March 31, 1970 J. ISREELI 3,503,265

CONTAINER ASSEMBLY WITH IDENTIFICATION MEANS

Filed Aug. 21, 1964 4 Sheets-Sheet 1

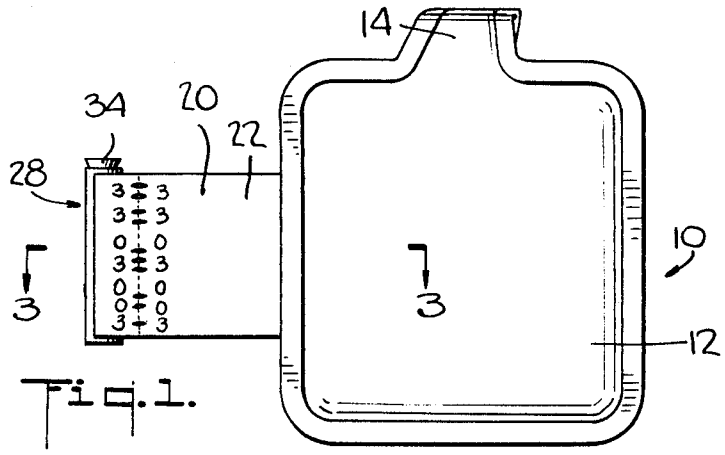


Fig. 1.

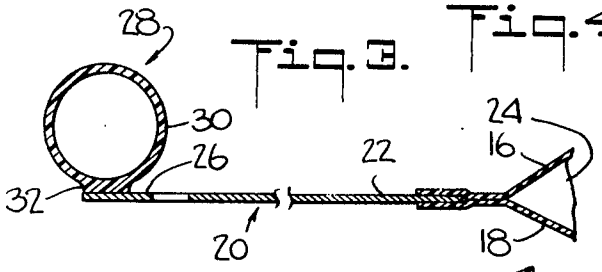


Fig. 3.

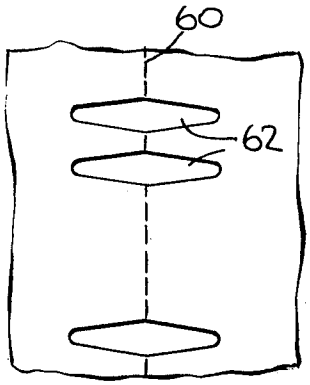


Fig. 4.

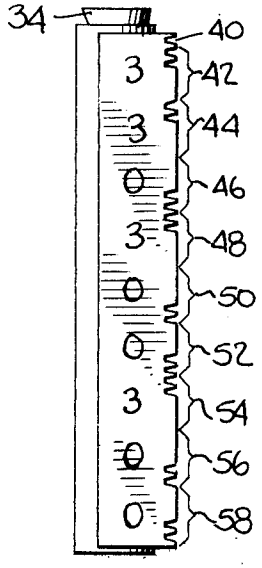


Fig. 7.

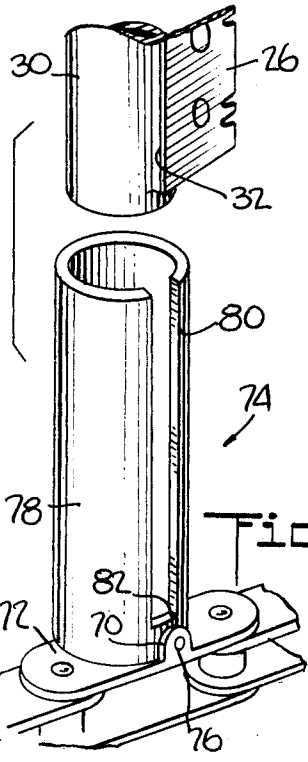


Fig. 8.

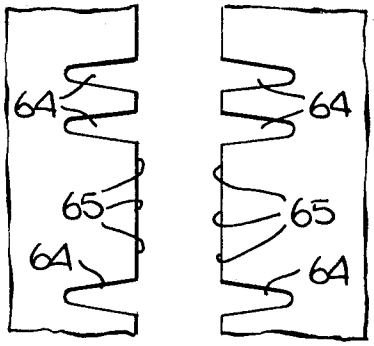


Fig. 6.

INVENTOR.
JACK ISREELI
BY
ATTORNEY

March 31, 1970 J. ISREELI 3,503,265

CONTAINER ASSEMBLY WITH IDENTIFICATION MEANS

Filed Aug. 21, 1964 4 Sheets-Sheet 2

Fig. 2.

