May 29, 1973 J. A. KRAFT ET AL 3,736,208

AUTOMATIC LABELING MACHINE

Filed Aug. 20, 1970 4 Sheets-Sheet 1

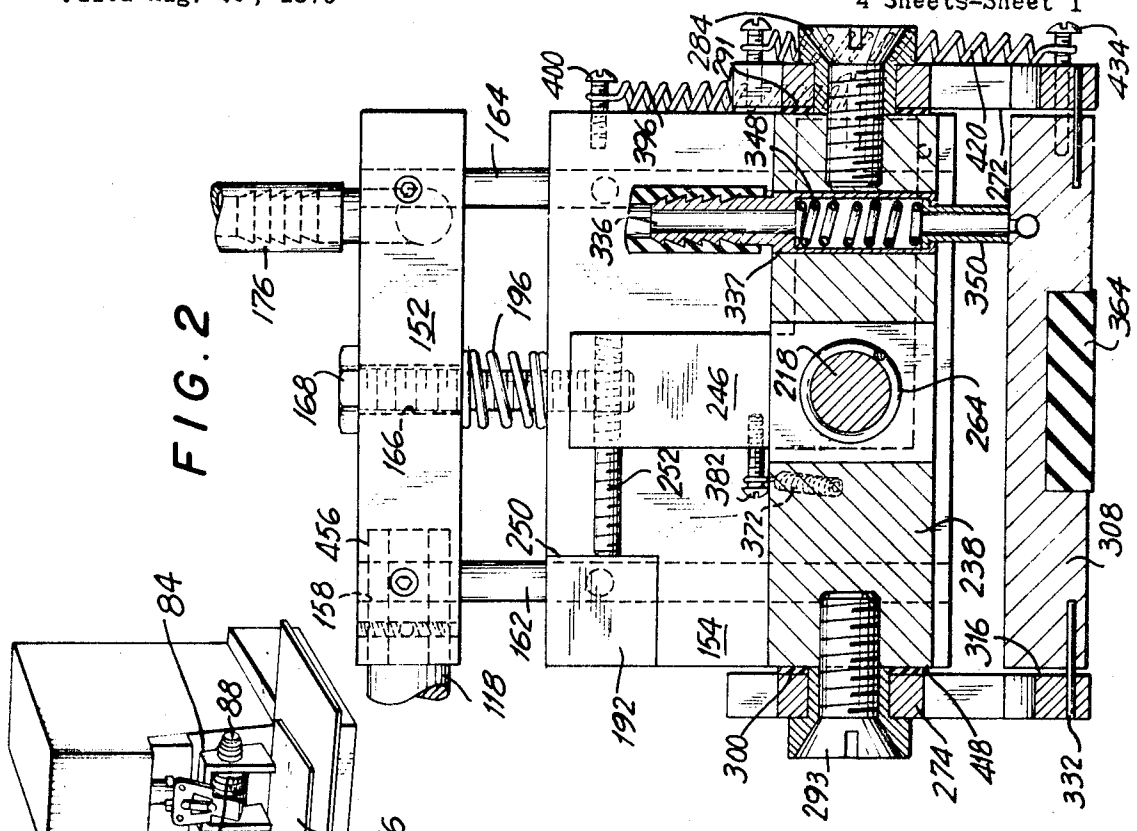


FIG. 2

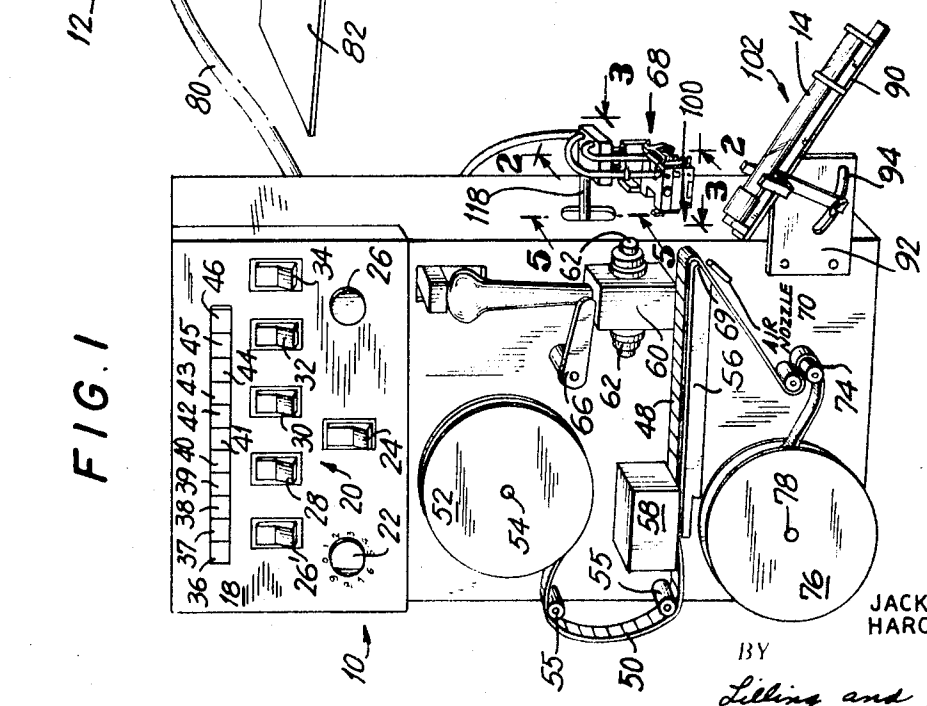


FIG. 1

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AUTOMATIC LABELING MACHINE

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FIG. 4

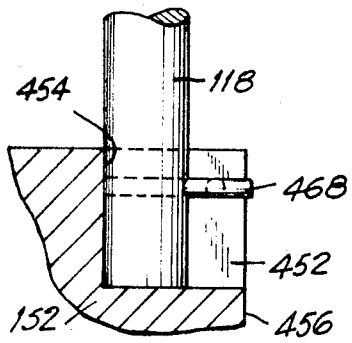
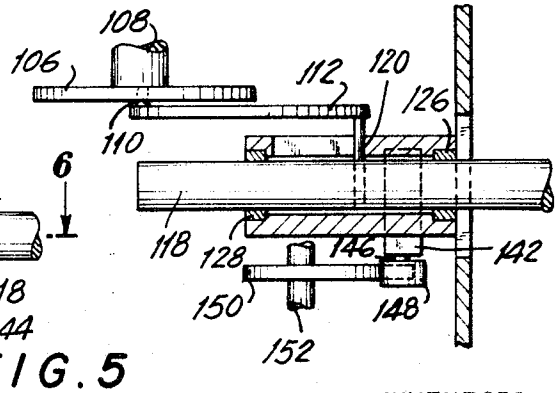


