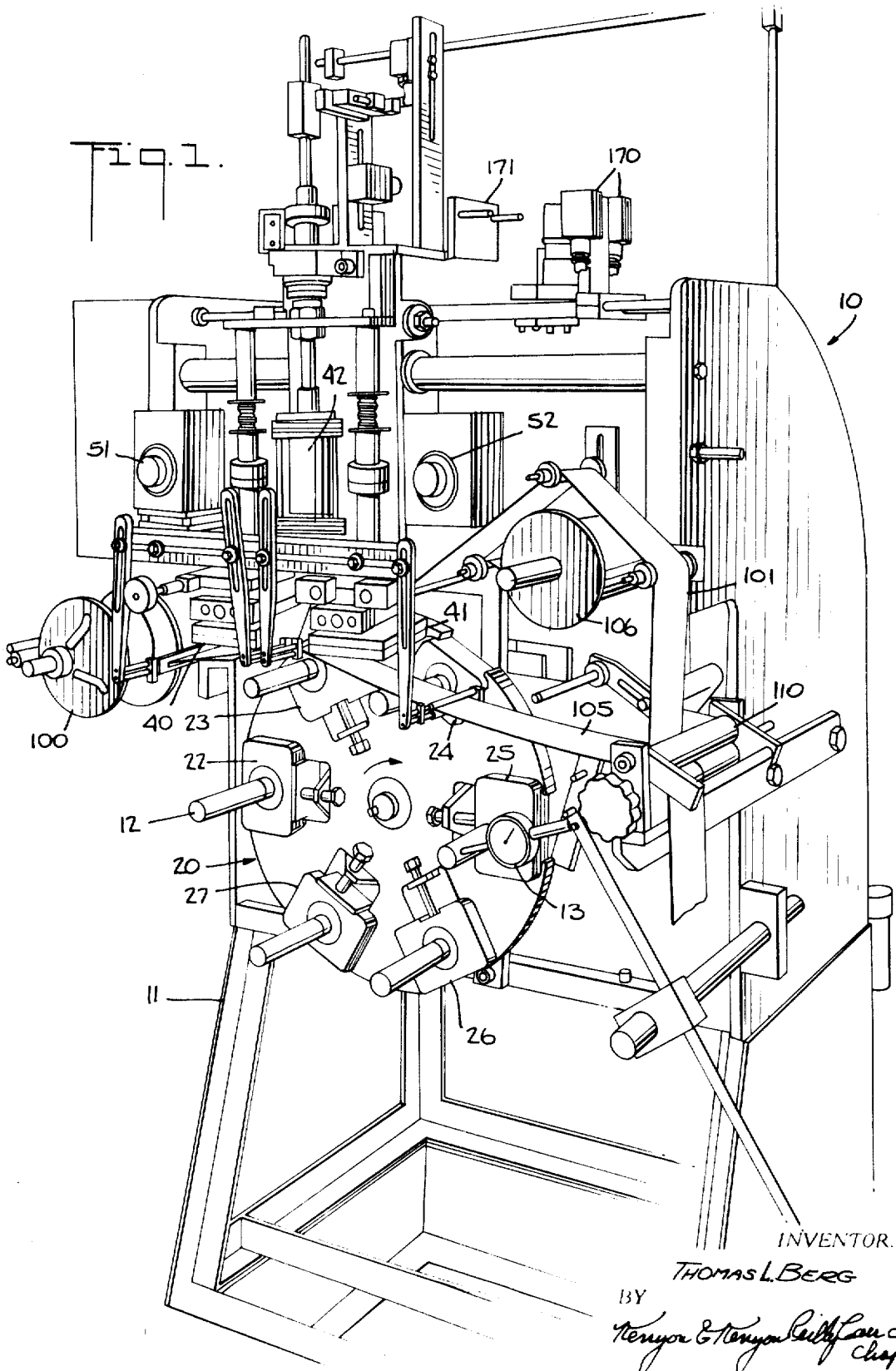


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Fig. 1.




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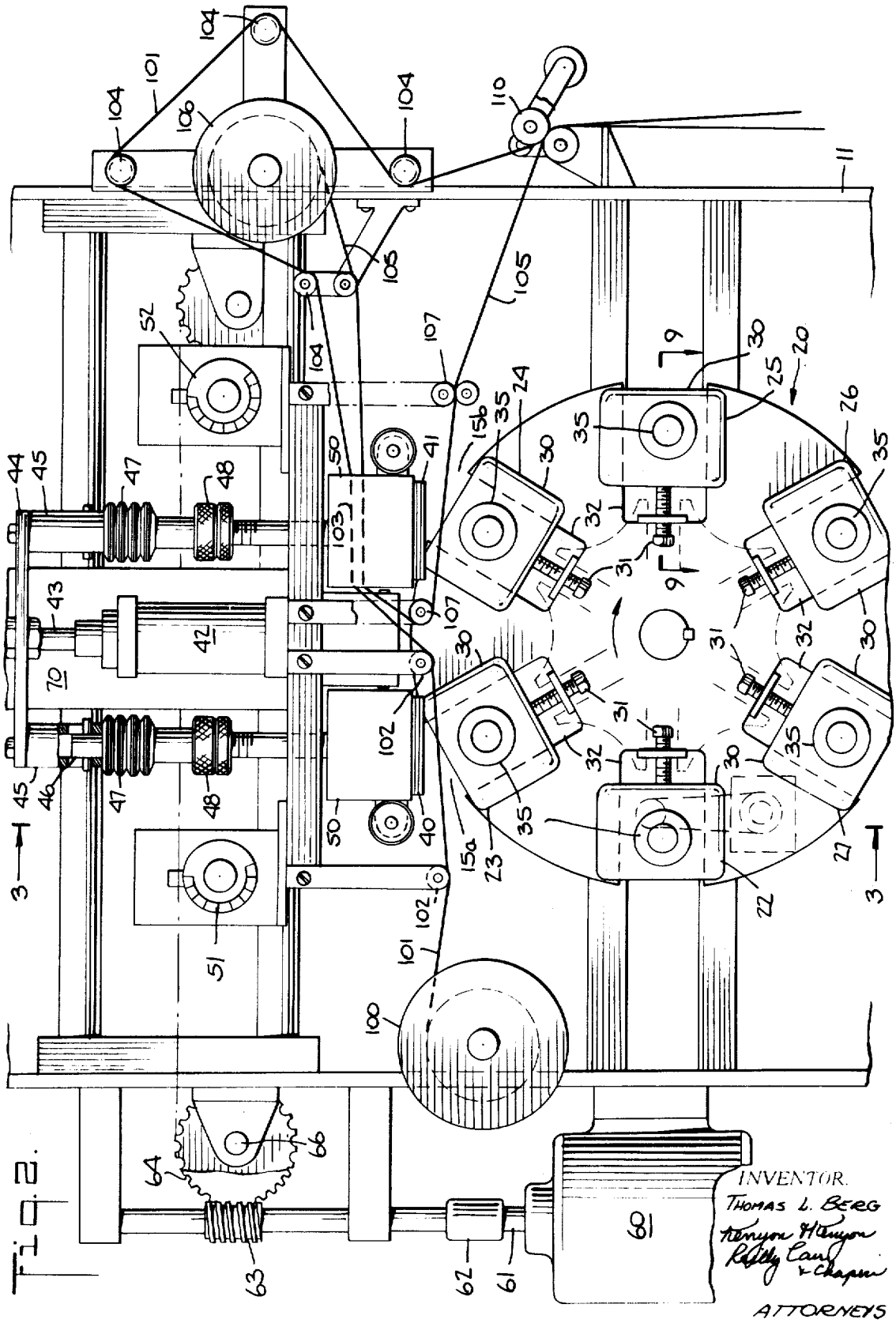
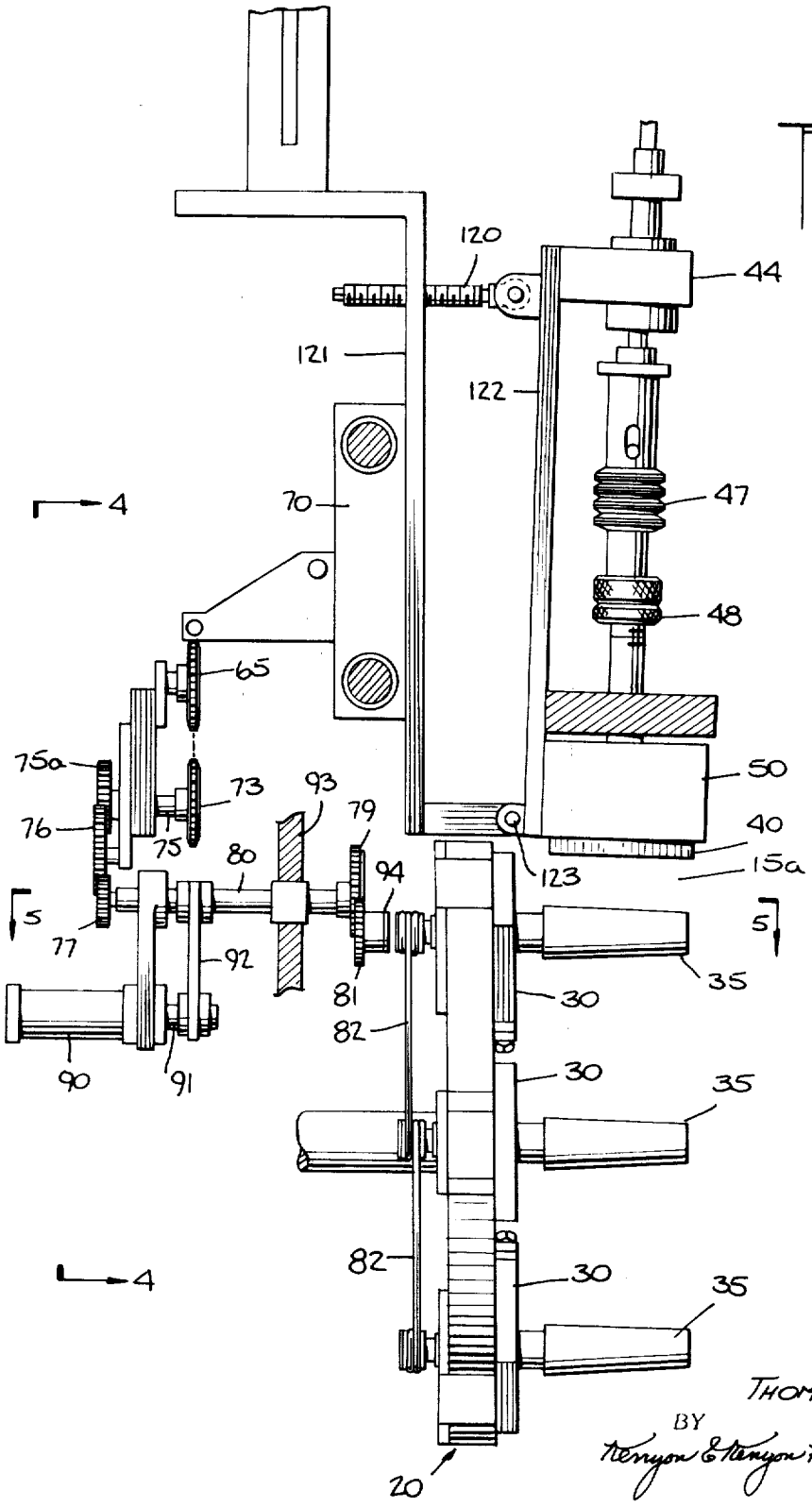