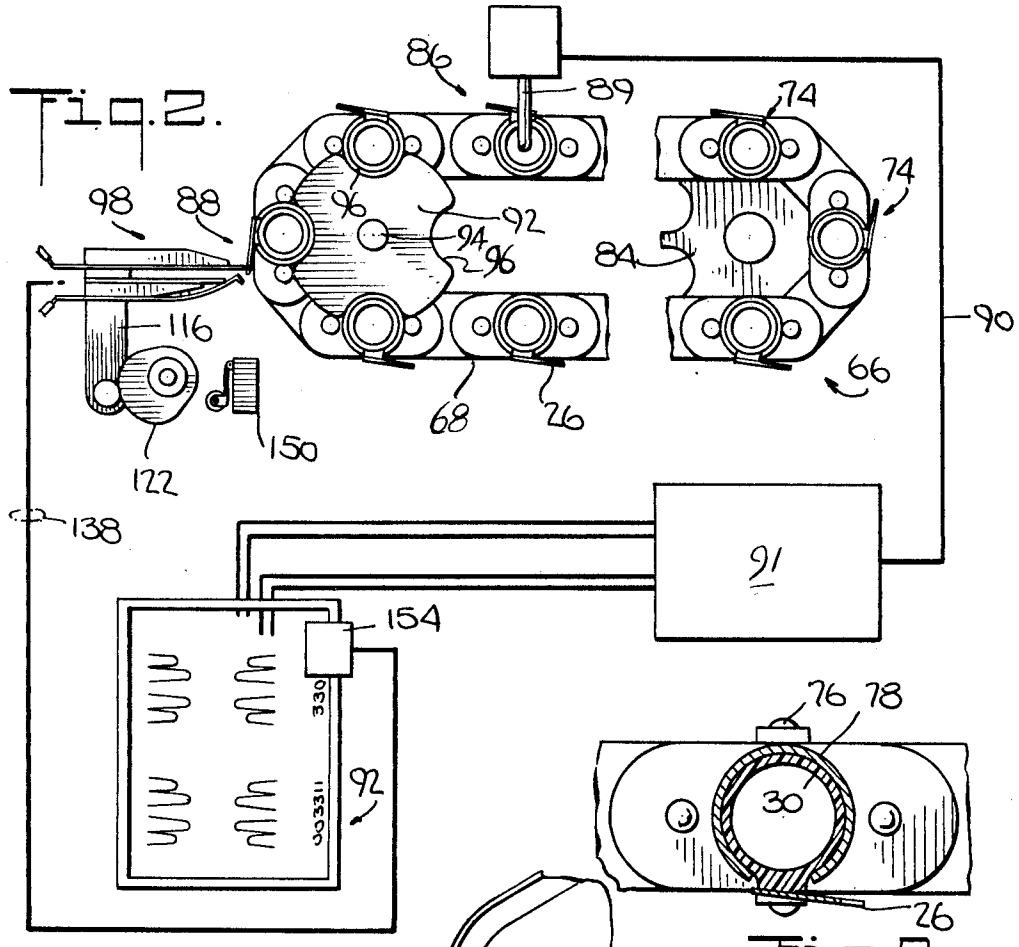


Fig. 9.

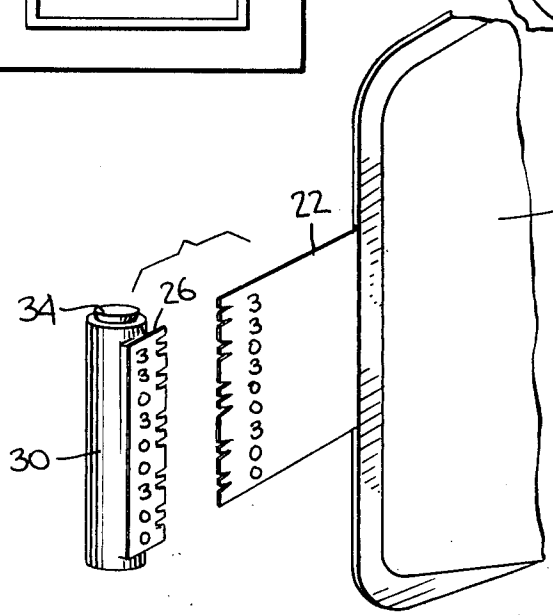


Fig. 5.

INVENTOR.
JACK ISREELI
BY
ATTORNEY

March 31, 1970 J. ISREELI 3,503,265

CONTAINER ASSEMBLY WITH IDENTIFICATION MEANS

Filed Aug. 21, 1964 4 Sheets-Sheet 3

Fig. 10.

