Aug. 5, 1969 J. V. CAUTHEN ET AL 3,459,235

MEANS FOR DETERMINING STOPS OF A LOOM OR THE LIKE

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Fig. 1.

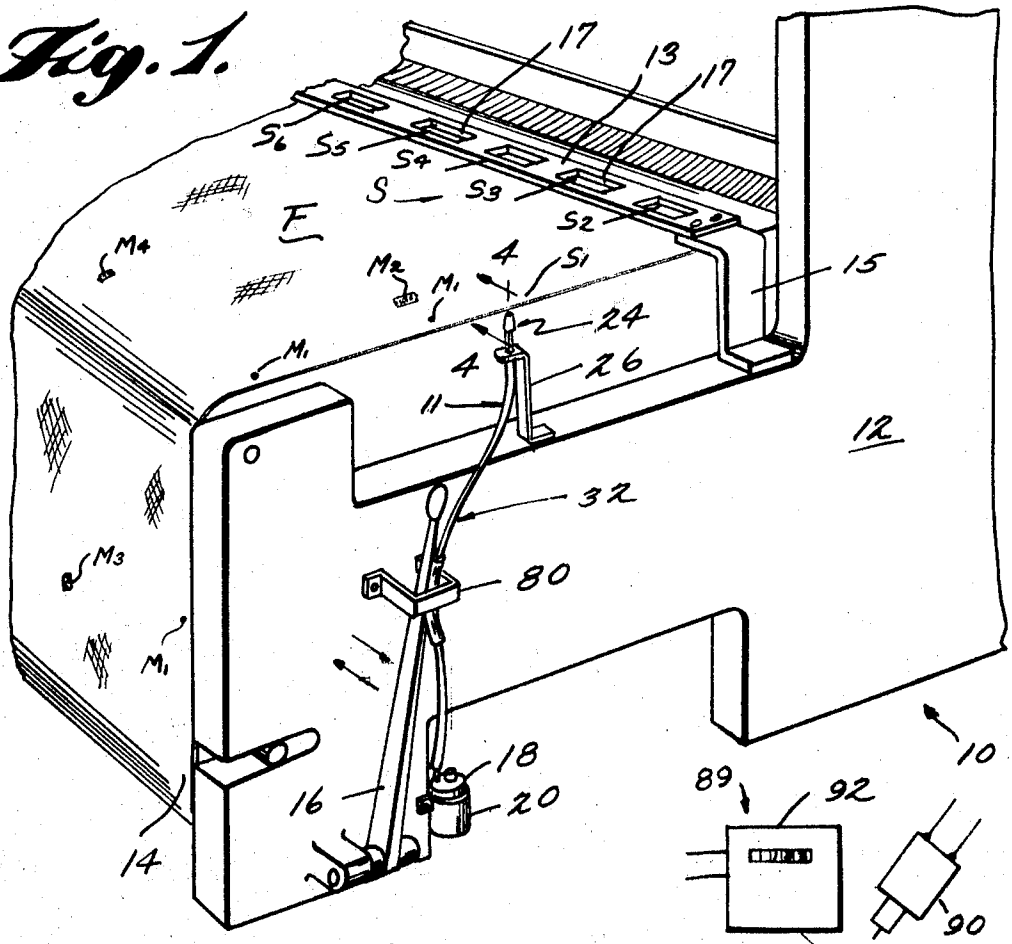


Fig. 4.

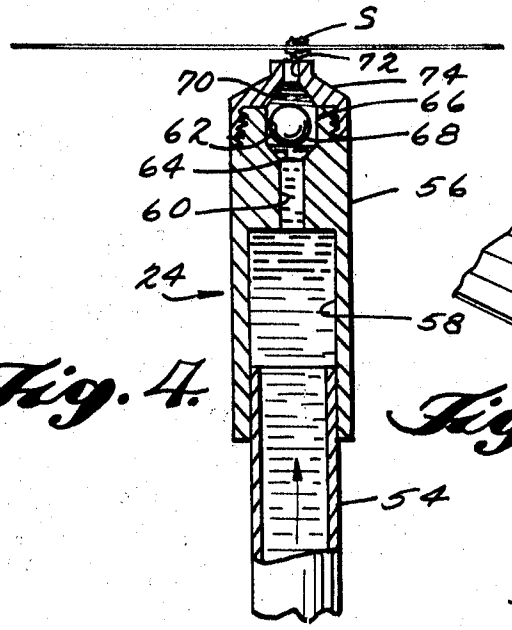


Fig. 5.