FIG. 3

FIG. 6



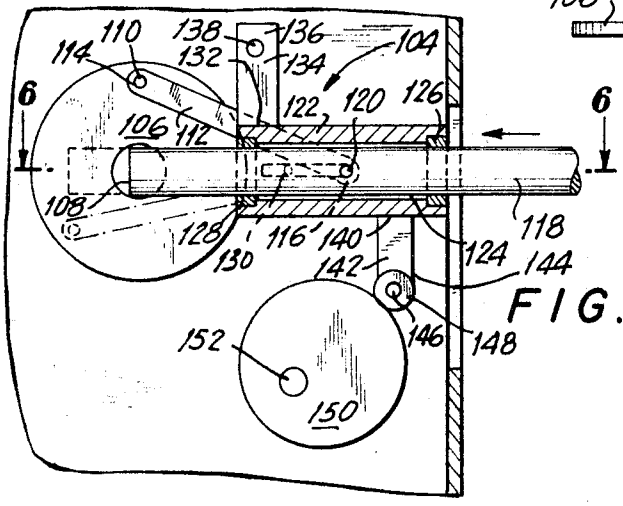


FIG. 5

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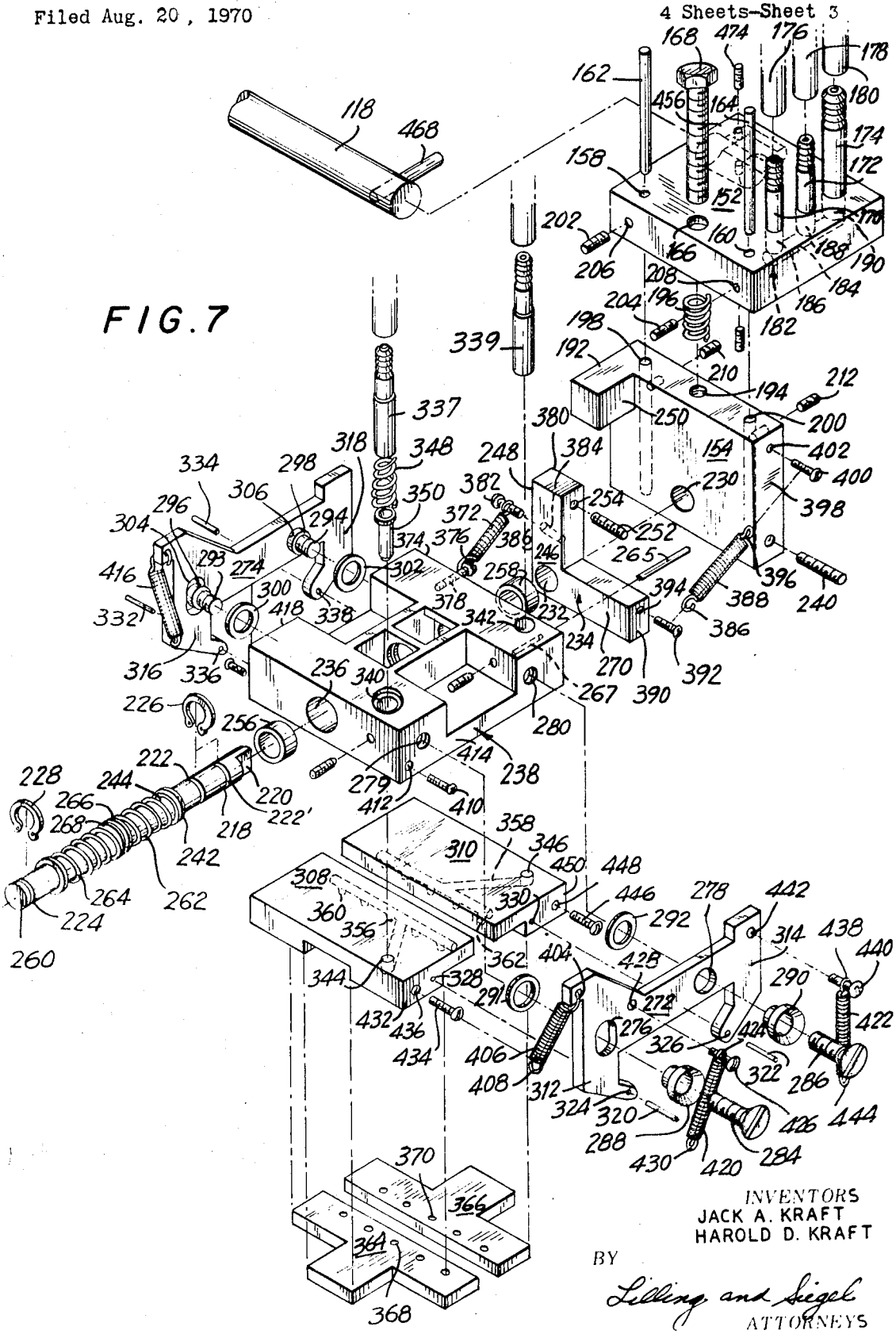
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Filed Aug. 20, 1970 4 Sheets-Sheet 3