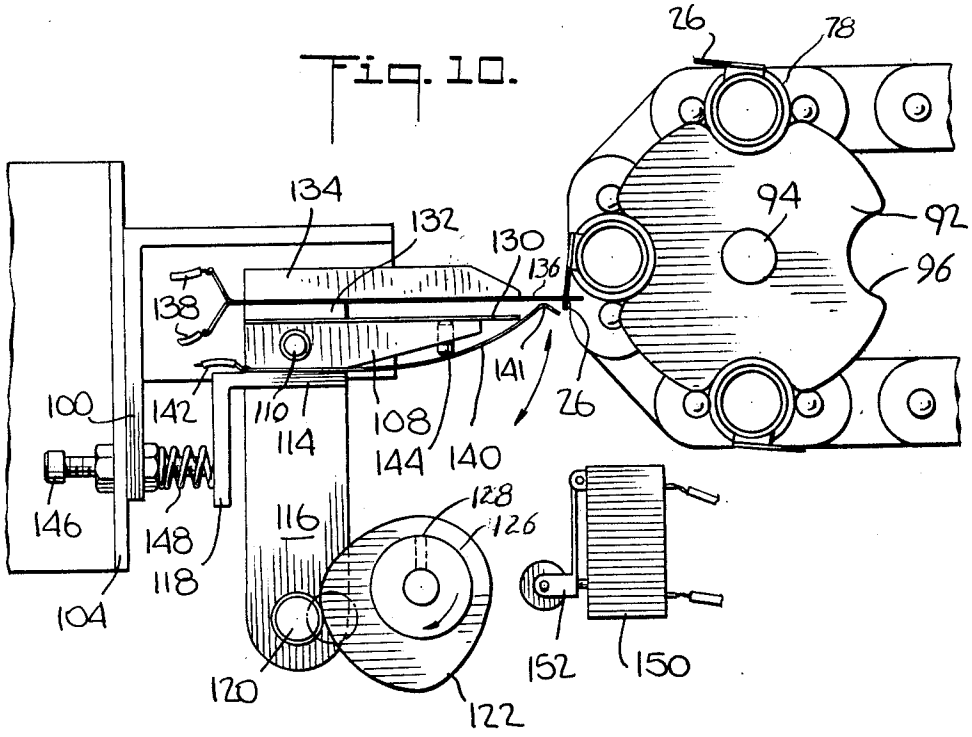
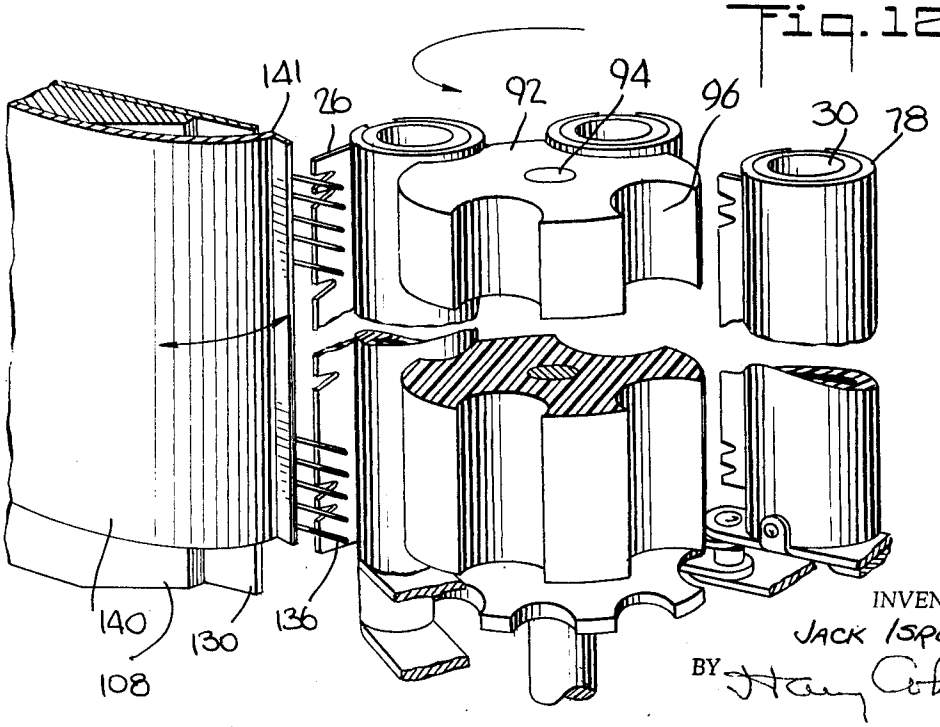


Fig. 12.



INVENTOR.
JACK ISREELI
BY
ATTORNEY

March 31, 1970 J. ISREELI 3,503,265

CONTAINER ASSEMBLY WITH IDENTIFICATION MEANS

Filed Aug. 21, 1964 4 Sheets-Sheet 4

Fig. 11.