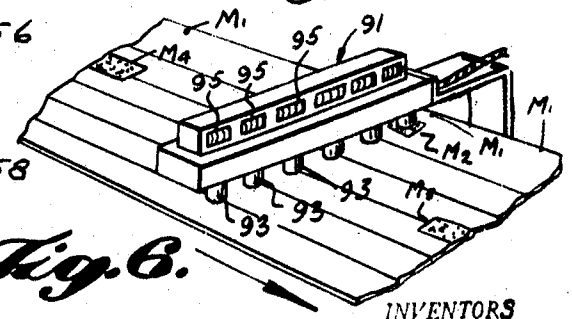


Fig. 6.

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Fig. 2.

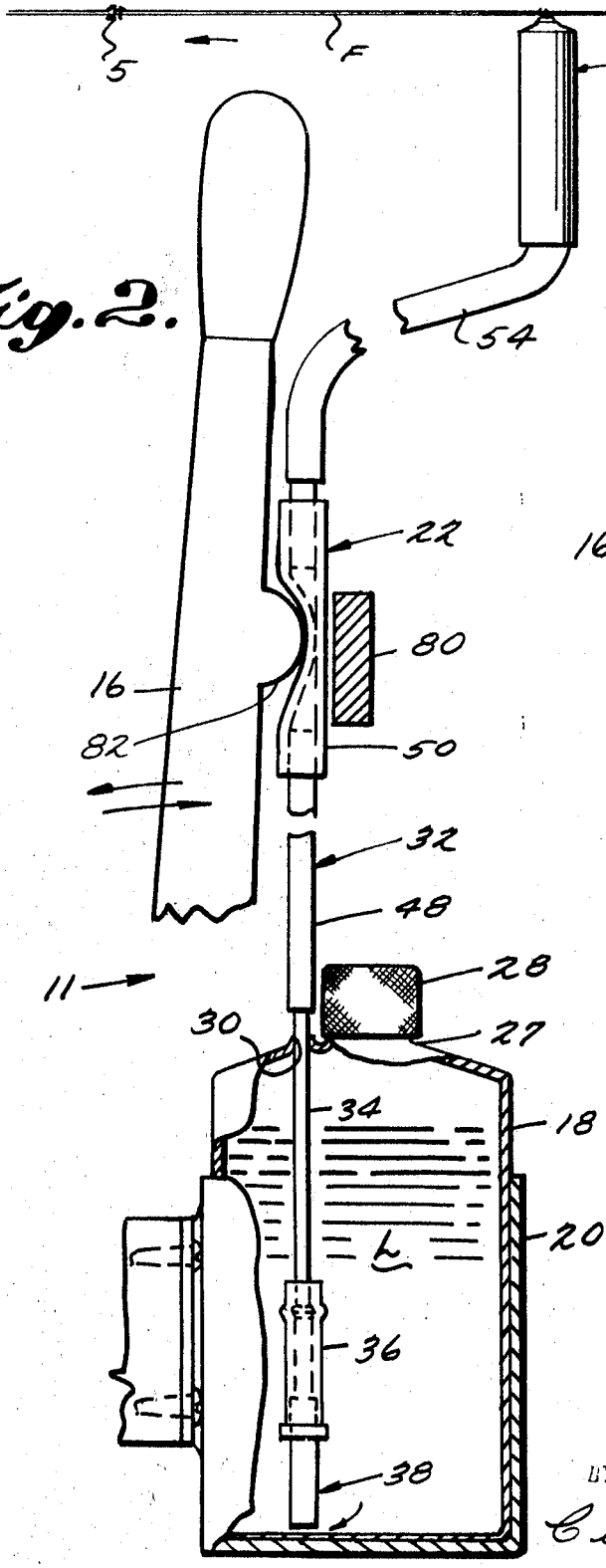
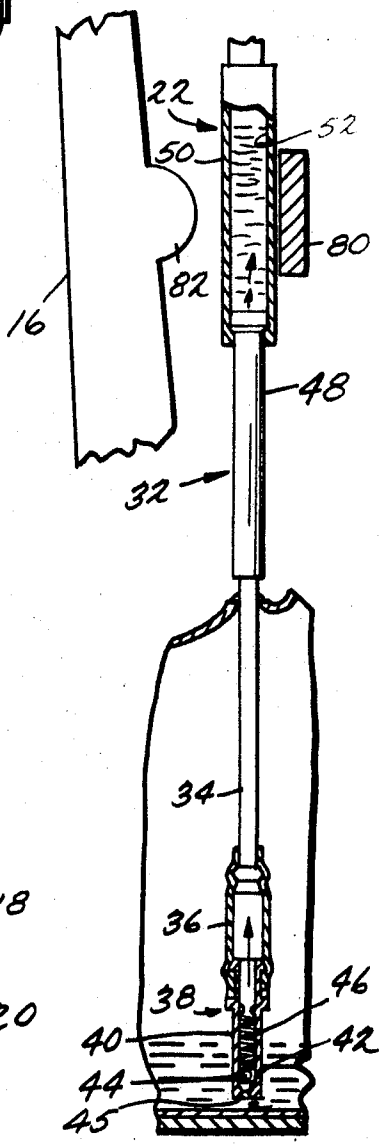