FIG. 7



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AUTOMATIC LABELING MACHINE

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FIG. 8

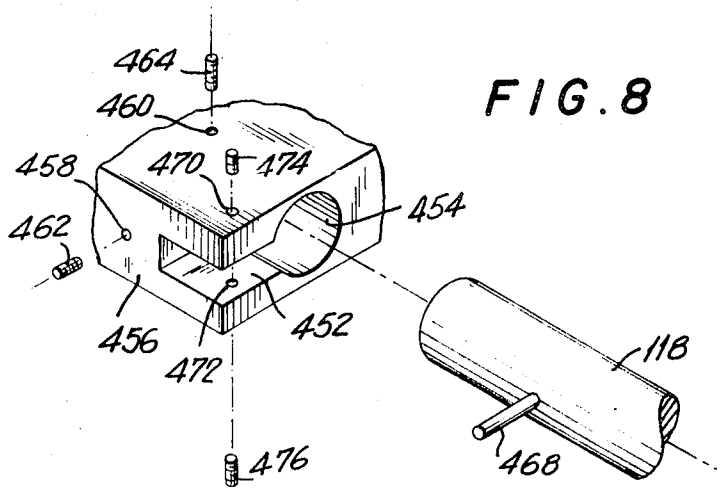


FIG. 9

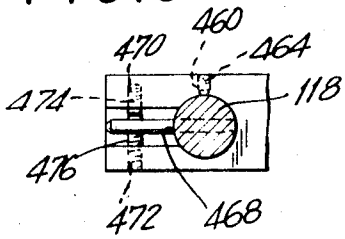


FIG. 10

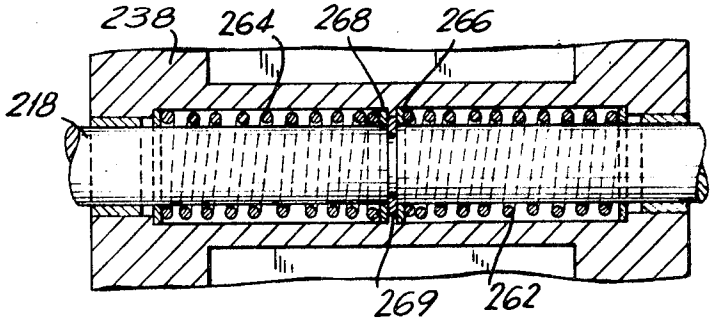
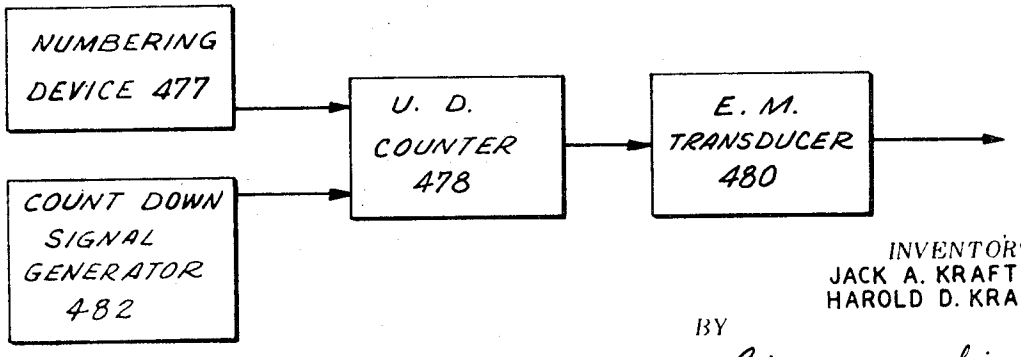


FIG. 11



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United States Patent Office 3,736,208
Patented May 29, 1973

3,736,208

AUTOMATIC LABELING MACHINE

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Filed Aug. 20, 1970, Ser. No. 65,523
Int. Cl. B65c 3/02, 9/18, 9/36
U.S. Cl. 156—361 25 Claims

ABSTRACT OF THE DISCLOSURE

A labeling apparatus for directly applying a label to an item immediately after the label is printed with a coded symbol. The labeling apparatus is provided with a master and a slave labeling unit with each capable of operating independently of the other. Each is capable of printing the same code a predetermined number of times with the slave unit generally printing the same code as the master unit. For use in medical laboratories, for instance, the master unit may label tests tubes while the slave unit labels corresponding requisition slips. An applicator is provided to carry the label after being printed to an applying position where the applicator applies the label to a test tube or the like. The applicator includes a pair of spread apart pads which are spaced apart a distance great enough to avoid obliterating the printed code on the label. In addition, the pads are capable of automatically adjusting to test tubes of varying diameters.

BACKGROUND OF THE INVENTION

This invention relates to an automatic labeling machine, and more particularly, to an automatic labeling machine for clinical laboratory use.

Labeling machines are conventionally found and utilized in large scale commercial entities where a multitutde of labels are printed to be later applied to a series of corresponding items. Such labeling machines, because of their consumer-orientated direction, are not accurate enough for use with scientific and medical procedures. In addition, such large scale labeling machines print a label which is later applied to the item, so that there may not be a one-to-one correspondence in that the label is not directly applied after being printed.

Such prior art labeling machines are relatively complex and expensive and are often difficult to use because of their complex nature. Such prior art labeling machines are generally designed to be utilized for single size items and cannot be easily modified when used with a plurality of differently sized items. The modifications entailed are generally time-consuming and cumbersome and, frequently, do not result in satisfactory performance. This lack of versatility found in most prior art high-speed labelers detracts from their effectiveness in the scientific and medical fields.

Many prior art labeling machines utilize a hydraulic system for applying the printed label to a surface. Such hydraulic or air pressure systems, when utilized for medical or scientific purposes, are generally unsatisfactory because the air stream which fixes the label onto the surface is not carefully enough controlled to prevent contamination of the liquid carried in the test tube. Such contamination cannot be tolerated in medical laboratory procedures. When used with test tubes or the like, an air stream is directed towards the printed label causing the rear face thereof to adhere to the tube. Unfortunately, such air streams or jets tend to obliterate the identifying code or label thereby minimizing the effectiveness of these machines.

In medical or biological laboratories, frequently, it is necessary to provide a degree of versatility for the labeling procedures to be employed. For instance, it may be

necessary to label 5 test tubes which relate to a single specimen and thereafter label 3 test tubes for the next specimen. Prior art labelers fail to provide this versatility and consequently, are not readily adaptable to such laboratories. Presently, many laboratories use manual labor to mark and identify such tubes or items which is both time-consuming and relatively inaccurate. In addition, many laboratories utilize a large number of labels daily which is beyond the capacity of the manual labor employed for such purposes, and where the identification procedure is not continuous, significant expense is incurred while the labor force is idle.