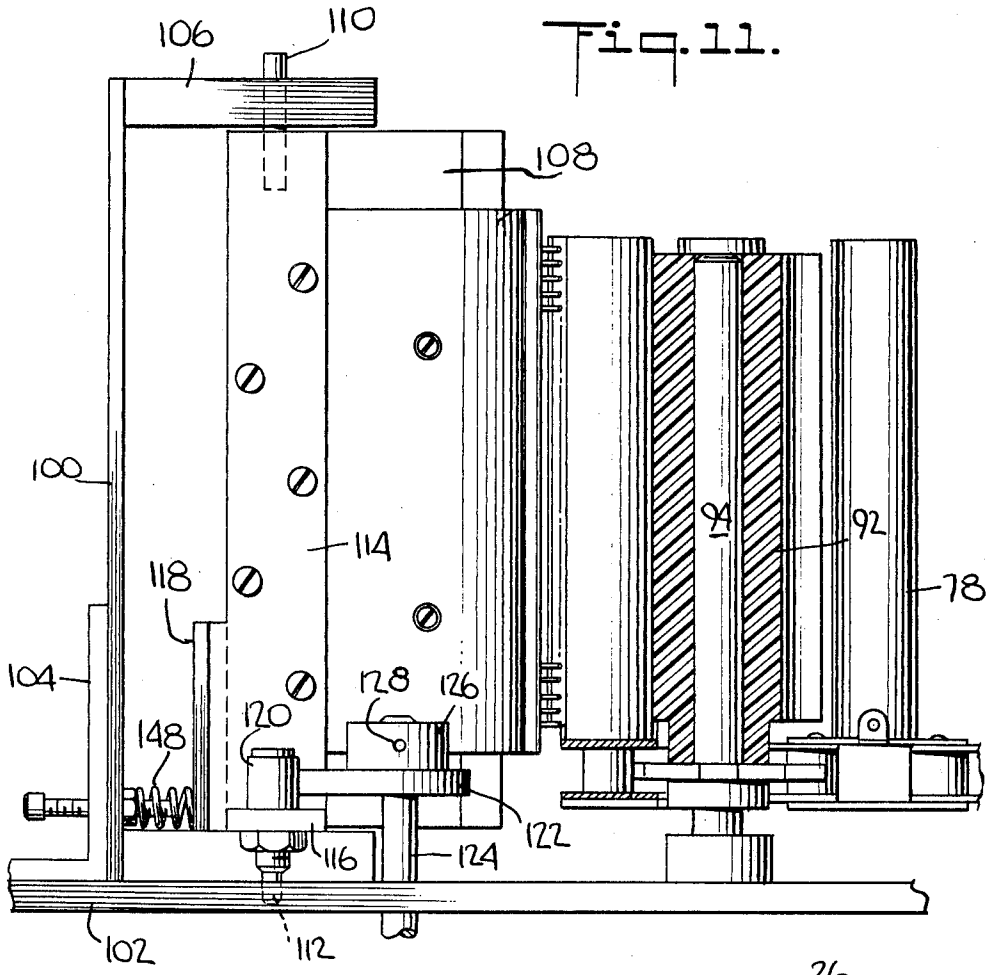


Fig. 13.

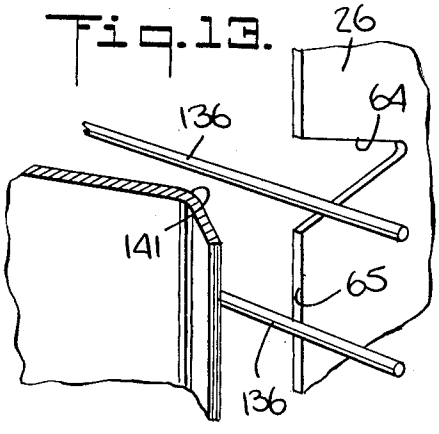
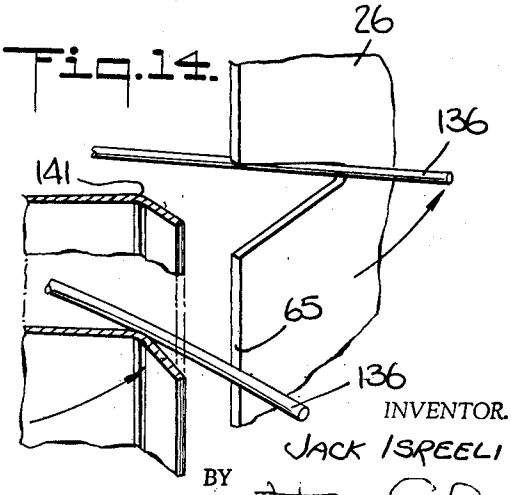


Fig. 14.



INVENTOR.
JACK ISREELI
BY
ATTORNEY

United States Patent Office 3,503,265 Patented Mar. 31, 1970

3,503,265

CONTAINER ASSEMBLY WITH IDENTIFICATION MEANS

Jack Isreeli, Mamaroneck, N.Y., assignor to Technicon Corporation, Chauncey, N.Y., a corporation of New York

Filed Aug. 21, 1964, Ser. No. 391,093
Int. Cl. G01n 1/00
U.S. Cl. 73—423 4 Claims

ABSTRACT OF THE DISCLOSURE

The system includes a main container and a sample container which are concurrently marked with uniquely identifying indicia by a single group of indicia applying means. The containers are initially joined by a linking member having a line of severance along and across which the indicia are applied. After severance, the sample container may be disposed in an analytical device wherein the contents of the container may be withdrawn for analysis and the indicia may be read automatically. The particular indicia disclosed are notches which are read by feeler wires.

This invention relates to the automatic identification of articles, and more particularly to the automatic identification of identically coded pairs of articles.

A major problem in many analytic procedures involves insuring that the results of an analysis of a sample are positively correlated with the sample which was analyzed. A further problem involves insuring that the sample which was analyzed (and the results of the analysis) are positively correlated with the supply from which the sample was taken. A prime example of these problems is found in the operation of a blood bank. Customarily, a supply of blood is drawn from a donor. A sample of the drawn blood is analyzed, inter alia, for blood type. The blood type is correlated to the supply of drawn blood. The supply of typed blood is given to a patient requiring blood of that particular type. The customary system is fraught with potential clerical errors. Initially, the blood is drawn separately into a main storage container, and separately into an independent sample storage container. Identification numbers are manually placed on these containers. The samples are each analyzed and the blood type determined. The blood type is manually recorded in correlation with the identification number. When blood of a particular type is required, the identification number of a storage container having that type is manually obtained, and the corresponding storage container is manually selected. If blood of an incorrect type is given to a patient the result may be fatal.

