Oct. 26, 1971 P. S. ABRAMS ET AL 3,614,940

MARKING DEVICE WITH PRESSURIZED FLUID FLOW

Filed April 18, 1969 2 Sheets-Sheet 1

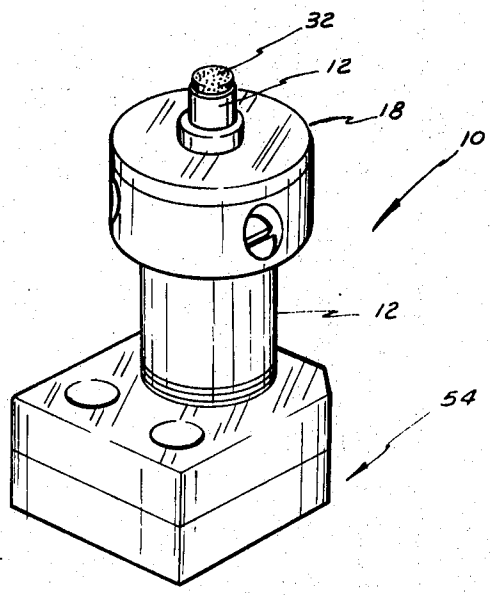

FIG. 1

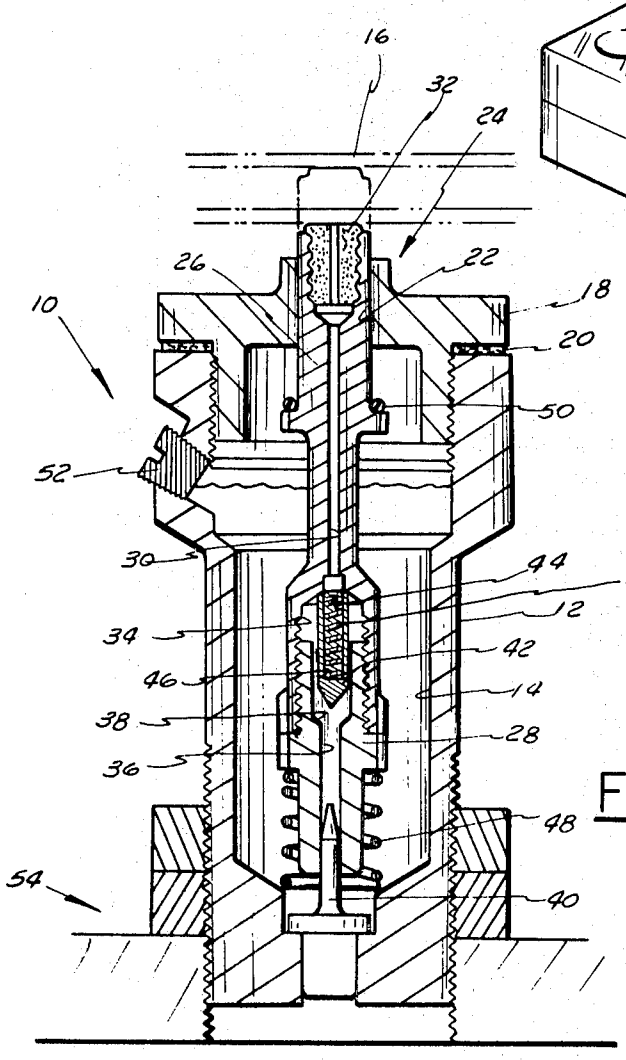

FIG. 2

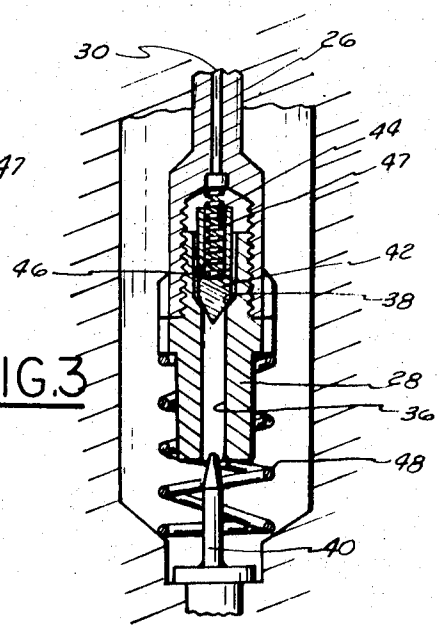

FIG. 3

INVENTOR.
PAUL S. ABRAMS
RUDOLPH G. PETERSON
BY

Hauke Knox Gifford & Patalidis
ATTORNEYS

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MARKING DEVICE WITH PRESSURIZED FLUID FLOW