With the advent of large scale computer usage by many laboratories, it would be desirable to provide a labeling system which can produce computer compatible symbols. Presently, such symbols are not available in most laboratories and on most machines.

An object of the present invention is to provide an improved labeling machine which may be conveniently utilized in medical and scientific laboratories.

Another object of the present invention is to provide a labeling machine which is versatile and easily adapted for specialized situations frequently found in such laboratories.

Still another object of the present invention is to provide a labeling machine which may be conveniently and easily utilized by non-skilled workers.

Another object of the present invention is to provide a labeling machine which is capable of being used with round and flat surfaces.

Yet another object of the present invention is to provide an accurate labeling machine.

Still a further object of the present invention is to provide a labeling machine which directly applies a label to an item immediately after applying a code to the label.

Another object of the present invention is to provide a labeling machine which applies a label to a test tube or the like without contaminating the material held therein or obliterating the identifying code.

Still another object of the present invention is to provide a labeling machine which is capable of printing computer compatible symbols.

Another object of the present invention is to provide a labeling machine which produces a code compatible with conventional computers to actuate a computer printing sequence in the computer.

Yet another object of the present invention is to provide a labeling machine which is capable of great versatility and is able to automatically print an identifying code a first predetermined number of times and then another identifying code a second predetermined number of times.

Still another object of the present invention is to provide a labeling machine which may conveniently apply the same code to a plurality of requisition slips and a single or multiple corresponding test tubes substantially simultaneously.

Another object of the present invention is to provide such a labeling machine which can simultaneously print a requisition slip and carbon copies thereof.

Yet another object of the present invention is to provide a labeling machine which may be utilized with items manually loaded or loaded by an automatic hopper.

Still another object of the present invention is to provide a labeling machine which may be conveniently utilized with either a hand or foot switch.

Another object of the present invention is to provide a labeling machine which compensates for surface irregularities upon which the label is to be placed.

Other objects, advantages, and features of the present invention will become more apparent from the following description.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, the above objects are accomplished by providing an automatic labeling machine comprising means for advancing a label to a first position, printing means actuated after the label is in the first position for applying a code to the label, applicator means for transporting the label from the first position to a second position and applying the printed label to an item by means of oppositely disposed pressure pads. The applicator lifts the printed label from a tape by suitable suction mechanism and carries or transports the label to a test tube or the like. The applicator then places the label on an item, such as a test tube by means of the applicator pads bearing against the top surface of the label causing the back surface thereof to adhere to the tube. The oppositely disposed applicator pads are separated by a distance greater than the height of the coded symbols so that the applicator pads do not touch the printed code or symbols.

The applicator further includes means for compensating for surface irregularities so that the self-adhering surface of the label will touch most portions of the irregular surface. The applicator utilizes an air stream or jet for lifting or peeling the label from a web, backing, or tape on which the label is carried. This air jet is located a significant distance from the test tube to be labeled preventing contamination thereof or undue turbulence near the top of the test tube.

In accordance with still another feature of the present invention, a slave printer or labeling unit is utilized in conjunction with the primary labeling machine. The slave unit, under control of the master unit is adapted to print a code corresponding to the code printed on the label. The code of the slave unit is applied to a requisition slip or the like which is to be utilized in conjunction with a test tube. The slave unit is capable of repeatedly printing the same code a number of times which number may be different from the number of test tubes being labeled. In addition, both the slave and master units are capable of printing consecutive numbers automatically.

The master unit is capable of printing the same code only once or repeatedly, as desired. Further after the code is printed on to a label, the applicator immediately removes the label and applies it to a test tube or the like, thereby eliminating the inaccuracies encountered in prior art high speed machines which apply the printed label to a respective item after a plurality of labels are printed.

In accordance with still another feature of the present invention, the codes or symbols utilized may be computer compatible faciliating the machines use in modern laboratories employing computers for data handling, storage, and inventory purposes.

The applicator of the present invention is suitable for use with flat or round and even irregular surfaces. Further, the applicator can apply labels to a test tube in an inclined or horizontal position and is particularly well suited for use with an automatic test tube hopper feed. In addition, where desired a V-shaped assembly may be provided for manual positioning of test tubes to be labeled.

In the drawings:

FIG. 1 is a perspective view of the labeling machine of the present invention and an associated slave labeling unit.

FIG. 2 is a cross-sectional view of the applicator of the present invention taken generally along lines **2—2** of FIG. 1.

FIG. 3 is another sectional view of the applicator taken along lines **3—3** of FIG. 1.

FIG. 4 is a fragmentary sectional view taken along lines **4—4** of FIG. 3.

FIG. 5 is a sectional view taken along lines **5—5** of FIG. 1 showing the drive mechanism for the applicator.

FIG. 6 is a sectional view taken along lines **6—6** of

FIG. 5 showing the drive mechanism for the applicator.

FIG. 7 is an exploded view of the applicator.

FIG. 8 is a rear exploded view of the vacuum plate chamber and inserted adjustable shaft portion of the applicator.

FIG. 9 is a fragmentary view, partially in section of the vacuum plate chamber and shaft shown in FIG. 8.

FIG. 10 is a sectional view taken along lines **10—10** of FIG. 3.

FIG. 11 is a block diagram of the electronic apparatus controlling the number of repeat printings of the same code by the master and slave labeling units.

DETAILED DESCRIPTION

Referring to the drawings and, in particular, to FIG. 1, there is shown a master labeling unit **10** and a slave labeling unit **12** which is controlled by the master unit **10**. The master unit is used to label such items as test tubes **14**, petri dishes and like equipment found in a medical laboratory. As an example, a plurality of test tubes may be filled with blood samples taken from a person and such tubes require labels to properly identify the sample. The same code is printed on a predetermined number of labels and directly applied to the respective plurality of test tubes. Frequently, requisition sheets **16** must be used which correspond to the samples in the test tubes. When such requisition slips are required the slave unit **12** is activated and under control of the master unit prints the same code on a selected number of requisition sheets. There may be more of such sheets than test tubes, and the master unit is capable of simultaneously controlling the two separate printing or labeling operations.