An object of this invention is the provision of an apparatus and a method to insure that both the main storage container and the sample storage container receive identical identification numbers.

Another object of this invention is the provision of an apparatus and a method to insure that the sample identification number is correlated with the analysis results of the particular sample.

Still another object of this invention is the provision of a novel sample container and identification number carrier from which the sample for analysis may be automatically removed and the identification number automatically read.

Yet another object is the provision of an apparatus and a method for automatically recording identification numbers of samples in an automatic analysis apparatus.

A feature of this invention is the provision of a main storage container and a sample storage container which

are concurrently marked with uniquely identifying indicia by a single group of indicia applying means, and a means for automatically reading the identifying indicia.

These and other objects, features and advantages will become apparent by reference to the following description of the invention considered in conjunction with the accompanying drawings in which:

FIG. 1 is a view in elevation of an embodiment of this invention, showing the container assembly for receiving blood from a donor;

FIG. 2 is a view in plan of an embodiment of this invention showing the continuous analysis system for serially analyzing a plurality of samples;

FIG. 3 is a detail view in plan in section taken along line 3—3 of FIG. 1 showing the attachment of the severable indicia carrier to the main and sample storage containers;

FIG. 4 is a detail view in elevation showing the lozenge shaped holes punched into the indicia carrier;

FIG. 5 is a detail view in perspective of the storage containers of FIG. 1, showing the severance of the indicia carrier;

FIG. 6 is a detail view in elevation, similar to FIG. 4, showing the notches produced in both parts of the indicia carrier after the severance thereof;

FIG. 7 is a view in elevation of the sample storage container with its indicia carrier;

FIG. 8 is a detail view in perspective showing the carrier for the sample storage container;

FIG. 9 is a detail view in plan showing the sample storage container in the carrier;

FIG. 10 is a detail view in plan of the system of FIG. 2 showing the readout mechanism in conjunction with the identification number readout station for the sample storage containers;

FIG. 11 is a detail view in elevation, partially in section, of the apparatus of FIG. 10;

FIG. 12 is a detail view in perspective, partially in section, of the apparatus of FIG. 10; and

FIGS. 13 and 14 are detail views in perspective, partially in section, showing the principle of the readout method.

A blood donation main storage container **10**, is shown in FIGS. 1 and 3, to comprise a body portion **12** and a foldover inlet and outlet spout **14** made of two layers of plastic **16** and **18** which are heat sealed together along their peripheries. An elongated member or indicia carrier **20**, which may be made of a thin, stiff plastic, has one end **22** thereof fixed to the container **10** by being sealed between the two layers **16** and **18**, but not in communication with the chamber **24** formed by these layers. The other end **26** of the elongated member is fixed to a sample container **28**. The sample container **28** comprises a tubular body portion **30**, closed at its lower end, having an elongated boss **32** to which the end **26** is fixed by suitable means, such as adhesive. A removable stopper **34** may be inserted in the upper end of the body portion **30**. The main storage container **10**, the sample storage container **28** and the interconnecting indicia carrier **20** together form a container assembly.

Prior to use, the container assembly is provided with a unique identification number. The coding system illustrated herein utilizes a binary system with a parity checking digit. That is, each decimal digit is represented by four binary digits plus a parity checking digit. Each binary digit is represented by the presence or absence of a punched hole. Nine decimal digits are provided for in the illustrated embodiment, but any number and any binary based coding system, such as a three out of five code, may be provided as required.

FIG. 7 illustrates the coding system utilizing notches in the edge of a carrier. The topmost notch **40** is used to check the vertical alignment of the carrier during the reading operation. The next five notch positions **42** provide the first decimal digit. The next five notch positions **44** provide the second decimal digit. The succeeding pluralities of five notch positions **46, 48, 50, 52, 54, 56** and **58** respectively provide the third through ninth decimal digits.

As shown in FIGS. 1 and 4, the indicia carrier **20** of the container assembly is provided with a line of severance **60**, such as a scored line. A plurality of lozenge shaped holes are punched into the carrier along the line of severance, so that one-half of each hole is on each side of the line of severance. The presence or absence of a hole is determined by the particular identification number to be given to the particular container assembly as converted into bi-quinary code. Each lozenge shaped hole may be punched by a single punch element in a punch assembly, not shown. The punch assembly is advantageously a gang punch wherein all of the holes are concurrently punched, insuring accurate spacing between the holes. Concurrently with the punching, the equivalent decimal digit may be printed on both sides of each group of holes.