Fig. 3.



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MEANS FOR DETERMINING STOPS OF A LOOM OR THE LIKE

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U.S. Cl. 139—1 21 Claims

ABSTRACT OF THE DISCLOSURE

A system and method for evaluating the effectiveness of operation of textile apparatus such as a loom or the like, by marking a spot on the textile product being produced on the apparatus with a marking liquid or chalk each time the textile apparatus stops, the mark identifying the kind of stop, and subsequently tabulating and recording the number of spots or marks for each kind of stop for the particular run. One type of apparatus used in the system for marking including a reservoir for marking liquid, a pump supplied with liquid from the reservoir, the pump in turn discharging a single shot of the marking liquid onto the product being produced by the textile apparatus through a nozzle when the textile apparatus stops. The pump is actuated by means of any member on the textile apparatus automatically movable to a predetermined position upon stoppage of the same.

The present invention relates to a system and a method for marking a spot on a textile product being produced by a textile apparatus each time the textile apparatus stops. More specifically, the present invention relates to a system and method for evaluating the efficiency of a particular piece of textile equipment, such as a loom or the like, by applying a spot with a marking material such as chalk or liquid or the like to the textile product being made or treated in specified marking zones representing different types of loom stops and then tabulating and recording the number of stops from the number of spots or marks for each zone as well as the total number of stops during a subsequent operation on the textile product.

Heretofore mechanically operated counters have been placed on textile equipment such as looms or the like, the counters being actuated each time the loom stops with the total number of such stops being readily visible to the particular operator of the loom. The provision of such mechanical counters was not entirely satisfactory as normally they reflect the kind of loom stop such as a warp stop, filling stop, selvage stop or the like. Because of this, the information obtained from the mechanical counter could not be effectively correlated with information of fabric defects collected at a grading station because there was no way of knowing whether the defect in the fabric resulted at the time of the stoppage or from a particular kind of loom stop. Since information was not known, looms oftentimes did not operate at peak efficiency.

An object of the present invention is to provide an improved system and method of evaluating the efficiency of

a piece of textile equipment such as a loom or the like and/or evaluating the operating personnel's effectiveness.

Another object of the present invention is to provide an improved system and method of evaluating the effectiveness of a loom by applying a spot or mark to the fabric of the loom at the loom when the loom stops and subsequently tabulating and recording the number of spots to determine the total number of stops of the loom.

Ancillary to the preceding object, it is a further important object of the invention to provide a system and method whereby the total number of a particular kind of loom stop can be easily determined for a run and thus efficiency of the loom evaluated.