Filed April 18, 1969 2 Sheets-Sheet 2

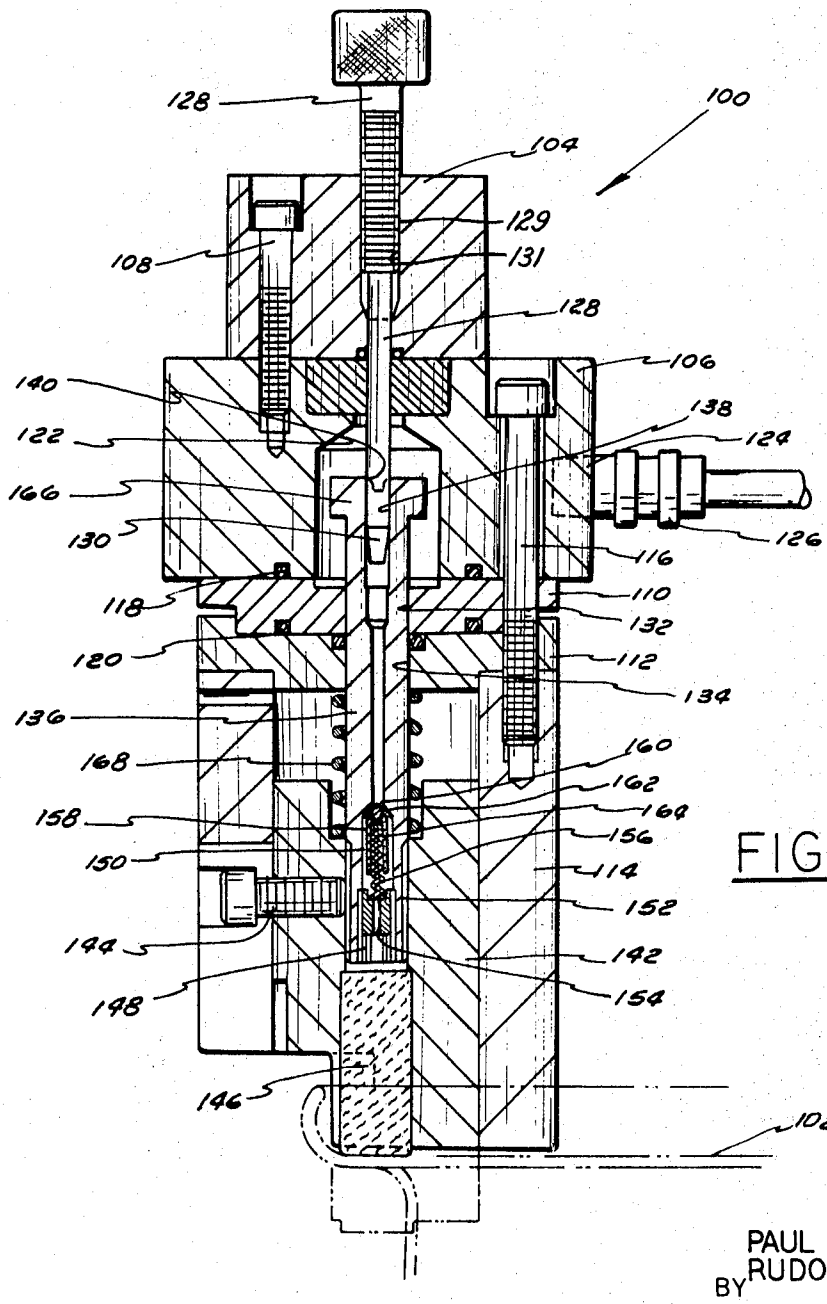

FIG-4

INVENTOR.
PAUL S. ABRAMS
RUDOLPH G. PETERSON
BY
Hauke Kraas Gifford & Patalidis
ATTORNEYS

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MARKING DEVICE WITH PRESSURIZED FLUID FLOW

Paul S. Abrams, Huntington Woods, and Rudolph G. Peterson, Detroit, Mich., assignors to Carco, Inc., Detroit, Mich.