A display panel **18** is located at the front of the master labeling machine **10** and is provided with a plurality of switches or tabs **20** which control selected functions in the machine. A counter display device **22** is provided on the display panel for indicating the number of repeat print operations to be performed. Swith **24** controls the power supplied to the machines while push button **26** when depressed causes a single print or label and apply operation to be performed. Switches or tabs **26'**, **28**, **30**, **32** and **34** control a plurality of modes of operations of the machine. Switches **36** through **46** control the number of repeat printing operations in the master labeling unit **10** while a similar group of switches (not shown) control the number of repeat printing operations in the slave unit **12**.

The master labeling machine is built with a modular concept permitting access to various portions of the machine. For instance, the front display panel is easily removed from the labeling machine **10** as is its associated electronics. The switches or tabs on the front panel generally control solenoids or relays or other type switches which are housed within the labeling machine and are not shown.

The labels **48** to be printed are carried on a tape or web **50** supplied from a feed roller **52** which rotates on a shaft **54** projecting from the front of the machine. The tape or web **50** passes over a pair of guide pins **55—55** and moves horizontally along a projecting platform **56** and under a label position sensor and adjustor **58**. The sensor **58** is capable of determining whether or not the tape and labels are in the proper positions and whether there is a label on the tape. Suitable microswitches (not shown) are housed within the sensor. If a signal is produced indicating a misalignment or a missing label, the operations of the labeling machine may be interrupted.

The tape is moved horizontally along the platform and under a print unit **60**. The print unit has a plurality of coded discs **62** rotatable on a shaft **64**. After a number is printed, the wheel or print unit is indexed by one to print the next sequential number. When desired, this automatic indexing operation is dispensed with by controlling a lever **66** which prevents the indexing opera-

tion. In addition, the lever permits the skipping of the next sequential number.

When a label is in a first position, that is, under the print unit, a coded symbol is printed on the label. After the label is printed, the web is driven to the end of the platform to a sharp-edged block **56** having a projecting knife edge **69** with a radius of approximately .015 inch. The knife edge peels the label from the web. As the label is peeled, an air assist nozzle **70** directs a stream of air towards the label assisting the peeling function. The label is moved in a horizontal direction as it is peeled while the web or tape is moved in a downward direction. An applicator **68** assists the peeling operation when in a first address position tape by suitable suction means, to be described hereinafter and then carries or transports the label to a second position where the label is then applied to a test tube **14**, or the like. These transporting and applying functions will be described in more detail below.

The tape is then carried between two friction rollers or wheels **72** and **74** and supplied to a take-up reel or spool **76** which rotates on a frontwardly projecting shaft **78**. After all the labels on the tape or web have been printed, the take-up reel **76** is removed from its shaft and new feed and take-up reels are supplied.

The slave labeling or printing unit **12** receives electrical control signals on an electrical cable **80** which is connected to the master unit **10**. The slave unit is provided with a printing platform **82** located below a printer **84** which has a plurality of coded wheels **86** rotatable on a shaft **88**. A requisition slip or the like is placed on the platform and when the printer **84** is actuated, a coded symbol is printed which will correspond to the symbol printed on the master unit. An indexing sytsem (not shown) is utilized with the slave unit to sequentially change the code number printed thereby, and such indexing device or means may be rendered inoperable when the same code is to be repeatedly printed.

The applicator **68** is capable of applying a label to rounded, flat, and irregular surfaces. For purposes of illustration, a V-holder **90** is illustrated in FIG. 1 holding a test tube **14**, the holder being connected to the front of the master panel of the labeling unit by means of a suitable plate **92**. The applicator is capable of printing on test tubes which are inclined as shown in FIG. 1 and on test tubes in a horizontal position. A slot or groove **94** is provided in plate **92** for adjusting the inclined position of the test tube held thereon. The applicator is capable of being used with an automatic hopper which places a test tube to be labeled in a proper print position. The hopper can be controlled by the master unit **10** to automatically supply a test tube after a previous one has been labeled.

From a review of the foregoing, it may be seen that the present invention provides a printer a labeling unit which directly applies an automatically printed label to a test tube or the like directly after being printed. Such a direct application of a label is not found in prior art automatic printing labeling machines embodying the features of the present invention. In addition, a slave unit is provided which is controlled by the master unit to print or identify items such as requisition slips as the test tubes are being labeled. It should be noted that the coded wheels or discs used in the master and slave labelers may carry computer compatible symbols, and the master unit may provide electrical signal indicative of its operation to a suitable computer for use by it. Further, the sensor which detects the proper position and presence of labels increases the accuracy of the automatic labeling machine of the present invention, which is desirable in medical, pathological, and biological laboratories. The labeler is also provided with the ability to sequentially number, skip numbers or repeatedly print the same number.

FIGS. 2–10 are more detailed views of the applicator of the present invention. The applicator is moved from an address position **100** to an application position **102**. When in address position **100**, the applicator is about two inches from the edge of the platform and by suction means (to be described) assists in peeling the label from the web or tape.

The applicator is driven from its address position to its application position by a sliding rod assembly **104**, more clearly seen in FIGS. 5 and 6. The sliding rod assembly is housed within the master labeling unit with the end thereof projecting out from the unit to control the movement of the applicator. When the applicator is to be moved, suitable electrical motors are energized. Such electrical motors are not shown but may be conventional such as a shaded pole gear type having a brake associated therewith. A circular cam or crank arm **106** having a large diameter is attached to the output shaft **108** of such a motor. As the motor turns, the cam **106** also is rotated. One end **110** of a connecting rod **112** is pivotally connected to the cam **106** by means of a bolt **114**, preferably a shoulder bolt. The other end **116** of the connecting rod is connected to a sliding rod **118** by means of a suitable bolt **120**, preferably a shoulder bolt. The sliding rod **118** is moved in and out of the housing by the drive cam **106**. In particular, a block **122** is provided having an axial bore **124** therethrough. Bushings **126** and **128** are located at either end of the bore and the sliding rod is passed through the bore **124** and aligned bushings **126** and **128**. The block completely encloses the sliding rod **118** and therefore, a slot **130** is provided in the block to permit the shoulder bolt **120** to be pivotally connected to rod **118**. As may be clearly seen, as the drive cam is rotated, the sliding rod moves in and out by means of the connecting rod. By using shoulder bolts, the sliding rod is prevented from twisting.