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FIG. 2.

Fig. 3.




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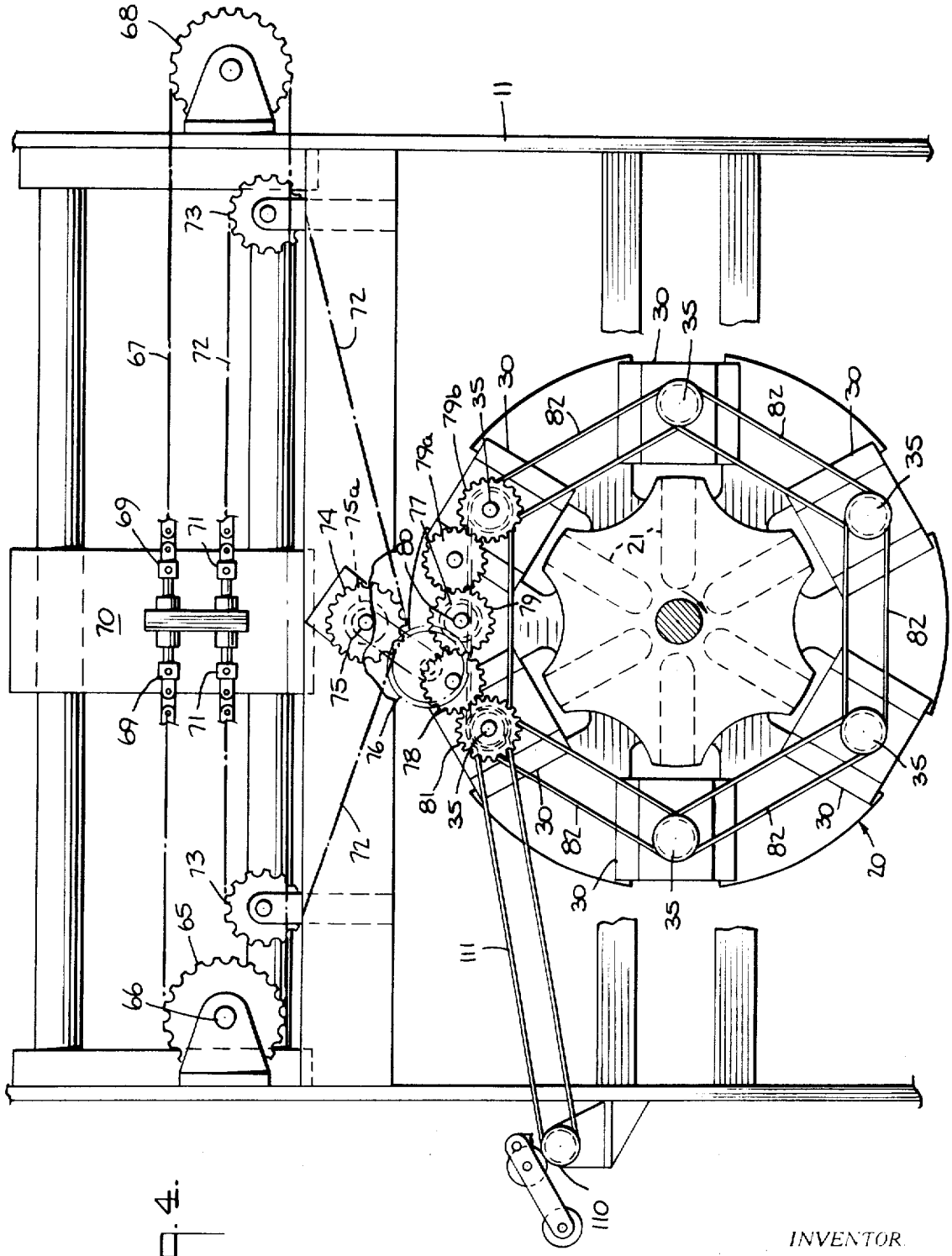