The complete and punched container assembly is brought to the donor, and blood is drawn from the donor, through a collection tube, not shown, attached to the spout **14**, into the chamber **24** of the main storage container **10**. A quantity of the drawn blood is then dispensed from the collection tube or the spout into the sample storage container **28**. The spout **14** is closed, and the tubular body portion is stoppered. As shown in FIGS. 5 and 6, the indicia carrier **20** is now severed along the line of severance **60**, separating the two containers. Each container retains a portion of the carrier **20**, and both of the edges resulting from the severance has a row of V shaped notches **64** and lands **65** which is identical in spacing with the single row of lozenge shaped holes originally provided in the carrier. Thus the identification indicia provided with the main container **10** is invariably identical to the identification indicia provided with the sample container **28**.

The analysis of the blood for blood type in each sample container **28** is advantageously performed in an automatic analyzer apparatus of the type shown in the United States patent application of William J. Smythe, S.N. 221,570, filed Sept. 5, 1962, and assigned to the assignee of this application. Each of the sample containers is placed in a sampler for sequential sampling and reading. A sampler **66** is shown in FIGS. 2 and 10. The sampler **66** includes an endless sprocket chain **68**. The links of the chain are formed of spaced apart pairs of plates. Alternate links have a pair of ears **70** upstanding from the upper plate **76** of the link. A sample container carrier **74** stands up from the top plate **72** and is riveted at **76** between and to the ears **70**. The carrier **74** has a tubular body portion **78**, with an open top, and a vertical slot **80** which extends from the open top to a level **82** above the ears **70**. The inner diameter of the carrier tubular body portion **78** is equal to the outer diameter of the sample container tubular body portion **30**, and the width and the thickness of the slot **80** are equal to the width and the thickness of the boss **32**. The sample container is slid into the carrier, with the underside of the boss **32** resting on the level **82**. The carrier **74** is fixed to chain **68** by the rivet **76** and is constrained against movement with respect thereto. The container **28** is constrained against rotation with respect to the carrier by the interlocking boss and slot, and is vertically aligned by the boss and the level **82**. The sample container indicia carrier end **26** is fixed to the boss **32** and disposed without the carrier **74**. By this arrangement the indicia carrier end **26** is fixedly located with respect to the chain.

The chain is provided with a plurality of carriers **74**, fixed to alternate links, and guided between sprocket wheels **84**. Although a substantially rectangular configuration of chain is shown in FIG. 2, a serpentine or other configuration may be utilized to provide a greater length of chain and a greater number of carriers in a limited area. The chain sequentially conveys each of the carriers past a first station **86** whereat the sample is automatically removed for analysis from the sample container **28**, and a second station **88** whereat the identification number of the sample is automatically read from the indicia carrier end **26**. The chain is intermittently driven by suitable power means, not shown.

A sample removal tube **89** is disposed at the first station. When the chain presents a sample container at the first station, the tube **89** is brought over to and down into the container, and a sample is aspirated out through a conduit **90** into the automatic analysis apparatus **91**. The tube is then brought out of the container, and in due course another container is presented. A suitable sample tube which is translated in a given plane is shown in FIG. 4 of the United States patent application of Jack Isreeli and Theodore Bilichniansky, S.N. 246,967, filed Dec. 26, 1962, and assigned to the assignee of this application. Each aspirated sample is sequentially analyzed, and the results of the analysis are charted as one or more curves for each sample by a recorder **92**. The recorder may advantageously be of the type shown in the United States patent application of Milton H. Pelavin and William J. Smythe, S.N. 298,762, filed July 30, 1963, and assigned to the asignee of this application. The analysis of each sample, which is performed on a continuous flow of samples, takes a finite interval of time from the aspiration of the sample to the charting of the results. During this interval, the chain continues to advance the sample container from the first station towards the second station. When the recorder is charting the results of the analysis of a particular sample, the container of that particular sample reaches the second station **88**.

The second station is disposed at a 180° bend in the chain. A multi-concave-surfaced element **92** is mounted on a rigidly vertical pivot **94** at the center of the bend. As the carrier approaches the bend **74** it enters one of the concave surfaces **96** and travels 90° around with the element **92** to the second station.

A readout mechanism **98** is disposed at the second station to automatically read the identification number from the indicia carrier end **26** on the sample container **28**.

The readout mechanism **98** includes a vertical bracket **100** which is fixed to a horizontal chassis **102** by an angle bracket **104** and which has a horizontal upper arm **106**. A vertical insulator block **108** is mounted for oscillation about a vertical axis on an upper pivot **110** in the upper arm **106** and a lower pivot **112** in the chassis **102**. A bracket has a vertical central portion **114** fixed to block **108**, a lower horizontal arm **116** extending forwardly from the central portion and a mediate vertical arm **118** extending forwardly from the central portion. A cam follower **120** is mounted to the forward free end of the horizontal arm **116**. A cam **122** is mounted on a shaft **124** by its integral collar **126** and a set screw **128** to engage the cam follower. The shaft passes through the chassis and is driven by suitable means, not shown.