In addition to the sliding rod being moved in and out, the rod also moves in a vertical position because the label to be applied may be placed in either a horizontal or inclined surface. To that end, one end **132** of an arm **134** is connected to the top of the block **122** while the other end **136** is pivotally connected to the housing of the master unit by means of a pivot pin **138**, or the like. One end **140** of a second arm **142** is connected to the bottom of the block **122** while the other end **144** is provided with a shaft **146** and ball bearing **148** rotatable thereon. The ball bearing abuts or rides on an eccentric cam **150** which rotates with a motor shaft **152**. When the applicator is to be moved in an up or down manner, eccentric cam **150** will be rotated, thus causing sliding rod **118** to be carried down by means of block **122** being moved in a down direction.

The applicator is carried to its application position and applies a label to a test tube or the like without obliterating the printed code. FIG. 7 presents an exploded view of the elements of the applicator and will be described hereinafter. The applicator includes three main blocks **152**, **154** and **238** which form its frame. Upper block **152** is provided with bores **158** and **160** adapted to carry guide pins **162** and **164**, respectively and with a bore **166** adapted to receive a threaded bolt **168** which is utilized to adjust the vertical position of the applicator to align it with the plane of the platform feeding the printed label. Three air conduits or tubes **170**, **172** and **174** are integrally formed with support block **152**, project upwardly therefrom and are provided with ridged outer ends to provide a friction fit at one end of air tubes, hoses or conduits **176**, **178** and **180**, respectively. An air channel or conduit **182** is formed within block **152** by an enclosed bore **184** and three feeder bores **186**, **188** and **190** which communicate with air tubes **170**, **172** and **174**, respectively. The air channels or conduits form a path for a suction type air pressure system which lifts the label to be printed from the web or tape. In particular, a vacuum motor (not shown) is provided within or without the housing of the labeling machine and such air suction pressure is carried from hose **180** through the internal conduit **184** to hoses **176** and **178**. Hoses **176**, **178** and **180** preferably are flexible in nature and may be

made of a transparent plastic material or rubber. The other end of air tubes **176** and **178** are connected to the ridged orifice ends of conduits **186** and **188**, described in more detail hereinafter.

Upper block **152** is connected to support block **154** having a frontwardly projecting portion **192** by means of threaded bolt **168**. A threaded recess **194** is provided in the top portion of support block **154** and is axially aligned with bore **166**. A spring member **196** is placed between the upper and support blocks and rides on the stem of bolt **168**. Recesses **198** and **200** are provided in the top of support block **154** which axially align with bores **158** and **160**, respectively, and are adapted to receive guide pins **162** and **164**, respectively. Guide pins **162** and **164** are fixed in place with respect to the upper block by means of set screws **202** and **204**, respectively, adapted to communicate with the guide pins through bores **206** and **208**, respectively provided in the upper plate. Guide pins **162** and **164** are positionally fixed with relation to the support block by means of set screws **210** and **212**, respectively, to bear against the guide pins.

The remaining members of the frame of the applicator communicate with a main shaft **218** having a flat **220** at one end. The shaft is provided with grooves **222**, **222'** and **224** suitable for receiving rings **226** and retaining ring **228**, respectively, the functions of which will be described hereinafter. The shaft passes through axially aligned bores **230** in support block **154**, **232** in an L-shaped block **234** and **236** in a swivel block **238**. The flat **220** is fixedly positioned with respect to support block **154** by means of a set screw **240** passing through a bore in support block **154** with the distal end thereof bearing against the flat. The set screw **240** serves to adjust the position of the applicator to be centrally located over the test tube. Rings **226** which are placed on shaft **218** serve to locate and separate L-shaped block **234** from support block **154** to prevent the surfaces thereof from binding. L-block **234** is maintained in a fixed positional relationship with respect to the shaft by means of a ring **242** located in a slot, groove or depression **244** in the shaft which bears against the inner surface of the block **238**.

The L-block is capable of rotating on shaft **218** while support block is maintained in a fixed position with respect thereto. When these two blocks are assembled on the shaft a side surface **248** of the block faces an oppositely disposed side surface **250** of projecting portion **192**. A set screw **252** passes through a bore **254** in the L-block and bears against surface **250** which permits the angular position of the L-block to be adjusted in a clockwise or counterclockwise direction by turning the set screw.

The swivel block **238** is also rotatable on shaft **218**, with the shaft passing through the bore **236** in the swivel block. Bushings **256** and **258** are located at the opposite ends of bore **236** and permit shaft **218** to pass therethrough. Ring member **242** separates swivel block **238** from the L-block and prevents binding between their facing surfaces. Ring member **228** is attached to an end **260** of the shaft to fix swivel block in position with respect thereto.

With particular reference to FIG. 10, there is shown the shaft **218** passing through swivel block **238**. A pair of oppositely biased spring members **262** and **264** are fixed at one end thereof to the shaft and are fixed with relation to each other by means of their opposite bias. A pair of oppositely disposed washers **266** and **268** are placed on the shaft on the near opposite ends of spring members **262** and **264**, respectively. A ring member **269** is placed in a slot of the shaft between the washers and bears against the opposite faces of the washer. This arrangement maintains a fixed positional relationship between shaft **218** and swivel block **238** because as the block is moved in one direction; for instance compressing spring member **262**, spring member **264** expands, and the natural action of the springs causes the swivel block to return to its initial position, thereby self-centering the swivel block.

Swivel block **238** is rotated with the L-block by means of a pin **265** which is held in a recess **267** in the swivel block and rides on top of the horizontal leg **270** of the L-block. Thus, as the L-block is rotated, the swivel block follows such motion and is also rotated.

A pair of side plates **272** and **274** are connected to opposite sides of swivel block **238**. Side plate **272** is provided with a pair of slots or holes **276** and **278** which axially align with a pair of threaded recesses **279** and **280**, respectively, which are located in one side **282** of the swivel block. Slot **276** is somewhat elongated, the function of which will be described below. A pair of screws **284** and **286** are placed through spacers **288** and **290**, respectively which fit into slots or holes **276** and **278**, respectively. The screws **284** and **286** are threaded onto washers **291** and **292**, respectively, and into recesses **279** and **280** connecting side plate **272** to one side of the swivel block. In a similar fashion, side plate **274** is attached to the opposite side of the swivel block by means of screws **293** and **294**, spacers **296** and **298**, washers **300** and **302**, and recesses in the side of the swivel block which are aligned with slots **304** and **306** in side plate **274**.