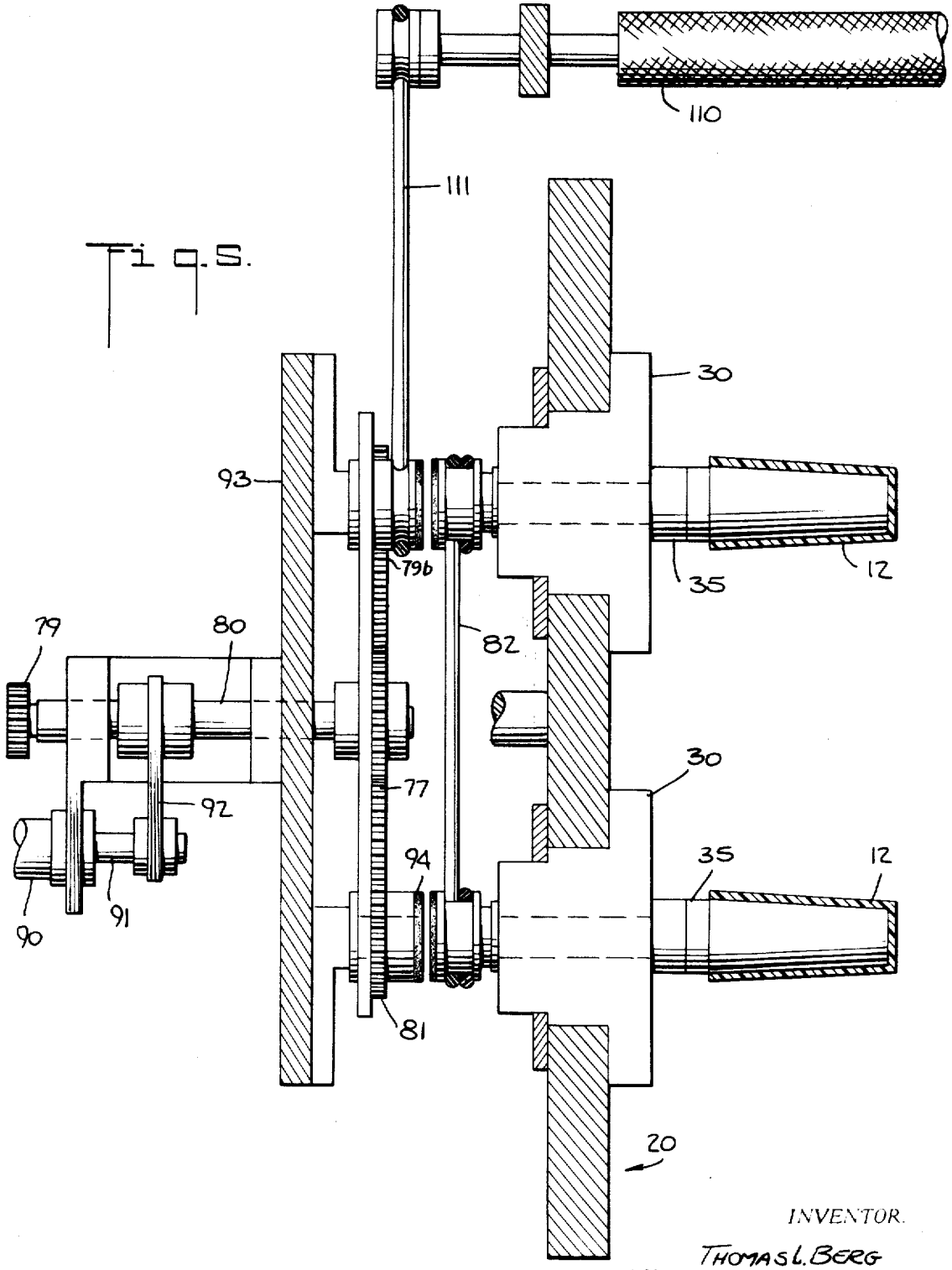

Fig. 4.

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Fig. 5.




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Fig. 6.

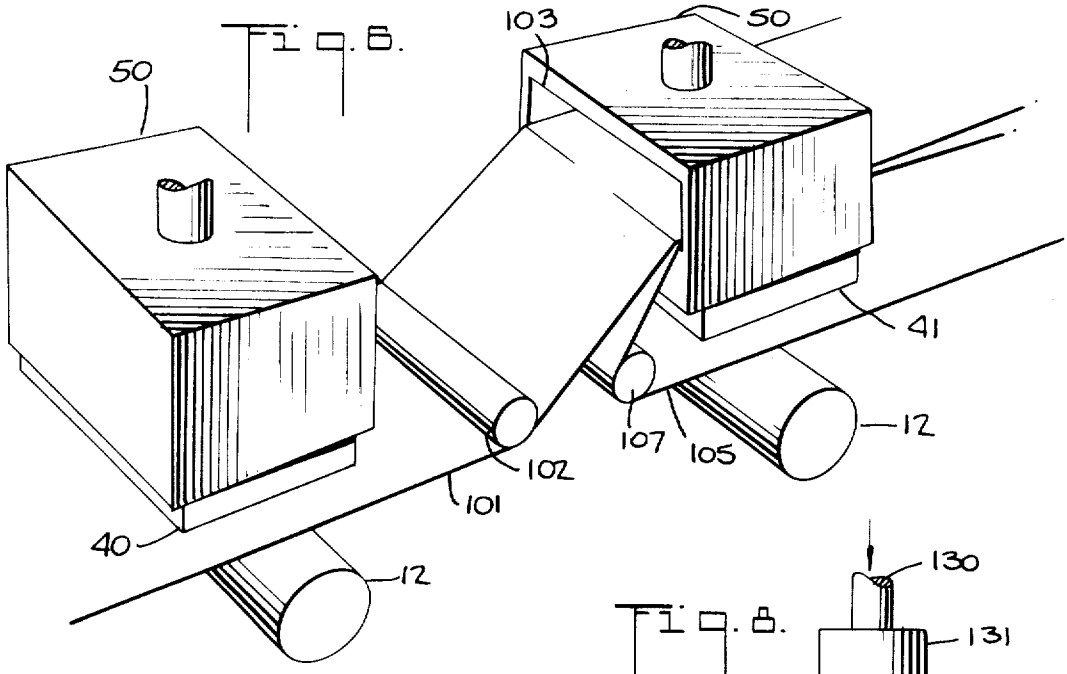



Fig. 8.

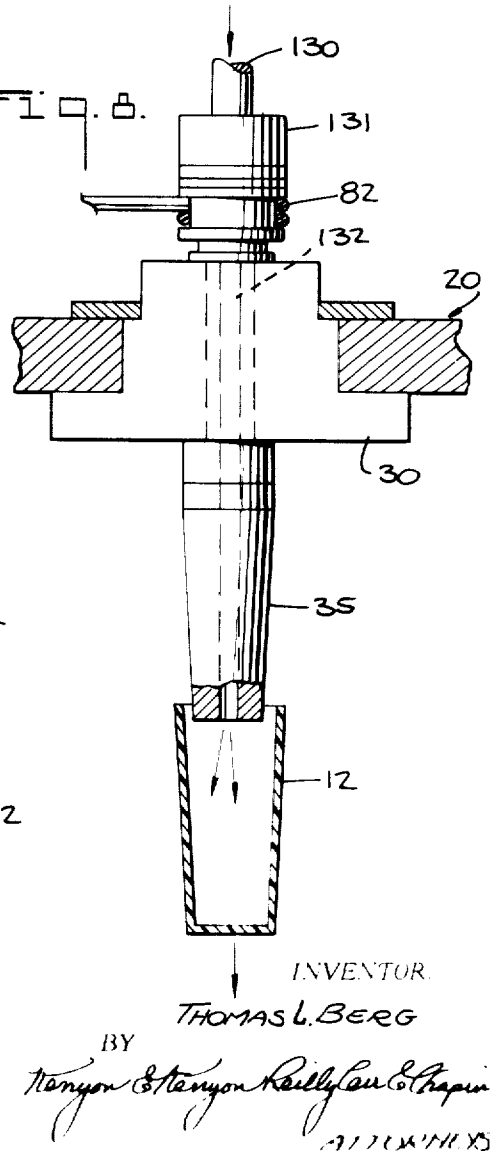



Fig. 7.

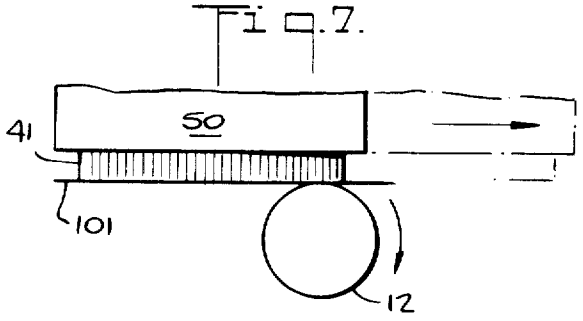



Fig. 9.

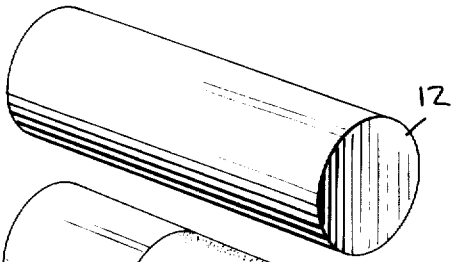



Fig. 10.

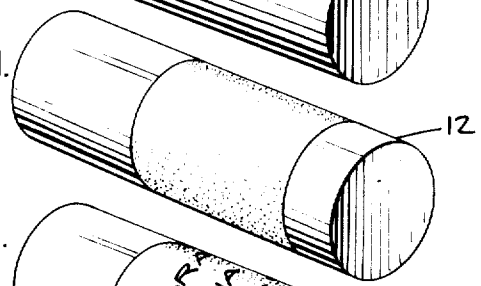
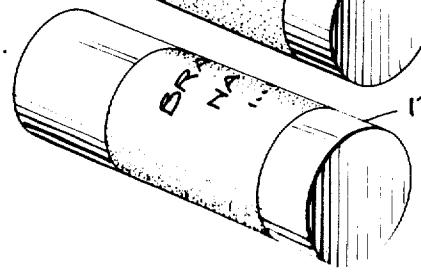



Fig. 11.