An insulator block **130**, an insulator block **132**, and an insulator block **134** are fixed to the rear of the insulator block **108**. The forward face of the block **134** is provided with a plurality of horizontal, spaced apart, grooves, and a plurality of feeler wires **136**, one in each groove, are clamped between the blocks **132** and **134**. The wires extend laterally on both sides of the block **134**. The right hand free ends of the wires are adapted to sense the notches, or the absence thereof, on the indicia carrier end portion **26**. The left hand free ends of the wires are respectively connected to individual output conductors **138**. A resilient, curved, ground bus **140** is fixed between the bracket vertical central portion **114** and the insulator block **108**. The left hand end of the ground bus **140** is

connected to a ground conductor **142**. The right hand free end of the bus is provided with a sharp, vertical bend which is slightly spaced away from the free ends of the feel wires **136**. The spacing of the bus from the feeler wires is controlled by a screw **144** threaded into a forward face of the block **108** and the right hand vertical edge of the block **130**. A stop screw **146** is mounted through the brackets **104** and **100** to limit the maximum rotation clockwise of the arm **118** and the rotatable assembly about the pivots **110** and **112**. A compression spring **148** is disposed about the screw **146** between the arm **118** and the bracket **100** to bias the arm **118** counterclockwise. A snap action switch **150** has an actuator arm **152** disposed to be operated by the high point of the cam **122**.

When the carrier **74** has traveled 90° around the bend to the readout position, the chain drive is halted. Any vertical play of the carrier is precluded by the vertical element **92** which is backing up the carrier. The cam **122** permits the spring **148** to rotate the rotatable assembly counter clockwise, bringing the feeler wires against the edge of the indicia carrier end portion **26**. A wire is provided for each notch position in the portion **26**. The vertical plane of the portion **26** may be disposed at a 6° angle to the vertical plane of the wires. As the assembly rotates counter clockwise, those feeler wires which are adjacent notches will respectively enter the notches and continue to travel counter clockwise until the rotation of assembly is halted by the low portion of the cam **122**, just before the wires reach the bottom of the notches. It may be noted that the notches **64** are V shaped, and therefore will permit the entrance of slightly misaligned wires, but not neighboring wires. Those wires which are not adjacent notches, will abut the lands **65** between the notches, and as the assembly rotates, will be deflected into engagement with the bend **141** in the ground bus. When the high point of the cam operates the switch **150**, associated circuitry, not shown, will apply a test potential to the conductors **138**. Those feeler wires which are deflected by lands will provide continuity to ground through the ground bus **140** and wire **142**. Those feeler wires which enter notches will not provide continuity.

The topmost feeler wire, entering a notch, indicates that the indicia carrier end portion **26** is correctly vertically aligned with respect to the feeler wires. The next five feeler wires provide an indication of the first decimal digit. The lower groups, by five, of feeler wires provide an indication of the other decimal digits. The output conductors **138** are taken to a code converter and printing head **154** which is disposed on the recorder **92** adjacent the recording pens. The printing head prints the decimal identification number of the sample adjacent the curves which provide the results of the analysis of that sample.

After the switch **150** is deoperated, the cam **122** rotates the rotatable assembly clockwise, against the bias of the spring **148**, withdrawing the feeler wires from the indicia carrier end portion **26**. The chain drive is energized to present the succeeding carrier to the readout position. If it is desired to minimize the arcuate distance through which the feeler wires are oscillated, the indicia carrier end portion **26** may be snapped past the ends of the feeler wires, deflecting them and the end portion, as the sample container carrier is moved from 90° to 180° from the readout position.

The 6° angle between the vertical planes of the card **26** and the feeler wires **136** may be obtained in various ways, as by mounting the card **26** tangentially to the central axis of the container **28**, as shown in FIG. 3, and having the slot **80** at 6° to the length of the sprocket chain, or by mounting the card at 6° and having the slot normal to the length of the chain, as shown in FIG. 9. Alternatively, the 6° angle may be omitted entirely, and the card and feeler wires may be brought together perpendicularly.

Although the embodiment herein shown has utilized indicia provided by notches and sensed by feeler wires, the indicia may also be provided by magnetic ink stripes which are printed on both sides of the severance line, or phosphorescent ink stripes, which, when the indicia carrier is severed, may be sensed by rows of magnetic or photo detectors. It may be noted that sensing the indicia at the center of a 180° curve, i.e. rotating the indicia carrier, permits engagement and disengagement of the indicia with the sensors to be accomplished within a small linear distance.

The indicia on the indicia carrier end portion **22** attached to the main container **12** may be read by a similar readout mechanism and used to control the correlation of the main container with the results of the analysis.

While I have shown and described the preferred embodiment of the invention it will be understood that the invention may be embodied otherwise than as herein specifically illustrated or described, and that certain changes in the form and arrangement of parts and in the specific manner of practicing the invention may be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

What is claimed is:

1. An identification number readout system, comprising: a plurality of resilient conducting wires; means supporting said wires in a spaced apart, parallel, planar array, with one end of each of said wires extending free of said supporting means; an elongated conducting means disposed adjacent yet spaced from each of said extending wire ends; an elongated cylindrical article, having a longitudinal axis; an elongated planar member attached substantially tangentially to said article, and having a longitudinal edge projecting from said article and substantially parallel to said longitudinal axis; a plurality of notches and lands provided in said projecting edge, the combinational arrangement of said notches and lands providing an identification number; and means for providing relative movement between said article and said planar array of wires to engage said extending wire ends with said projecting edge and for rotating said article about an axis parallel to said longitudinal axis to cause certain of said wires to enter said notches and the remainder of said wires to be deflected by said lands into electrical contact with said additional conducting means whereby engagement and disengagement between said wires and said lands is accomplished within a short linear distance.