A pair of applicator plates **308** and **310** are connected between side plates **272** and **274**. Side plate **272** is generally irregularly shaped with a pair of oppositely disposed downwardly extending portions **312** and **314** while side plate **274** is provided with similar downwardly extending portions **316** and **318**. Pins **320** and **322** are placed through bores **324** and **326**, respectively which are located in portions **312** and **314**, respectively. The pins are placed through the bores and into recesses **328** and **330** which are in the side of applicator plates **308** and **310**, respectively, securing side plate **272** to the applicator plates. In a similar manner, pins **332** and **334** are placed through bores **336** and **338**, respectively, located in extending portions **316** and **318**, respectively, and into axially aligned recesses in the side of applicator plates **308** and **310**. In this fashion, the applicator plates are firmly held between the opposite side plates and under swivel block **238**.

Orifices or air tubes or conduits **337** and **339** are axially aligned with bores **340** and **342**, respectively, in swivel block **238** and axially aligned recesses or conduits **344** and **346**, respectively in applicator plates **308** and **310**, respectively. The bottom of conduit **337** bears against a spring member **348** the bottom of which bears against the tops of an insert or spacer **350**. Insert **350** is placed in bore **340** and forms an air tight assembly. Conduit **339** is directly inserted into bore **342**. Recesses **344** and **346** communicate with internal conduits **356** and **358**, respectively, which carry the vacuum pressure to a pair of a plurality of orifices **360** and **362**, respectively. Applicator pads **364** and **366** are adhesively secured to the bottom of applicator plates **308** and **310**, respectively and are provided with a plurality of bores **368** and **370** which align with orifices **360** and **362**. The applicator pads preferably are T-shaped as shown and are made of a soft material, such as neoprene. When the applicator moves to its address position, a vacuum is created at bores or orifices **368** and **370** in the applicator pads which aids the label while being peeled from the tape or web on which the label is carried.

One end of a spring member **372** is fixedly connected to the rear surface **374** of the swivel block by means of a screw **376** which is screwed into a threaded recess **378** in the rear surface **374**. The other end of spring member **372** is attached to the vertical leg **380** of the L-block by means of a screw **382** which communicates with a threaded recess **384** in the side surface **386** of the L-block. Spring member **372** maintains the top of the L-block biased against pin **265** to aid the rotating of swivel block **238** as the L-block or plate rotates.

One end **386** of a spring member **388** is attached to a side surface **390** of the bottom leg of the L-plate or block by means of a screw **392** which communicates with a threaded recess **394** in surface **390**. The other end **396** of spring member **388** is secured to a side surface **398** of sup-

port plate or block **154** by means of a screw **400** communicating with a threaded recess **402** in side **398**. Spring member **388** maintains an upward force on the tension L-plate causing set screw **252** to bear against surface **250**.

Side plates **272** and **274** are slaved to the swivel block or plate by means of their fixed connection thereto, but pivot through their respective slots with the elongated slots serving as stops to this pivoting action. Such pivoting action also causes the swivel block or plate to follow this swivel motion because of its connection to the side plates. In particular, one end **404** of a spring member **406** is hooked into a bore in the top of side plate **272** while the other end **408** is attached to the swivel block by means of a screw **410** which communicates with a threaded recess **412** in the side **414** of the swivel block. Similarly another spring member **416** is connected between side plate **274** and the opposite side **418** of the swivel block. These springs **406** and **416** pull down their respective side plates when the surface to be printed is somewhat uneven. Such an action tends to compensate for the uneven or irregular printing surface. It may be understood that spring loaded member **350** associated with bore **344** compensates for such motion while maintaining an air tight connection between the conduit **337** and its associated bore **344**.

A pair of spring members **420** and **422** maintain the wrapper or applicator plates **308** and **310** in a horizontal position. In particular, one end **424** of spring member **420** is connected to side plate **272** by means of a screw **426** which communicates with a theaded bore **428** in the side plate, while the other end **430** of the spring **420** is connected to a side **432** of the front applicator plate by means of a screw **434** communicating with a threaded recess **436** in the side **432**. Similarly, one end **438** of a spring member **422** is attached to the side plate **272** by means of a screw **440** communicating with a threaded bore **442** in the side plate, while the other end **444** of the spring member **422** is connected to the rear wrapper or applicator plate by means of a screw **446** communicating with a threaded recess **448** in a side **450** of the rear applicator plate.

As may readily be understood, the applicator of the present invention is capable of applying a label to test tubes of varying diameters since the applicator plates and pads are capable of spreading or swiveling as they bear on and press against the test tube surface. Further, the pads and plates are spaced apart or separated by a distance in excess of the height of the printed symbol, thereby preventing the printed symbol from being obliterated as the label is applied. Conventional self-stick adhesive labels are employed which easily adhere to the surface of the item being labeled.

FIG. 8 is a rear exploded view of a portion of the vacuum plate chamber or upper block **152** illustrating a horizontal adjustment mechanism for the applicator. In particular, an extended slot or recess **452** terminating in a cylindrically shaped member **454** is made in the rear portion **456** of the upper block **152**. The block is provided with threaded bores **458** and **460** adapted to receive threaded screws **462** and **464**, respectively. A shaft **466**, cylindrical in shape, having a projecting arm **468** is adapted to be inserted in the recess **452** with the arm **468** adapted to be disposed in the recess. After the shaft is placed in the recess, screws **462** and **464** are tightened permanently fixing and securing the shaft with respect to the upper block. A pair of threaded bores **470** and **472** aligned above and below the resting point for the projecting arm or pin **468**, are capable of receiving threaded set screws **474** and **476**, respectively. These set screws abut the arm or pin and rotate the block **152** when the screws are adjusted providing for a rotational adjustment of the applicator.

As the applicator bears down on the test tube or item to be printed, an upward force is exerted on the upper block or vacuum chamber **152** which might tend to rotate the block. The pin or arm **468**, being held rigidly in place, prevents serious rotation thereof.