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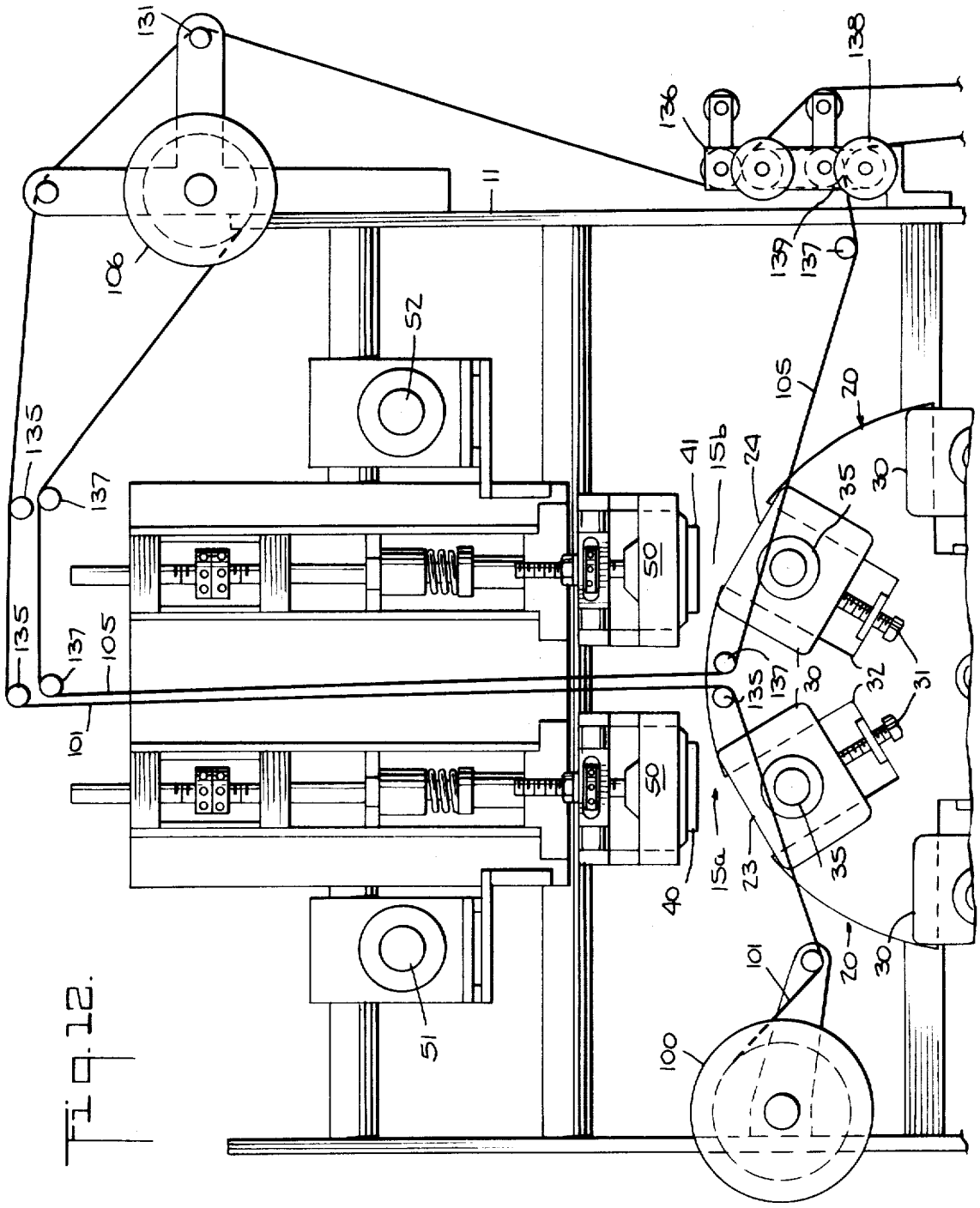


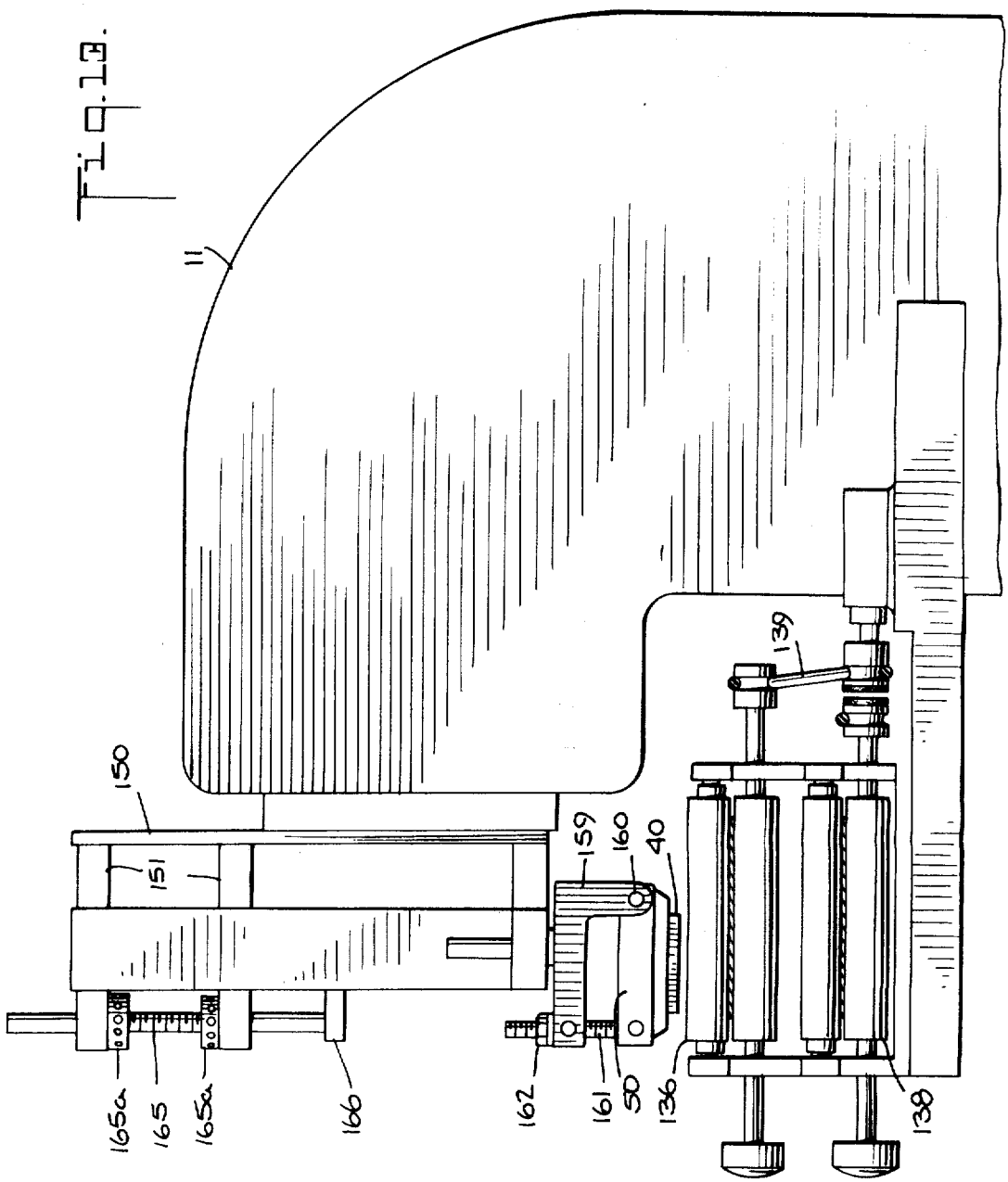

Fig. 12.

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Fig. 19.