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U.S. Cl. 118—3 6 Claims

ABSTRACT OF THE DISCLOSURE

A marking device having therefor a housing with a reservoir for storing a liquid marking agent and a reciprocally mounted feed tube having its inner end extending into the reservoir and its outer end terminating in a marking nib externally of the housing. The feed tube is reciprocated during each marking stroke to engage a plunger within the reservoir to pump a charge of the liquid marking agent into the tube to the marking nib.

CROSS-REFERENCE TO RELATED APPLICATION

This application is related in substance to patent application, Ser. No. 635,215, filed May 1, 1967, and Pat. No. 3,459,484, issued Aug. 5, 1967.

BACKGROUND OF THE INVENTION

(I) Field of the invention

The invention relates to marking devices of the type having a feed tube reciprocally mounted on a housing for delivering a liquid marking agent from a reservoir in the housing to a marking nib carried at the outer end of the feed tube, and more specifically to a marking device of this character having pump means in the reservoir actuated by reciprocation of the feed tube during a marking stroke for introducing a charge of the marking agent into the feed tube under pressure.

(II) Description of the prior art

In the aforementioned Pat. No. 3,459,484, a novel marking device useful in industrial applications for marking a series of metal workpieces with a pigmented ink is disclosed. This marking device employs a reciprocally mounted feed tube on a barrel with a porous nib carried at its outer end. When the feed tube is retracted in a marking stroke, valve means carried at the inner end of the feed tube opens communication between the reservoir and the feed tube so that the liquid marking agent can enter the feed tube under the force of gravity.

One of the features of the marking device of the aforementioned patent was a self-cleaning valve means for insuring a reliable flow of the marking agent from the reservoir and into the feed tube on each marking stroke. This valve means obviated a serious clogging condition occurring in conventional marking devices and caused by a tendency of certain pigmented marking agents to readily assume a clogged state. The broad purpose of the present invention is to provide a marking device similar to the aforementioned device but having pump means in the reservoir for introducing a charge of marking liquid under pressure into the feed tube during each marking stroke.

SUMMARY

One preferred embodiment of the present invention, which will subsequently be described in greater detail, comprises a housing having an internal reservoir containing a supply of a liquid marking agent. An elongated feed tube is mounted on the housing with its inner end disposed in the reservoir and its outer end supporting a porous marking nib. The nib could be of neoprene or other similar material with a small hole for discharging the marking agent. The feed tube is spring biased toward a normally extended position and is retracted during each marking stroke when the marking nib engages a workpiece.

The feed tube is preferably formed of upper and lower sections threaded together to form a chamber for a check valve. An internal passage extends through the upper feed tube section from the chamber to the marking nib. The lower feed tube section has an internal passage connecting the chamber with the reservoir. A spring biased check valve in the chamber is adapted to close the upper feed tube from the lower feed tube in the absence of pressure in the lower feed tube.

The check valve is opened by fluid pressure in the lower feed tube to admit fluid into the upper feed tube through axial and transverse passages in the check valve. The passages in the check valve are arranged so that it has self-cleaning characteristics similar to the self-cleaning characteristics of the valve means in the aforementioned patent.

A plunger-like piston is fixedly mounted in the reservoir adjacent the inlet end of the lower feed tube. When the feed tubes are retracted in a marking stroke, the inlet of the lower feed tube section initially engages the piston to trap a charge of the marking agent in the feed tube. Continued motion of the feed tube toward the piston pressurizes the charge until the pressure lifts the check valve to replenish the fluid used by the nib. As the feed tube returns toward its extended position, upon termination of the marking stroke, the check valve closes to trap the fluid in the upper feed tube section. Thus there is always a ready supply of marking fluid for the nib.

By providing the combination of pump means in the reservoir actuated by the motion of the feed tube to introduce a pressurized charge of fluid into the feed tubes and a check valve for trapping the charge in the feed tubes between strokes, the preferred device can be mounted in any marking position. That is the nib can be mounted either above or below the reservoir and still receive a charge of the marking agent.