Still another object of the present invention is to provide an improved device for marking the selvage of fabric of a loom each time the loom stops, the device being inexpensive to manufacture, easy to install and simple to operate.

A still further object of the present invention is to provide an improved system and method for automatic or visual tabulation of the stops of the loom at a site remote from the loom.

Ancillary to the immediately preceding object, it is a further object of the present invention to provide a system and method which may be utilized to correlate the number and kind of stops of a loom with the defects in the fabric produced by the loom.

These and other objects and advantages of the present invention will appear more fully in the following specification, claims and accompanying drawings in which:

FIGURE 1 is a fragmentary perspective view of a typical loom having the improved marking devices of the present invention installed thereon for marking the selvage of the fabric and the fabric itself with a spot by application of a marking material each time the loom stops;

FIGURE 2 is an enlarged view of one type of the marking device of the present invention, partly in elevation and partly in cross-section, the view illustrating a single shot of liquid being applied to the selvage of the fabric upon stoppage of the loom;

FIGURE 3 is a fragmentary view of the device in FIGURE 2, the view being similar to FIGURE 2 and with parts omitted for clarity, the view further illustrating the pump in cross-section as well as a portion of the reservoir for the marking liquid, the view also showing the pump being charged with marking liquid;

FIGURE 4 is an enlarged cross-sectional view of the nozzle of the device of FIGURE 2, the valve in the nozzle being shown in the open position;

FIGURE 5 is a schematic view illustrating a detecting and recording means at a position remote from the loom for recording the spots from the devices of FIGURE 1; and,

FIGURE 6 is a further schematic perspective view of the detecting and recording means.

Referring now to the drawings wherein like reference numerals or characters represent like or similar parts, FIGURE 1 of the drawings illustrates a portion of a typical loom **10** for weaving fabric or cloth F. As a typical loom, the side frames **12** support a cloth beam **14** upon which is wound the fabric F produced by the loom. The loom **10** is provided with a shipper handle **16** mounted

conveniently on the side frame **12** for purpose of illustration, the shipper handle **16** being movable between an off position where the loom is stopped and an on position to start the loom. As is conventional, whenever the loom **10** stops because of a malfunction or the like, the shipper handle **16** automatically moves from the on position to the off position and remains in this position until it is desired to again start the loom.

As is well known in the art, the loom **10** may be physically stopped by the operator or it may be automatically stopped because of a particular malfunction or condition. For example, the loom **10** is provided with a number of automatic stop devices which may be actuated to stop the loom upon the existence of a particular condition. In this respect, the loom **10** will be provided with the usual stop motion devices to stop the loom when the warp, selvage, or filling breaks. Additionally, there are stop motion devices for stopping the loom when there is improper transfer of the shuttle, bang-off or the like. Each of the various kinds of stops for a malfunction or condition of the loom oftentimes creates a defect in the fabric being woven. In order to improve the efficiency of the loom, the number of each kind of stop has to be tabulated to facilitate the evaluation of loom operation and thus provide a guide to adjustment and operation of the loom.

The system and method of the present invention involves providing a plurality of marking stations S at the loom **10** adjacent its fabric or discharge side. Each marking station S_1, S_2, S_3, etc., serves as a zone for making a mark or spot for a particular type of loom stop. For example, the station S_1 is provided adjacent the selvage of the fabric and includes a marking device generally designated at **11** for placing a mark or spot on the selvage every time the loom **10** stops irregardless of the reason for the loom stop. The marking stations S_2, S_3, S_4, etc., are provided in particular areas across the width of the fabric being produced by the loom **10**, each of the marking stations representing a particular kind of loom stop, the particular station being utilized to mark the fabric F when that particular kind of stop occurs. In order to accurately locate the marks M_2, M_3, M_4, etc., on the fabric F, a template **13** is supported just above the fabric by means of a bracket **15** secured to the loom side. The template **13** has a plurality of slots **17** which designate the various marking stations S_1, S_2, S_3, etc. A light reflective chalk or dye is used to make the marks M_2, M_3, M_4, etc., on the fabric through the slots whereas the light reflective liquid is used in the device **11** to make the marks M_1 on the selvage. Of course, if a visual tabulation of the number of each of the marks M_1, M_2, M_3, etc., made is desired, then the marks will be made with a colored chalk or liquid.