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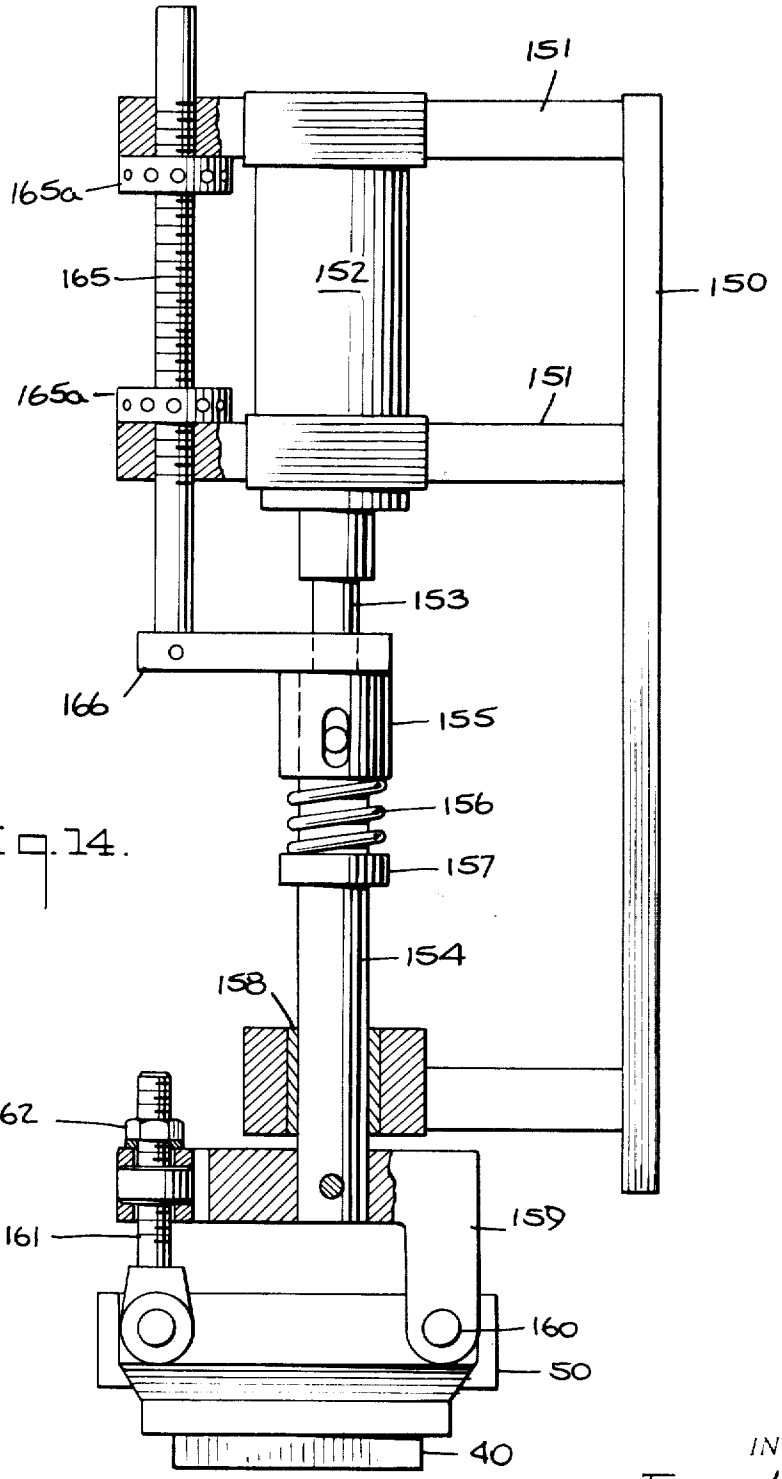



Fig. 14.

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# METHOD AND APPARATUS FOR DECORATING ARTICLES

## BACKGROUND OF THE INVENTION

This invention relates generally to a method and apparatus for decorating articles, and more particularly to one wherein a transfer material is caused to adhere to the article being decorated.

It has heretofore been common to apply labels and other product identifying indicia to containers. With the changing types of materials being used for packaging various types of products, particularly plastics, major changes have occurred in decorating techniques. Packaging trends have diminished the usage of paper labels and made it more desirable to employ esthetic multi-color designs to provide a more attractive and marketable package for the product. These newly imposed requirements necessitate a more versatile decorating machine, adapted to be flexible in that different designs may be imparted onto the various containers, and further be adapted for simple and quick changeover to accommodate different sized articles requiring decoration.

Various types of decorating are in present use depending on the type of product and container being used to house the product. Included among the decorating techniques which have to a great extent superseded the application of a label are offset printing, silk screening, hot stamping and heat transfer of a predetermined design onto the container.

Offset printing has been heretofore frequently utilized when many colors are desired to be applied to the container. The offset printing system has found wide acceptance since it provides an economical high volume operation.. However, offset printed inks on a great number of plastics are inferior both to the hot stamping and silk screening techniques, in that the quality and richness of colors are limited and do not compare with the effects which can be attained by the latter processes.

The silk screening process, on the other hand, allows for a wide range of rich opaque colors to be applied to a container generally of a blow-molded type. Screen printing involves the use of a metal wire or a nylon mesh stencil specifically prepared by a photographic and chemical process. A squeegee or applicator forces the paint through the open portions of the screen and onto the surface of the container. Screen printing generally leaves a raised decoration, whereas the hot stamping process is characterized in that the decoration is somewhat recessed. In fact, an embossed effect can only be obtained by the hot stamping process. Although the silk screening process is capable of imparting decorative designs, the use of ink limits the definition or sharpness of the decoration, as compared with the hot stamping process.

Hot stamping, however, is highly desirable, particularly when a true metallic printing on a plastic container is required such as is frequently employed on cosmetic type packages. Hot stamping involves the use of a roll leaf foil which includes a polyester, cellophane, or acetate film base or carrier. On this base is applied a release coating, a lacquer to provide abrasion resistance after application and a vacuum-metallized or pigmented layer. Hot stamping is generally a single step process which requires no further steps such as the drying necessary in some of the other processes. Further, hot stamping provides a system wherein a high quality and rich metallic decorative design may be applied to a variety of differently shaped designs.



Another of the commonly used decorating techniques includes the heat transfer process wherein multi-color designs may be applied to the container in a single step operation. The heat transfer process involves the use of a release-coated carrier upon which the design to be transferred is printed. The design is transferred from the carrier to the container generally by using a combination of both heat and pressure. The prime advantage of the heat transfer technique is that a multi-color design of an infinite variety may be applied to a container.

Although the processes which employ a transfer carrier, such as in hot stamping and heat transfer decorating, provide a number of advantages, particularly in that certain decorative designs may only be accomplished by these systems, these techniques have been considered relatively uneconomical when compared to certain other type printing techniques. This has been due primarily to the lack of automated versatile equipment being available. By the means disclosed herein, a machine is provided which is readily adaptable for either of these techniques and which produces high quality decorative designs at a high production rate. The means disclosed herein is further characterized in that it is readily adapted for changeover to accommodate either different decorating processes or different sized and shaped containers.

## SUMMARY OF THE INVENTION

Briefly stated, the invention herein provides for the decorating of the outer surface of an article at a decorating station by means of a die disposed adjacent thereto. The article to be decorated is rotatably mounted on a rotary table which advances the article to the decorating station. At the decorating station, a layer of transfer material is interposed between the die and the article. The die is then caused to urge the transfer material into contact with the rotatable article, with the die being moved across the outer surface of the article to cause a portion of the transfer material to adhere to the article in the form of the desired decoration.

In one of the embodiments of the invention, a plurality of mandrels are rotatably mounted to the rotary table and provide a means for holding the articles being decorated. Further means are provided for interconnecting each of the rotatable mandrels with one another. In this manner, when the mandrel at the decorating station is rotated, the remaining mandrels simultaneously rotate therewith in order to register each of the articles mounted on the mandrels with respect to one another.

In another of the embodiments of the invention, a pair of dies are disposed adjacent one another at each decorating station. A layer of transfer material is interposed between each of the dies and the article adjacent thereto. A rotary table is again provided for advancing the articles to each of the decorating stations, with the mandrels again being interconnected so that each is rotated simultaneously with the mandrels at the decorating stations, thereby registering each of the arti-

cles mounted on the mandrels with respect to one another. This embodiment allows for a higher production rate in that a pair of articles may be decorated simultaneously or they may also be utilized in those instances where a multi-color design is to be transferred to the article, or where two designs are required to be imprinted on the article with two separate dies, whether in one color or more.

Further embodiments of the invention include the utilization of a resilient means coupled to the printing die in order to accommodate surface irregularities on the article being decorated. Also, means are provided for adjusting the angle of the die surface with respect to the article so that tapered articles may be accommodated. Additional means are provided for conveying the transfer material at substantially the same speed as the outer surface of the article being decorated, thereby providing a clear and uniform decorating. Additional features reside in that the apparatus is compact in size, can accommodate large size articles with a minimum die stroke, and is provided with adjustment means to facilitate rapid changeover for different type or size articles.

Accordingly, it is an object of this invention to provide a simplified and effective means for decorating the outer surface of an article.

It is another object of this invention to provide an article decorating means capable of high production rates while maintaining high quality decorating.

It is still another object of this invention to provide an article decorating means capable of imparting a multi-color design on the article being decorated.

It is an additional object of this invention to provide an article decorating means capable of imparting designs by more than one die in consecutive operations on the article, using one or more types of color transfer materials.

It is a further object of the invention to provide a means for registering a plurality of articles to be decorated with respect to one another so that the location of the design on the article at the second decorating station may be controlled and correlated with respect to the design applied at the first decorating station.

It is a still further object of this invention to provide a means for decorating articles containing surface irregularities as well as articles containing tapered surfaces.