It is therefore an object of the present invention to provide an improved marking device having a reciprocally mounted feed member carrying a marking nib with pump means in the reservoir for producing a pressurized flow of a liquid marking agent into the feed tube during each marking stroke.

Other objects and advantages of the present invention will readily occur to one skilled in the art to which the invention pertains upon reference to the following detailed description.

DESCRIPTION OF THE DRAWINGS

The description refers to the accompanying drawings in which like reference characters refer to like parts throughout the several views and in which:

FIG. 1 is a perspective view of a marking device embodying the present invention;

FIG. 2 is a longitudinal sectional view of the marking device of FIG. 1 with the feed tube in its retracted position;

FIG. 3 is a fragmentary sectional view showing the feed tube in its extended position; and

FIG. 4 is a longitudinal sectional view of another embodiment of the invention.

DESCRIPTION OF SEVERAL PREFERRED EMBODIMENTS

Now referring to the drawing, one preferred marking device **10** comprises a cylindrical body or barrel housing **12** having a hollow interior defining a reservoir **14** for containing a quantity of a liquid marking fluid. The mark-

ing fluid is preferably an opaque, pigmented ink for marking a metal workpiece **16**.

A cap **18** closes off the upper end of the housing **12**. A gasket **20** disposed between the housing **12** and the cap **18** provides a sealed engagement between the two parts. The cap **18** has an axial bore **22** formed on the longitudinal axis of the housing **12**. Feed means generally indicated at **24** are axially slidably mounted in the bore **22** for movement between extended and retracted positions with respect to the housing **12**.

Feed means **24** comprises an upper feed tube **26** and a lower feed tube **28**. The upper feed tube **26** has an axial feed passage **30** extending throughout its length and terminating at its outer end in a porous felt nib **32** which receives marking fluid delivered through the feed passage **30**.

The lower feed tube **28** is threadably joined to the upper feed tube **26** and cooperates with the feed tube **26** to form a valve chamber **34** which connects feed passage **30** with a feed passage **36** in the lower feed tube **28**. Feed passage **36** has a smaller diameter than the chamber **34** and terminates at its upper end in a frustoconical valve seat **38**. A piston **40** fixedly mounted at the bottom of the reservoir **14** is adapted to engage the lower end of the lower feed tube **28** and trap a charge of marking fluid which is forced up to valve chamber **34** when the feed means **24** is in a retracted position.

A floating, cylindrical valve member **42** is disposed in the valve chamber **34** with its lower conical end normally seated in the valve seat **38** to close off the upper end of feed passage **36** as can best be seen in FIG. 3. The valve member **42** has an internal passage **44** which is open at its upper end for communication with the feed passage **30** in the upper feed tube **26**. The passage **44** is connected at its lower end with a transverse inlet **46**. The valve member **42** is movable between a lower position (FIG. 3) wherein it is seated on the valve seat **38** and closes fluid communication between the passage **36** in the lower feed tube **28** and the valve chamber **34** and a raised position (FIG. 2) where fluid communication is opened between the feed passage **36** in the lower feed tube **28** and the valve chamber **34**. In the raised position, the valve member **42** provides communication from the valve chamber **34** through the transverse inlet **46** and the internal passage **44** to the feed passage **30** in the upper feed tube **26**. A spring **47** biases the valve member **42** toward its lower closed position.

It can be seen that in its raised position, the marking fluid follows a tortuous path through the transverse inlet **46** and the internal passage **44**. This path assists in maintaining the valve member **42** in an unclogged condition.

A cylindrical helical spring **48** acts between the bottom of the reservoir **14** and the lower feed member **28** to keep the feed means **24** in a normally extended position. In this extended position an O-ring seal **50** carried by the upper feed member **26** engages the lower surface of the cap **18** to provide a fluid seal between the upper feed member **26** and the bore **22**. A plug **52** provides means for replenishing the marking fluid in the reservoir **14**.

The marking device **10** is shown as mounted in a reciprocating fixture **54** which raises the marking device toward an engaged position with the lower surface of the workpiece **16**. When a mark has been produced on the workpiece **16**, the fixture **54** lowers the marking device **10** below the position of the workpiece.