At the grading station when the fabric is unrolled from the beam **14**, the fabric F is passed under a tabulating and recording means **89** (FIGURE 5) for determining the total number of stops of the loom **10** during the run as well as under a second tabulating and recording means **91** (FIGURE 6) for tabulating and individually recording the total number of each kind of loom stop. With this information tabulated, it may be transferred onto punch cards, such as IBM cards, for use in a data processing program to determine the efficiency and control the operation of the particular equipment involved. A more detailed description of the means **89** shown in FIGURE 5 and means **91** shown in FIGURE 6 will be described later in the specification.

While it is desirable to utilize an automatic tabulating and recording means as just previously described, a visual counting and recording of the spots S can be made when the spots are made with a marking liquid or colored dye or the like. This operation can also be accomplished at the grading station for the fabric as the data obtained could then be easily correlated with any defects noted in the fabric.

The method of collecting loom stop data and automatically tabulating the same is best suited for fabrics which have to be subsequently treated as the marks M can then be washed out of the goods. The automatic tabulation of loom stop data is best suited for short runs of goods as the information could then be collected frequently enough to make in process adjustments or corrections. For long runs of goods and goods not subsequently finished, the marks could be made on the surface of a roll of paper traveling alongside of the goods and stopping when the goods stop due to a loom stop. The marks on the paper could then be evaluated periodically in the same fashion as described above.

The device of the present invention for marking a spot on the selvage of the fabric F when the loom **10** stops is generally designated at **11** and includes a reservoir **18** in the form of a plastic bottle supported at a suitable position on the side frame **12** of the loom by means of a cup-shaped bracket member **20**, pump means generally designated at **22** and a nozzle **24** supported beneath and immediately adjacent the selvage of the fabric F means of a bracket **26**. In more detail, the reservoir **18** is provided with a filler neck **27** for threadedly receiving a filler cap **28**. The reservoir, in its upper wall, is provided with an aperture **30** for receiving conduit means, generally designated at **32**, extending from the nozzle **24** through the aperture and into the marking liquid L from within the reservoir.

The conduit means **32** includes a tube **34** made of polyethylene extending into the reservoir and provided with a connector **36** at its lower end. The tube **34** may be sealed in the aperture **30** if desired to insure its proper position within reservoir **18**. The connector **36** supports a one-way check valve **38** at its lower end, the check valve including a tubular body **40** having a valve seat **42** therein, a ball valve element **44** cooperating with the valve seat **42** and spring means **46** normally urging the ball valve element **44** onto the seat **42** to close the inlet orifice **45**. Connected to the upper end of the tube **34** is a plastic tubing **48** as long as necessary, the tubing **48** being connected at its upper end to the inlet of the pump means **22**. Pump means **22** is defined by a short flexible tube **50** having an increased diameter over the tubing **48**. The tube **50** is preferably made of a gum rubber or other elastomer material with the interior of the tube **50** defining a variable chamber **52**. Connected to the upper or outlet end of the pump means **22** is another piece of plastic tubing **54** as long as necessary, the tubing **54** also being connected to the lower or inlet end of the nozzle **24**.

As best shown in FIGURE 4, the nozzle **24** includes a body member **56** having a counterbore **58** therein coaxial with a bore **60**. At the upper end of the bore **60**, the body member **56** is provided with a second counterbore **62** defining an outwardly facing valve seat **64** for a one-way check valve generally designated at **66**. The one-way check valve **66** additionally includes a ball valve element **68** normally urged by a spring **70** into seating engagement with the outwardly facing valve seat **64**. An outlet orifice **72** is provided in a member **74** threadedly received on the body member **56**.