These and other objects, advantages and features of the invention will become more apparent from the following description taken in conjunction with the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the article decorating machine of this invention;

FIG. 2 is a partial front elevation view of the article decorating machine of FIG. 1;

FIG. 3 is a side elevation view, partially in cross-section, taken along the line 3—3 of FIG. 2;

FIG. 4 is a partial rear elevation view taken along the line 4—4 of FIG. 3;

FIG. 5 is a plan view, partially in cross-section, taken along the line 5—5 of FIG. 3;

FIG. 6 is an enlarged perspective view of an article at each of the decorating stations;

FIG. 7 is an enlarged fragmentary front elevation view of the die engaging the article at the decorating station;

FIG. 8 is an enlarged plan view, partially in cross-section, of an article at the ejection station;

FIG. 9 is an enlarged perspective view of an article to be decorated;

FIG. 10 is an enlarged perspective view of an article having been decorated with a first color;

FIG. 11 is an enlarged perspective view of an article having been decorated with a second color on the first color;

FIG. 12 is a front elevation view of an alternate embodiment of the article decorating machine of this invention with the layers of transfer material being controlled and routed independent of one another;

FIG. 13 is an enlarged side elevation view of the alternate embodiment illustrated in FIG. 12; and

FIG. 14 is a side elevation view, illustrating partially in cross-section, an alternate embodiment of the die adjusting mechanism.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings, the machine of this invention is illustrated and described in a form utilizing the hot stamping technique previously discussed. It is however noted that the same principles and mechanisms described with reference to hot stamping may be employed in other types of decorating, particularly heat transfer decorating, by merely changing the die.

The hot stamping machine, indicated generally at 10, includes a frame 11 for supporting the various components. A rotary table 20 is vertically disposed and mounted adjacent the base portion of the frame 11. The rotary table is utilized to advance the article to be decorated or workpiece 12, to a decorating station indicated at 15*a* and 15*b*. An independent drive means (not shown) is utilized to intermittently drive the rotary table 20 and is coupled thereto by means of a geneva mechanism. The drive means output shaft engages one of the radical slots 21 on the rearward portion of the rotary table 20 (FIG. 4). Each time the drive means makes a complete revolution, the rotary table is thereby advanced one position or station. The drive means output shaft subsequently engages the next radial slot 21 in a similar manner thereby intermittently advancing the rotary table 20 and the article or workpiece 12 mounted thereto toward the decorating station.

Mounted on the rotary table 20 are six mandrel or spindle assemblies 22, 23, 24, 25, 26 and 27 for supporting the articles to be decorated (FIG. 2). Each of the mandrel assemblies includes a base plate 30 which is radially adjustable with respect to the center of the rotary table. An adjustment screw 31 is threadedly coupled to each of the fixed plates 32, the latter of which are attached to the rotary table 20. By means of rotating the screw 31, which at one end is fixed to base plate 30, each of the mandrel assemblies may be redially moved with respect to the center of the rotary table 20. This adjustable feature allows for the rapid changeover of the machine to accommodate different size articles to be decorated. Such a change of the machine is accomplished by manipulating the adjusting screws 31 in

conjunction with a dial indicator 13 (FIG. 1) so that each of the mandrel assemblies 22–27 may be accurately located an equal distance from the center of the rotary table. This insures that each article will be uniformly decorated once it advances to the decorating station. Each of the mandrel assemblies 22–27 further includes an easily removable spindle or mandrel 35, which in the preferred embodiment contains a slight degree of taper in order to facilitate easy mounting of the article or workpiece 12 thereon (FIG. 3).

Disposed adjacent the decorating station are a pair of printing dies 40 and 41, which, as described below, allow for decorating a multi-color design onto each of the articles 12. It is noted that if a single color design is desired or if only one design die is desired, one of the dies may be eliminated from the machine or otherwise inactivated. Alternatively, each of the dies may be maintained in the illustrated configuration with the indexing of the rotary table changed to advance two stations and thereby allow for decorating of two articles simultaneously with identical or different designs and colors. Each of the dies 40 and 41 is coupled to a common drive member so that they move in conjunction with one another. Vertical movement of the dies is accomplished by means of the air cylinder 42, which has the piston end 43 attached to a coupling plate 44. Mounted at each end of the coupling plate 44 is a hollow sleeve 45 into which the upper end of slide rod 46 protrudes. Slide rod 46 contains mounted thereon a helical or disc spring 47, which abuts at one end thereof against the sleeve 45 and at the other end against the larger diameter shaft 46*a*. An adjusting nut 48 is provided and when its position is varied the desired amount of spring tension on the slide rod 46 and printing die may be produced.

A heat chamber 50 is coupled to the lower end of each slide rod 46, with each heat chamber having mounted at the base thereof a printing die 40 or 41. The heat chambers 50 are provided with a plurality of resistance elements which are independently controlled by means of thermostats 51 and 52. Because of the independent thermostatic controls for each of the heat chambers 50, each die 40 and 41 may be maintained at a different temperature as is necessary in those instances where different materials are being used to decorate the article. As is described more fully hereinafter, the air cylinder 42 provides for vertical movement of the dies 40 and 41 in order to bring the latter into engagement with the workpiece 12 at each of the decorating stations 15*a* and 15*b* respectively. Surface irregularities on the workpiece, such as is typical with plastic materials, as compensated by means of the spring 47 which insures uniform pressure between the die and the article being decorated. This accommodation of surface irregularities is particularly necessary when utilizing the hot stamping technique in order to produce a uniform pressure during the printing operation.

Each of the dies 40 and 41 is further moved across the workpiece in a horizontal direction in order to engage the entire periphery of a circular type workpiece. As indicated in FIGS. 2 and 4, a drive motor 60, which as illustrated is pneumatic although other suitable drive means may be provided, has extending out of the upper end thereof a drive shaft 61. A coupling 62 is utilized to connect the drive motor 60 to a worm 63 which is engaged with the worm gear 64. Sprocket 65 is mounted on a common shaft 66 with the worm gear 64. A horizontal drive chain 67 is disposed over both sprocket 65 and a similar sprocket 68 mounted at the opposed side of frame 11, with each end of the chain 67 being fixedly attached at 69 to carriage 70. Carriage 70 on its forward face has mounted thereto the air cylinder 42 and coupling means for each of the dies 40 and 41. Accordingly, as drive motor 60 is activated, carriage 70 and the dies mounted thereto are caused to move horizontally by means of the drive chain 67 previously described. Alternatively, a ball screw drive mechanism or other equivalent means may be substituted for the drive chain 67.

Also affixed to the carriage at 71 is a second chain 72 which is used to drive each of the mandrels as well as the transfer material. Chain 72 is disposed over identical sprockets 73 and a lower sprocket 74. Lower sprocket 74 is coupled via a common shaft 75 to gear 75*a* which in turn mates with gear 76. Gear 76 is pivotally mounted so that it may be brought into engagement with and drive change gear 77, the latter of which is preferably of the same size as the workpiece being decorated. Idler gear 78 is driven by gear 79 which is mounted to shaft 80 as is change gear 77. Idler gear 78 in turn engages gear 81, which is brought into engagement with the mandrel assembly stationed at one of the decorating stations to provide a drive means therefor. Gears 79*a* and 79*b* driven by gear 79, may further be utilized to simultaneously drive the mandrel disposed at the other decorating station. By means of the flexible belts 82 connecting each of the mandrels with one another, each of the mandrels is caused to rotate simultaneously and thereby maintain proper registering with respect to one another.

As illustrated in FIG. 3, an air cylinder 90 is provided with its piston 91 being coupled to plate 92. The plate 92 is coupled at its other end to shaft 80 which has a portion thereof connected to supporting plate 93. Shaft 80 has mounted at one end gear 77, and at the mandrel end change gear 79. A clutch is provided at 94 adjacent the mandrel drive gear 81. Clutch 94 engages the rearward end of the rotatably mounted mandrel at the decorating station when the air cylinder 90 is activated. In this manner, once the intermittently driven rotary table 20 comes to rest, clutch 94 engages and caused the mandrel at the decorating station to be driven in conjunction with the horizontal movement of the die.

Referring again to FIG. 2, a roller assembly 100 is provided onto which a transfer tape 101 is mounted and which in the case of a multi-color decorating process contains the base or first color. The transfer tape is in the form of a roll leaf foil which includes preferably a polyester, cellophane or acetate film base or carrier. Onto the film base is applied a release coating a lacquer to provide an abrasion resistance after application, and a vacuum metallized or pigmented layer which is ultimately imparted on the article being decorated. The transfer tape 101 is guided by means of rollers 102 through decorating station 15*a* and subsequently passed through the right hand heat chamber 50 via a tunnel 103. Guide rollers 104 further direct the transfer tape 101 into a drive roller 110 to be described more fully below. A second transfer tape for decorating

an additional or second color onto the article is indicated at **105** and amounted on roller assembly **106**. Tape **105** is also guided through tunnel **103** and by means of rollers **107** through decorating station **15***b* and into the drive roller **110**. The drive roller **110**, as indicated in FIGS. **3** and **4**, is driven by means of the motor **60** via chain **72** and the gear train previously described. A flexible belt **111** couples the drive roller **110** to the mandrel drive gear **81** thereby causing the transfer tape to move at substantially the same velocity as the outer surface of the article being decorated. A uniform and clear decorating is thereby insured since the transfer tape, the outer surface of the article being decorated and the horizontally moving die each move at substantially the same velocity.