In operation the feed means **24** is normally in its extended position. When the marking device is raised into position so that the marking nib **32** engages the workpiece **16**, the feed means **24** is forced down against the bias of the spring **48**. As the feed means **24** moves downwardly, the piston **40** forces a trapped charge of marking fluid upwardly with a force sufficient to lift the valve member **42** off the seat **38** against the bias of spring **47**. The charge of marking fluid enters the valve chamber **34** and is delivered under pressure through the transverse inlet **46** and the internal passage **44** of the valve into the feed passage **30** in the upper feed tube **26** to replenish the marking fluid used in the marking stroke.

When the marking device is lowered in its return stroke so that the feed means **24** assumes its normally extended position, the valve member **42** returns downwardly to its normally seated position to close communication between the feed passages in the upper and lower feed members. This prevents the marking fluid in the upper feed tube **26** from returning back to the reservoir **14** so that a supply of marking fluid is always available to the marking nib **32**.

Thus it can be seen that we have described in detail an improved marking device useful in marking vertical or horizontal surfaces of a workpiece by a marking nib **32** mounted on a reciprocally mounted feed means **24**. The feed means engages pump means in the reservoir **14** which forces a replenishment quantity of marking fluid upwardly toward the marking nib **32** on each marking stroke. The replenishment quantity of marking fluid is retained above the normal level of the marking fluid in the reservoir by a self-cleaning check valve member **42** mounted in the valve chamber **34**. The valve member **42** is adapted to transfer a uniform quantity of marking fluid on each stroke in a high speed production line. The improved marking device readily lends itself to a wide variety of actuating means such as cams, air cylinders and manual methods. The marking nib is ready to produce a mark on its initial stroke even after a considerable period of time between strokes.

FIG. 4 illustrates another preferred marking device **100** which can be mounted in any position so as to mark any surface of a workpiece and is illustrated as marking the upper horizontal surface of a workpiece **102**. The marking device **100** includes a pair of mounting block members **104** and **106** joined together by a plurality of elongated threaded fasteners **108** (only one of which is shown). A pair of bearing plates **110** and **112** are mounted below the mounting block **106** and joined with a tubular housing **114** by an elongated fastener **116**. A pair of O-rings, **118** and **120**, provide a fluid tight seal between the bearing plates **110** and **112** and the mounting block **106**.

The mounting block **106** has an internal chamber **122** for holding a quantity of marking fluid and is connected by a passage **124** which provides means for filling the chamber **122**. An elongated piston member **128** has a threaded portion **129** engaging a threaded bore **131** in the upper block **104**. The piston member **128** has a lower end **130** extending into the chamber **122**; the amount of extension of the lower end **130** into the chamber **122** being dependent upon the amount of engagement between the threaded portion **129** and the threaded bore **131**.

The bearing plates **110** and **112** have bores **132** and **134** mounted on an extension of the axis of the piston **128**. A pump barrel **136** is reciprocally mounted in the bores **132** and **134** of the bearing plates. The pump barrel **136** has an axial feed passage **138** with an inlet **140** disposed in the chamber for receiving marking fluid. A nib holder **142** is fixedly secured by a threaded fastener **144** to the lower end of the barrel **136** so that the holder **142** and the barrel **146** reciprocate as a unit relative to the housing **114**. Preferably a porous nib **146** is mounted in the nib holder **142** adjacent the outlet **148** of the feed passage **138**.

The feed passage **138** is enlarged adjacent its outlet to form a valve chamber **150**. A check valve plug **152** having an axial passage **154** is mounted at the outlet **148** of the pump barrel and provides means for seating a valve spring **156** which provides an upward bias on a valve member **158** disposed in the valve chamber **150**. The valve **158** is similar to the valve member **44** of the embodiment of FIGS. 2 and 3 in that it has a frusto-conical seating surface **160**, and lateral passage means **162** connected with axial passage means **164** to provide a self-

cleaning action while delivering marking fluid from the inlet to the outlet of the feed barrel **136**, as the valve moves up and down between open and closed positions.

The spring **156** acts to bias the valve toward its closed position so that fluid flow through the passage means **138** is normally interrupted between marking strokes.

The barrel **136** has an enlarged head **166** in the chamber **122** which limits the stroke of the barrel as it is extended and retracted. The barrel is normally biased toward an extended position by a spring **168**.