Referring now to FIGURES 1, 2 and 3, it will be noted that a bracket **80** is mounted on the side frame **12** of the loom and extends around the shipper handle **16** as well as the pump means **22**. The tube **50** of the pump means **22** by being intermediate the shipper handle **16** and the bracket **80** will be compressed, reducing the size of the chamber **52** therein, as shown in FIGURE 2, when the shipper handle **16** is in the off position as the shipper handle **16** engages the same and compresses the tube **50** of the pump means **22** against the bracket **80**. A projection **82** may be provided on the shipper handle **16** for actually engaging the tube **50** so as to give the necessary clearance between the shipper handle and the bracket when the handle is in the off position. In FIGURE 3 the shipper handle **16** is illustrated in the on position which is the position to start the loom, the shipper handle remaining

in this position so long as the loom **10** is operating correctly. In this position the shipper handle **16** does not engage the tube **50** of the pump means **22** and consequently the tube which is flexible assumes its normal shape.

The operation of the device thus far described is as follows. First, the reservoir **18** is filled with the desired marking liquid L. The marking liquid L may be either a colored dye for making a visible spot, the dye being preferably washable from the fabric during a subsequent washing operation or it may be a light reflecting liquid for making a spot which will reflect light differently than the fabric F being produced. The tube **50** is squeezed several times by the inspector for the purpose of charging the pump means **22** and the conduit means **32** up to the check valve **66** in the nozzle **24**. When the tube is first squeezed there, of course, is no liquid in the tube and thus when the inspector lets go of the tube, no air can pass the one-way check valve **66** and, thus, when the tube returns to its original position it causes the ball **44** of the check valve **38** to lift off its seat **42** against the pressure of the spring **46** allowing a predetermined amount of liquid into the conduit **32**. This procedure is repeated until the inspector notes a small shot of liquid L discharging from the orifice **72** of nozzle **24**. When this occurs the inspector will know that the conduit means **32** and tube **50** are fully charged with liquid L and the loom is ready for operation. When the loom operator throws the shipper handle **16** to the position shown in FIGURE 3, the loom will start operation and fabric F will be woven. If for any reason the loom stops, either by manual movement of the shipper handle **16** or because of a malfunction, the shipper handle **16** moves to the position shown in FIGURE 2 where it squeezes the tube **50** of the pump means **22** against the bracket **80** thus reducing the size of the chamber **52** in the tube. As soon as this occurs, the one-way check valve **38** will be closed by the ball **44** being on the valve seat **42** and the only place for the marking liquid L in the conduit means **32** and pump means **22** to escape is through the orifice **72** of the nozzle **24**. This can occur because the pressure behind the ball **62** overcomes the pressure of the spring **70** in check valve **66** and unseats the ball as shown in FIGURE 4, and, thus, lets a small shot of marking liquid to be discharged onto the selvage of the fabric F. Once the loom **10** is started again by the shipper handle **16** being moved to the position shown in FIGURE 3, the pressure is removed from behind the ball element **68** and, thus, the spring **70** closes the ball element against the valve seat **64** thereby preventing air being sucked into the conduit means **32**. The ball element **44** is unseated from the valve seat **42** as the tube **50** returns to its relaxed position as shown in FIGURE 3. Thus a sufficient amount of marking liquid L is drawn into the conduit means **32** to replace that liquid discharged therefrom. The above described operation is repeated each time the loom is stopped and then started.

Referring now to FIGURE 5, there is disclosed the means **89** for tabulating and recording the number of spots M_1 on the selvage of the fabric F at another station of fabric F processing operation such as at the grading station. When light reflective dye is used as the marking liquid, the number of stops S can be counted by disposing a collimated light source **90** and a detector unit **92** adjacent the selvage of the fabric. The collimated light source is so arranged to direct a light ray onto the selvage, the light ray R being deflected from the selvage to the detector unit **92** and whenever a mark or spot passes the light source, the reflected ray will have a different intensity which is detected by the detector unit **92**. The detector unit **92** could have its output converted into an electrical pulse which could be counted by any of the well known devices for counting electrical pulses and such a device may form a part of the detector unit.