2. Automatic sample feed apparatus comprising: a plurality of open-topped, tubular, sample containers; each said container having a tubular portion and a planar portion bearing indicia and attached to said tubular portion spaced from and parallel to a plane tangential thereto by an interconnecting portion; a chain including a plurality of horizontal links interconnected by vertical pivots; a plurality of open-topped, tubular upstanding carriers, each for supporting a sample container; each said carrier having a longitudinal slot therein, whereby said tubular portion of a respective container is disposed within said carrier, said elongated planar portion of said container is disposed without said carrier, and said interconnecting portion is disposed within said slot, whereby said container is precluded from rotation within said carrier; said carriers being fixed at regular intervals along the length of said chain, each said carrier being fixed to a companion link; an off-take station having off-take means for the removal of material from the tubular portion of the sample container; a sensing station having means for sensing the indicia on said planar portion of said container; means coupled to said chain for intermittently advancing said chain past said off-take station and said sensing station; and means adjacent said sensing station coupled to said chain for abruptly changing the direction of movement of said chain adjacent said sensing station and sharply change the angle between said planar portion of said container and said sensing station during the approach of each said container to said sensing station and

during the departure of said container from said station.

3. Automatic sample feed apparatus comprising: a plurality of open-topped, tubular, sample containers; each said container having a tubular portion and an elongated planar portion bearing indicia attached to said tubular portion spaced from and parallel to a plane tangential thereto by an interconnecting portion; an endless sprocket chain movable along a horizontal plane; said chain including a plurality of pairs of vertically spaced apart links, each pair of links coupled to the adjacent pair of links by a vertical pivot element; a plurality of open-topped, tubular, upstanding carriers, each for uprightly supporting a sample container; each said carrier having a longitudinal slot therein, whereby said tubular portion of a respective container is disposed within said carrier, said elongated planar portion of said container is disposed without said carrier, said interconnecting portion is disposed within said slot, whereby said container is longitudinally positioned within said carrier and precluded from rotation within said carrier; said carriers being fixed at regular intervals along the length of said chain, each said carrier being fixed to and upstanding from a companion link; an off-take station having off-take means for the removal of material from the tubular portion of the sample container; a sensing station having means for sensing the indicia on said planar portion of said container; means coupled to said chain for intermittently advancing said chain past said off-take station and said sensing station; means adjacent said sensing station coupled to said chain for abruptly changing the direction of movement of said chain adjacent said sensing station and sharply change the angle between said planar portion of said container and said sensing station during the approach of each said container to said sensing station and during the departure of said container from said station; and means adjacent said sensing station for engaging each carrier as it approaches said sensing station for precluding movement at an angle to the horizontal plane.

4. Automatic sample feed apparatus comprising: a plurality of open-topped, tubular sample containers; each said container having a tubular portion with a longitudinal axis and an elongated planar portion spaced from said tubular portion by an interconnecting portion and extending substantially tangentially from said tubular portion with a longitudinal edge projecting from said tubular portion and substantially parallel to said longitudinal axis, said edge having therein a plurality of notches and lands providing an identification number;

a chain including a plurality of horizontal links interconnected by vertical pivots;

a plurality of open-topped, tubular, upstanding carriers, each for supporting a sample container;

each carrier having a longitudinal slot therein, whereby said tubular portion of a respective container is disposed within said carrier, said elongated planar portion of said container is disposed without said carrier, and said interconnecting portion is disposed within said slot whereby said container is precluded from rotation within said carrier;

said carriers being fixed at regular intervals along the length of said chain, each said carrier being fixed to a companion link;

an off-take station having off-take means for the removal of material from said tubular portion of said sample container;

a sensing station comprising

a plurality of resilient conducting wires;

means supporting said wires in a spaced apart, parallel, planar array, with one end of each of said wires extending free of said supporting means;

an elongated conducting means disposed adjacent yet spaced from each of said extending wire ends;

means coupled to said chain for intermittently advancing said chain past said off-take station and said sensing station;

means adjacent said sensing station coupled to said chain for abruptly changing the direction of movement of said chain adjacent said sensing station and rotating said container about an axis parallel to said longitudinal axis to cause certain of said wires to enter said notches and the remainder of said wires to be deflected by said lands into electrical contact with said additional conducting means along a minimal linear distance; and

electrical means coupled to said wires and said additional conducting means for determining which of said wires are deflected into contact with said additional conducting means.

References Cited

UNITED STATES PATENTS

2,342,517	2/1944	Nevin	235—61.12
2,868,452	1/1959	Dougherty	235—61.11
3,266,298	8/1966	Whitehead et al.	73—53
3,112,378	11/1963	Holzer	200—33
3,125,672	3/1964	Kull	235—61.11
2,567,552	9/1951	Cronin.	

DARYL W. COOK, Primary Examiner

U.S. Cl. X.R.

235—61.11