FIG. 11 illustrates one embodiment of the electrical apparatus controlling the number of repeat printing operations to be performed. In particular, a number is supplied by a numbering device **477** and is preset into an up-down counter **478** which causes an electromagnetic transducer **480** to be operated so long as a digital code representative of a non-zero condition is present. The electromagnetic transducer controls the printing operations of the master and slave units. Each time a label is printed a signal is generated in a count-down signal generator **482** which causes counter **478** to count down to a zero condition thereby disabling the repeat print condition in the machine. Other arrangements may be provided to control the number of repeat print operations, and the block diagram illustrated in FIG. 11 is only exemplary.

The master and slave units may be operated by a hand switch or foot switch (not shown) and as can clearly be seen may be operated by an unskilled worker.

The present labeling invention may be used with a hopper which automatically feeds tubes to be labeled or may be used with a manual feed, such as shown with the V holder in FIG. 1 and as a labeling operation is completed another test tube is placed in the holder after the labeled one is removed. The labeler is capable of successively automatically printing and labeling or may be controlled to print and label only once with a manual actuation required each time an operation is to be completed.

The printer and labeler machine is capable of dispensing a blank or even a printed label without applying it to an item, such as a test tube. In this manner consecutive or repeat printed labels may be produced individually for application to surfaces unable to be accommodated by the applicator. The labeling machine is capable of dispensing blank labels where desired by merely inhibiting the printing operation.

In addition, it will be appreciated that the apparatus of the invention may also be provided with suitable means for covering or coating the label either before or after it is applied to the test-tube or other object, such as a microscope slide. The covering or coating should be clear when applied so that the information on the label is legible, but the primary function of such a cover or coating is to preclude chemicals from attacking, dislodging or obliterating the label should same be immersed in processing solution, such as microscope slides are subjected. Of course, a secondary function of the cover means or coating is to prevent aging.

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

We claim:

1. Automatic apparatus for applying printed labels to articles, a plurality of said labels being carried on a movable tape, said apparatus comprising means for printing predetermined coded symbols on said labels, a transport system for moving said tape and labels past said printer means, said printer means being automatically actuated to print said predetermined symbols on said labels, label removing means being located after said printer means with respect to the movement of said tape for removing said labels from said tape, one at a time, applicator means being disposed to hold each of said labels as said labels are removed from said tape, said applicator means transporting each of said labels from said label removing means to said article and applying said label to said article, said applicator means comprising a pair of applicator pads, and means for adapting the direction of movement of said applicator means to be normal to the surface

of said article upon which said label is placed, positioning means capable of positioning said article at any position between horizontal and vertical positions.

2. An automatic labeling apparatus as set forth in claim 1, wherein said means for adapting comprises a swivel block rotatable about a horizontal axis, said swivel block being attached to said applicator pads.

3. An automatic labeling apparatus as set forth in claim 1, wherein said applicator pads are spaced apart by a distance at least as great as the height of the printed symbol so that the label is held by the applicator pads without the printed symbols on the labels being touched by the applicator pads.

4. An a automatic labeling apparatus as set forth in claim 1, wherein said transport system includes a sensing means placed in the path of movement of said tape, said sensing means being capable of sensing the absence of a label from said tape.

5. An automatic labeling apparatus as set forth in claim 1, wherein said printing means is provided with a plurality of coded wheels.

6. An automatic labeling apparatus as set forth in claim 5, wherein said coded wheels are provided with said symbols for printing on said label, said symbols being computer compatible.

7. An automatic labeling apparatus as set forth in claim 1, including means for preventing said printing means for applying a code to said label.

8. An automatic labeling apparatus as set forth in claim 1, including means to print consecutive codes on consecutive labels.

9. An automatic labeling apparatus as set forth in claim 1, including means for controlling said printing means to reprint the same code on a predetermined number of consecutive labels.

10. An automatic labeling apparatus as set forth in claim 1, including a master and a slave labeling unit, said master unit adaped to label articles with labels carrying predetermined coded symbols and said slave unit adapted to print corresponding coded symbols on corresponding requisition slips or the like.

11. An automatic labeling apparatus as set forth in claim 10, wherein said master unit includes means for printing consecutive coded symbols on consecutive labels and said slave unit includes means for printing corresponding consecutive coded symbols on consecutive requisition slips or the like.

12. An automatic labeling apparatus as set forth in claim 10, wherein said master unit includes means for placing a coded symbol on a first predetermined number of labels and said slave unit is capable of placing a corresponding coded symbol on a second predetermined number of requisition slips or the like.

13. An automatic labeling apparatus as set forth in claim 12, wherein said first and second predetermined number of labels and requisition slips or the like are equal.

14. An automatic labeling apparatus as set forth in claim 10, including means for controlling said slave unit from said master unit.

15. An automatic labeling apparatus as set forth in claim 1, wherein said removing means includes a sharp edged instrument for peeling said label from said tape after said label passes said printing means.

16. An automatic labeling apparatus as set forth in claim 15, wherein said removing means includes an air block, said air block directing a stream of air towards said label as it is removed from said tape.

17. An automatic labeling apparatus as set forth in claim 1, wherein said labeling apparatus includes means for applying a label to a curved surface.

18. An automatic labeling apparatus as set forth in claim 1, wherein said printing means includes means for automatically consecutively printing on a plurality of labels.

19. An automatic labeling apparatus as set forth in claim 1, wherein said applicator means includes vacuum means for removing said label from said tape and holding said label.

20. An automatic labeling apparatus as set forth in claim 19, wherein said applicator means is provided with vertical adjustment means for vertically adjusting said applicator.

21. An automatic labeling apparatus as set forth in claim 1, wherein said pads are made of a soft material.

22. An automatic labeling apparatus as set forth in claim 21, wherein said soft material is neoprene.

23. An automatic labeling apparatus as set forth in claim 1, wherein said applicator means is provided with means for swiveling said applicator pads to conform to the size of said item being labeled.

24. An automatic labeling apparatus as set forth in claim 1, wherein said applicator means is provided with means to prevent said applicator from rotating as a label is applied to an item.

25. An automatic labeling apparatus as set forth in claim 1, wherein said applicator means is provided with means for self-centering said applicator means with respect to the article being labeled.

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