Again referring to FIG. **3**, each of the dies **40** and **41** is pivotally mounted so that the surface thereof may be adjusted to mate with the surface of the article being decorated. In this embodiment, a jackscrew **120** is threadedly coupled to support plate **121** which is a part of carriage **70**. As the jackscrew **120** is rotated, the die mounting plate **122** is pivoted about point **123**. In this manner each of the dies **40** and **41** may be accurately positioned so that they engage the surface of the article being decorated, which is particularly advantageous in the case of decorating tapered articles.

Referring to FIG. **8**, an ejection station is illustrated which is preferably disposed on the rotary table **20** at the 3 o'clock position. A supply of air is provided at **130** in the direction indicated by the arrow. When the rotary table **20** is in the stopped position, the air supply collar **131** is advanced by means of the support plate **93** and brought into engagement with the mandrel in a manner similar to the clutch **94** previously described. A tubular conduit **132** is provided through the mandrel assembly as well as its mounting plate. In this manner, a workpiece **12** may be ejected from the machine into a collecting hopper after it has been decorated.

An alternate routing for each of the transfer tapes is illustrated in FIG. **12**. Here again, transfer tape **101** is supplied on a roller **100** which is mounted to the machine frame **11**. Guide rollers **135** are disposed so that tape **101** is routed free of the moving dies and into an upper drive roller assembly **136**. Similarly, tape **105** is supplied on a roller assembly **106** and routed by means of the guide rollers **137** through decorating station **15***b* free of the moving dies and into the lower drive roller assembly **138**. The drive roller assemblies **136** and **138** are again driven off the horizontal chain drive mechanism in a manner similar to that previously discussed. A flexible belt **139** is used to couple each of the drive rollers so that they rotate at substantially the same speed (FIG. **13**). In this manner, each of the transfer tapes again moved at the same surface speed as that of the workpiece **12** while maintaining independent control and tension over each which allows for a uniformly clear decoration to be applied to the workpiece.

An alternate embodiment for mounting the die members **40** and **41** is illustrated in FIGS. **13** and **14**. Here, support plate **150** is again attached to the carriage and is provided with mounting arms **151** extending therefrom. An air cylinder **152** having piston **1523** extending therefrom is mounted between arms **151**. Piston **153** is coupled to the push rod **154** by means of a retaining pin in telescopic joint **155**. Again, a spring **156** is provided to accommodate surface irregularities with its tension being adjusted by means of the coupling collar **157**. A bushing **158** guides the push rod **154** which is connected at its lower end to a die support plate **159**. In this embodiment, the heat chamber **50** is pivotally connected at **160** to the die support plate **159** and contains at its forward end a pivotally mounted adjusting screw **161**. By rotating adjusting nut **162**, the angle at which the die **40** contacts the workpiece **12** may be adjusted so that total surface contact is insured. A further adjustment for the die travel is provided by adjusting screw **165** which is fixed at one end to the plate **166**. Raising and lowering the plate **166** is accomplished by rotating the adjusting screw **165** which is threadedly coupled to plates **151**. Accordingly, the stroke of the die travel may be varied depending upon the size of workpiece being decorated with the adjusting screw **165** being locked in position by means of lock nuts **165***a*.

In operation, each of the mandrel assemblies **25** – **27** is first adjusted by means of the dial indicator **13** so that the radial distance of each with respect to the center of rotary table **20** is the same and in accordance with the size of the workpiece. Additionally, the appropriate colors or types of transfer tapes **101** and **105** are selected. In the event that the hot stamping technique is to be utilized, dies **40** and **41** are appropriately selected to contain the desired design. Alternatively, if the heat transfer decorating technique is to be used, a blank die would be utilized in conjunction with a releasable decorative design carried on each of the transfer tapes.

With the machine ready for operation, the power source is activated and a workpiece **12** is placed on the mandrel assembly **22** at the 9 o'clock position. By means of the geneva drive mechanism, the rotary table **20** is intermittently advanced in order to bring workpiece **12** to the decorating station **15***a*. With the workpiece at the decorating station, the die **40** is driven vertically downward into engagement with the workpiece by means of air cylinder **42**. Once the die has contacted the workpiece with the layer of transfer material **101** interposed therebetween, the die is moved horizontally toward the right and across the workpiece so that the outer surface of the article or workpiece is decorated. As the die is moving toward the right, the lower chain drive **72** also causes the workpiece to be rotated by means of the gear train assembly previously discussed. Additionally, the drive roller **110** is driven by the lower chain drive **72** so that the transfer tape **101** is moved at substantially the same velocity as that of the workpiece **12**. In this manner, the workpiece is decorated with the first desired color or design via the transfer tape **101**.

As the dies mounted on carriage **70** reach the end of the stroke, a limit switch **170** is engaged by the abutment **171** on carriage **70** (FIG. **1**). This causes the carriage **70** to return to the extreme left position and also activates the geneva drive to advance another workpiece to decorating station **15***a*. This advancement of rotary table **20** causes the workpiece previously decorated at station **15***a* to be moved to decoration station **15b**. The right hand die **41** is then vertically driven toward the workpiece with the transfer tape **105** interposed therebetween. Die **41** is similarly driven horizontally across the workpiece with a second color or design

thereby being imparted onto the article. The rotary table is subsequently advanced, with the completely decorated workpiece **12** arriving at the 3 o'clock position on the rotary table **20**. At this point the air supply is activated, again by means of engaging limit switch **170**, with the decorated article being ejected from the machine into a collecting hopper.

Thus, there has been described a highly reliable method and apparatus for decorating the outer surface of an article. Further, the machine is capable of high production rates as a result of its automated operation, with the design being uniformly decorated on the article. In addition to the multi-colored and multi-die decorating capabilities of the machine, it is also adapted to accommodate surface irregularities, as well as provide registering between the articles so that the design or designs may be accurately positioned on the article or workpiece.

Although the above description is directed to a preferred embodiment of the invention, it is noted that other variations and modifications will be apparent to those skilled in the art, and may be made without departing from the spirit and scope of the present disclosure.

What is claimed is:

**1**. An apparatus for decorating the outer surface of an article which comprises:

a. a rotary table for advancing the article to a decorating station;

b. at least one article holding means rotatably mounted to said rotary table;

c. a die disposed adjacent to said decorating station;

d. a layer of transfer material interposed between said die and the article at said decorating station;

e. means for moving said die in a first direction toward the article to cause said layer of transfer material to engage the article being decorated; and

f. means for moving said die in a second direction along a substantially straight line in a path tangential to and across the uppermost portion of the outer surface of the article being decorated to cause at least a portion of said layer of transfer material to be transferred thereto.

**2**. An apparatus for decorating the outer surface of an article which comprises:

a. a rotary table for advancing the article to a decorating station;

b. at least one article holding means rotatably mounted to said rotary table;

c. a die disposed adjacent to said decorating station;

d. a layer of transfer material interposed between said die and the article at said decorating station;

e. means for moving said die in a first direction toward the article to cause said layer of transfer material to engage the article being decorated;

f. means for moving said die in a second direction along a substantially straight line in a path tangential to and across the uppermost portion of the outer surface of the article being decorated to cause at least a portion of said layer of transfer material to be transferred thereto; and

g. a pivotally adjustable mounting means for said die whereby the entire surface of said die may be adjusted with respect to the article so as to engage the outer surface of the article to be decorated.

**3**. An apparatus in accordance with claim **2** wherein said means for moving said die in a first direction comprises a pneumatic cylinder.

**4**. An apparatus in accordance with claim **3** which further includes resilient means interposed between said die and said pneumatic cylinder to permit relative movement between said die and the article being decorated thereby compensating for surface irregularities on the article being decorated.

**5**. An apparatus in accordance with claim **2** wherein said means for moving said die in a second direction includes a drive means, a sprocket coupled to and driven by said drive means, and a chain engaging said sprocket and attached to said die.

**6**. An apparatus in accordance with claim **2** wherein said pivotally adjustable mounting means comprises a support plate for mounting said die, pivotal mounting means at one end of said support plate, and a screw adjustment means for pivoting said die with respect to said article holding means.

**7**. An apparatus in accordance with claim **2** which further includes means for heating said die, means for regulating the temperature of said heated die, and said layer of transfer material is adapted to be applied to the article upon the application of heat and pressure.