In operation the barrel **136** is normally extended between marking strokes with the valve **160** in its closed position. The feed device is positioned such that the engagement of the nib **146** with the workpiece **102** causes the feed barrel **136** to retract so that the inlet **140** of the feed passage moves upwardly toward the lower end **130** of the piston. This upward motion traps a charge of marking fluid between the inlet **136** of the passage and the valve **160**. Continued motion of the feed barrel toward the piston causes the trapped fluid to open the valve **160** which allows the fluid to pass through the lateral and axial passage means **162** and **164** and downwardly through the passages **154** of the plug so as to replenish the marking fluid consumed by the nib in the marking stroke. At the completion of each marking stroke the barrel **136** returns to its extended position and the valve **160** closes under the influence of the spring **156**. The lower end of the piston **130** and the inlet end of the barrel separate to allow another charge of fluid to flow into the inlet of the feed passage. By varying the amount of extension of the piston **130** into the feed passage inlet **140**, the amount of marking fluid consumed by the nib may be selectively controlled externally of the marking device **100**.

It is to be understood that although we have described but two embodiments of our invention, various changes and revisions can be made therein without departing from the spirit of the invention as expressed in the scope of the appended claims.

Having described our invention, we claim:

1. A marking device, comprising:

(a) a housing providing a fluid reservoir for a supply of a liquid marking fluid;

(b) feed means mounted on said housing for reciprocal movement between extended and retracted positions, said feed means having a feed passage with an inlet in said reservoir for receiving said marking fluid and an outlet for the discharge of said marking fluid;

(c) bias means for urging said feed means towards one of said positions;

(d) pump means in said reservoir for introducing said marking fluid into the inlet of said feed passage when said feed means is reciprocated towards the second of said positions during a marking stroke;

(e) a marking nib mounted on the outlet of said feed means for the transfer of said marking fluid received from said feed means to a workpiece during a marking stroke; and

(f) an enlarged valve chamber in said feed passage between the inlet and outlet of said feed passage; means forming a valve seat at the inlet side of said valve chamber; a pressure responsive valve member floatably mounted in said valve chamber and normally seated on said valve seat to close fluid flow between said inlet and said outlet, said valve member having internal passage means communicating the outlet end thereof with said chamber; said pump means generating a pressure in said feed passage on the inlet side thereof to unseat said valve member in response to the reciprocal movement of said feed means relative to said housing; such that said outlet end of said valve member engages the outlet side of said chamber and the fluid flow is from the inlet through said internal passage means to said outlet of said feed passage.

2. The marking device defined in claim **1**, wherein said feed means is mounted with the outlet of said feed passage above the fluid in said reservoir and including means for mounting said valve member to close communication between the inlet and the outlet of said feed passage when said pump means is not introducing said marking fluid into said inlet.

3. The marking device defined in claim **1** wherein said pump means comprises a piston mounted in said reservoir about the axis of motion of said feed means and adjacent the inlet of said feed passage, said piston having a diameter accommodating the inner diameter of said feed passage so that when said feed means moves toward said piston, said piston is received by the inlet end of said feed means to deliver a charge of said marking fluid from said inlet and toward said outlet.

4. The marking device defined in claim **3**, wherein said feed means comprises a pair of separable feed tubes each having a feed passage section and joined together about a common axis to form said valve chamber, the unjoined end of one of said feed tubes being adapted to retain said marking nib, the unjoined end of the second of said feed tubes being adapted to cooperate with said piston when said feed tubes are moved towards said piston to pump said marking fluid from said reservoir toward said valve chamber, said pressure-responsive valve member in said valve chamber normally closing the connection between the feed passage sections in said feed tubes, said valve member being adapted to open in response to a pressure increase produced by said piston delivering a charge of said marking fluid through the second of said feed tubes and to close and retain a replenishment quantity of marking fluid in the first of said feed tubes when said feed means moves away from said piston.

5. The marking device defined in claim **3** wherein said piston is fixedly mounted in said reservoir.

6. The marking device defined in claim **3** wherein said piston is movably mounted in said reservoir to permit relative adjustment between the inlet of said feed means and said piston to control the amount of said flow of said marking fluid.

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JOHN P. McINTOSH, Primary Examiner

U.S. Cl. X.R.

118—266; 401—148, 150