**8**. An apparatus for decorating the outer surface of an article by means of the hot stamping process which comprises:

a. a rotary table disposed to rotate about a horizontal axis;

b. a plurality of mandrels extending along a horizontal axis and rotatably mounted to said rotary table for holding the articles to be decorated;

c. means for intermittently driving said rotary table to advance an article to a decorating station;

d. a substantially flat die having said flat portion thereof lying in a substantially horizontal plane and disposed adjacent to said decorating station, said die including on the flat surface thereof raised characters in the form of the design to be imparted to the article being decorated;

e. a horizontally disposed layer of transfer material interposed between said die and the article at said decorating station;

f. means intermittently engagable with one of said plurality of mandrels for rotating said article mounted on said mandrel relative to said rotary table while at said decorating station; and

g. means interconnecting said plurality of article holding mandrels so that each of said mandrels is rotated simultaneously with said mandrel at said decorating station thereby registering each of the articles mounted on said mandrels with respect to one another.

**9**. An apparatus in accordance with claim **8** wherein said means for intermittently driving said rotary table comprises a drive means, and a geneva mechanism having one end thereof coupled to said drive means and the other end thereof coupled to said rotary table.

**10**. An apparatus in accordance with claim **8** which further includes a rotatable member engaging said layer of transfer material, and means interconnecting said rotatable member with said means for rotating said article relative to said rotary table so that said layer of transfer material is conveyed at substantially the same

velocity as the outer surface of the article being decorated.

11. An apparatus in accordance with claim 8 which further includes means for moving said die across the outer surface of the article being decorated so that at least a portion of said layer of transfer material is transferred thereto.

12. An apparatus in accordance with claim 11 wherein said means for moving said die across the outer surface of the article being decorated includes a drive means, a sprocket coupled to and driven by said drive means, and a chain engaging said sprocket having one end thereof attached to said die.

13. An apparatus in accordance with claim 12 which further includes a second sprocket, a second chain engaging said second sprocket having one end thereof attached to said die, and means coupling said second chain and said means for rotating said article thereby providing a common drive means for said article rotating means and said means for moving said die across the article being decorated.

14. An apparatus in accordance with claim 11 which further includes a sensing means disposed at the end of the stroke of said die moving across said article, said sensing means being in electrical communication with said intermittent drive means so that as said die reaches the end of said stroke said rotary table is advanced to position another article at said decorating station.

15. An apparatus in accordance with claim 8 which further includes means for radially adjusting said plurality of mandrels on said rotary table whereby the distance of each of said plurality of mandrels from said decorating station may be adjusted to accommodate a different size article.

16. An apparatus in accordance with claim 8 which further includes means for heating said die, means for regulating the temperature of said heated die, and said layer of transfer material is adapted to be applied to the article upon the application of heat and pressure.

17. An apparatus in accordance with claim 8 which further includes a pivotally adjustable mounting means for said die whereby the surface of said die may be adjusted to engage the outer surface of the article to be decorated.

18. An apparatus in accordance with claim 8 which further includes means for ejecting a decorated article from said mandrel holding the article.

19. An apparatus in accordance with claim 18 wherein said means for ejecting the decorated article comprises pneumatic means disposed at a station beyond said decorating station and operatively communicating with the interior of said mandrel to cause the article to be ejected therefrom.

20. An apparatus for decorating the outer surface of articles at a plurality of decorating stations which comprises:

a. a rotary table;

b. a plurality of mandrels rotatably mounted to said rotary table for holding the articles to be decorated;

c. means for intermittently driving said rotary table to advance the articles being decorated to a first and second decorating station, each of said decorating stations being spaced from one another so that the article positioned at said first station is different then the article positioned at said second station;

d. a pair of spaced apart dies each of which is disposed adjacent one of said decorating stations and adapted to engage one of the articles to be decorated thereat;

e. a layer of transfer material interposed between each of said dies and an article at each of said decorating stations;

f. means for moving each of said pair of dies in a first direction toward the respective decorating stations to cause said layers of transfer material to engage the article being decorated thereat; and

g. means for moving each of said pair of dies in a second direction along a substantially straight line in a path tangential to and across the uppermost portion of the outer surface of the article being decorated at the respective decorating stations to cause at least a portion of said layers of transfer material to be transferred to the article being decorated thereat.

21. An apparatus in accordance with claim 20 which further includes means interconnecting said plurality of article holding mandrels so that each of said mandrels is rotated simultaneously with said mandrels at said decorating stations thereby registering each of the articles mounted on said mandrels with respect to one another.

22. An apparatus in accordance with claim 20 wherein said means for moving said pair of dies in a first direction comprises a pneumatic cylinder, and which further includes resilient means interposed between each of said pair of dies and said pneumatic cylinder to permit relative movement between each of said pair of dies and the article being decorated thereby compensating for surface irregularities on the article being decorated.

23. An apparatus in accordance with claim 20 which further includes means for conveying said layer of transfer material interposed between each of said dies and an article at substantially the same velocity as the outer surface of the article being decorated.

24. An apparatus in accordance with claim 20 which further includes a pivotally adjustable mounting means for each of said dies whereby the surface of each of said dies may be adjusted to engage the outer surface of the article to be decorated.

25. An apparatus in accordance with claim 20 which further includes means for heating each of said pair of dies, means for regulating the temperature of each of said heated dies, and said transfer material is adapted to be applied to the articles upon the application of heat and pressure.

26. A method of decorating the outer surface of an article at a plurality of decorating stations which comprises:

a. advancing the article on a rotary table to the first of said plurality of decorating stations and holding it thereat;

b. moving a die in a first direction toward the article at the decorating station to cause a layer of transfer material to engage the article to be decorated;

c. moving the die in a second direction along a substantially straight line in a path tangential to and

across the uppermost portion of the outer surface of the article to be decorated;

d. rotating the article with respect to the die at a speed such that the velocity of the outer surface of the article being decorated is substantially the same as the speed of the die moving across the article;

e. synchronizing the moving of the layer of transfer material between the die and the article being decorated with the rotational speed of the article and the die moving thereacross thereby imparting a portion of the transfer material onto the article in the form of a decorative design;

f. advancing the article on the rotary table from said first station to the second of said plurality of decorating stations and holding it thereat; and

g. repeating said steps (b), (c), (d) and (e) at the second of said plurality of decorating stations.

**27**. A method in accordance with claim **26** which further includes the step of:

a. ejecting the article from the rotary table once the article has been decorated.

**28**. An apparatus for decorating the outer surface of an article which comprises:

a. a rotary table;

b. a plurality of mandrels rotatably mounted to said rotary table for holding the articles to be decorated;

c. means for intermittently driving said rotary table to advance an article to a decorating station;

d. a die disposed adjacent to said decorating station;

e. a layer of transfer material interposed between said die and the article at said decorating station;

f. means for rotating said article mounted on said mandrel relative to said rotary table while at said decorating station;

g. means interconnecting said plurality of article holding mandrels so that each of said mandrels is rotated simultaneously with said mandrel at said decorating station thereby registering each of the articles mounted on said mandrels with respect to one another; and

h. means for radially adjusting said plurality of mandrels on said rotary table whereby the distance of each of said plurality of mandrels from said decorating station may be adjusted to accommodate a different size article.

**29**. An apparatus for decorating the outer surface of an article which comprises:

a. a rotary table;

b. a plurality of mandrels rotatably mounted to said rotary table for holding the articles to be decorated;

c. means for intermittently driving said rotary table to advance an article to a decorating station;

d. a die disposed adjacent to said decorating station;

e. a layer of transfer material interposed between said die and the article at said decorating station;

f. means for rotating said article mounted on said mandrel relative to said rotary table while at said decorating station;

g. means interconnecting said plurality of article holding mandrels so that each of said mandrels is rotated simultaneously with said mandrel at said decorating station whereby registering each of the articles mounted on said mandrels with respect to one another; and

h. means for ejecting a decorated article from said mandrel holding the article, said ejecting means comprising pneumatic means disposed at a station beyond said decorating station and operatively communicating with the interior of said mandrel to cause the article to be ejected therefrom.

**30**. An apparatus for decorating the outer surface of an article which comprises:

a. a rotary table for intermittently advancing the article to a decorating station;

b. at least one article holding means rotatably mounted to said rotary table;

c. a die disposed adjacent to said decorating station;

d. a layer of transfer material interposed between said die and the article at said decorating station;

e. a pneumatic cylinder for moving said die in a first direction toward the article to cause said layer of transfer material to engage the article being decorated;

f. means for moving said die in a second direction along a substantially straight line in a path tangential to and across the uppermost portion of the outer surface of the article being decorated to cause at least a portion of said layer of transfer material to be transferred thereto; and

g. resilient means interposed between said die and said pneumatic cylinder to permit relative movement between said die and the article being decorated thereby compensating for surface irregularities on the article being decorated.

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