Referring now to FIGURE 6 there is disclosed the means **91** for tabulating and recording the total number of marks or spots for each kind of loom stop. The unit or means **91** works on the same principle as the unit or means **89** described above only it includes a plurality of collimated light sources **93** each cooperating with an individual detector unit **95** having its output converted into an electrical pulse which could be counted by any well known electric counting device. The individual light sources **93** and detector units **95** are arranged across the fabric in such a manner that they cooperate with the respective marking stations S_2, S_3, S_4, etc.

The system and method heretofore described and illustrated in the drawings fully and effectively accomplish the advantages and objects of the present invention. It will be realized that the foregoing specific embodiments have been shown and described only for the purpose of illustrating the principles of this invention and are subject to some modification without departing from such principles.

Therefore, the terminology used in this specification is for the purpose of description and not limitation, the spirit and scope of the invention being defined in the claims.

What is claimed is:

1. A device for marking a textile product being produced by a textile apparatus each time the textile apparatus stops comprising: a nozzle having an outlet orifice positioned closely adjacent the textile product to be marked; a reservoir having a marking liquid therein; conduit means extending from the marking liquid in said reservoir to said nozzle; and pump means in said conduit means intermediate said nozzle and said reservoir, said pump means being operable to discharge a single shot of liquid from the nozzle onto the textile product each time the textile apparatus stops.

2. A marking device as claimed in claim **1** including a first one-way check valve in said conduit means on the outlet side of said pump means and a second one-way check valve in said conduit means on the inlet side of said pump means, said first check valve permitting a shot of liquid to be discharged onto the textile product when said second check valve is closed and said pump is actuated and said second check valve permitting said pump to be charged with marking liquid from said reservoir when said first check valve is closed.

3. A marking device as claimed in claim **1** in which said pump means includes a tubular member having a chamber therein for marking liquid and means for reducing the size of said chamber for discharging a shot of marking liquid from said nozzle.

4. A marking device as claimed in claim **3** in which said tubular member is a flexible tube collapsible upon stoppage of the textile apparatus.

5. A marking device as claimed in claim **4** including a first check valve in said conduit means on the outlet side of said flexible tube and a second one-way check valve in said conduit means on the inlet side of said flexible tube, said first check valve being open when said flexible tube is collapsed and said second check valve being open when said flexible tube returns to its relaxed position thereby permitting the chamber in said tube to be charged with marking liquid from said reservoir.

6. A marking device as claimed in claim **1** in which said marking liquid is a colored dye.

7. A marking device as claimed in claim **1** in which said marking liquid is a light reflective dye.

8. A marking device as claimed in claim **7** including a collimated light source having its light rays directed onto the textile product and a detector means for detecting variations in intensity of light reflected from the textile product.

9. A marking device as claimed in claim **8** in which said detector means includes an electrical pulse counter.

10. A system for auditing the performance of a loom with respect to the kinds of and number of loom stops during a particular run comprising in combination: a loom, means defining a plurality of marking stations where light reflective spots may be placed in predetermined positions on fabric being produced on the loom, each of said marking stations representing a different kind of loom

stop and being utilized for only that kind of loom stop, said means defining said marking stations including a template extending widthwise of the fabric being produced on said loom, said template having slots therein for each kind of loom stop and through which the spots may be applied to the fabric; and a light source-detecting means for individually recording the number of spots placed on the fabric at each of said marking stations.

11. A system as claimed in claim **10** in which said light source-detecting means includes a collimated light source and a detector unit for individually detecting spots made at each marking station, each detector unit including an electrical pulse counter.

12. A system as claimed in claim **10** including means for marking the selvage of the fabric being produced each time said loom is stopped.

13. A system as claimed in claim **12** in which said loom has a shipper handle movable to an off position each time the loom is stopped and to an on position to start the loom and in which said means for marking the selvage each time the loom stops includes a nozzle mounted on said loom adjacent the selvage of fabric being produced by the loom; a reservoir having marking liquid therein, conduit means extending from the liquid in said reservoir to said nozzle; and pump means in said conduit means intermediate said reservoir and said nozzle, said pump means being actuated by said shipper handle when said shipper handle moves to the off position upon stoppage of the loom to discharge a shot of marking liquid from said nozzle onto the selvage of the fabric.

14. A system as claimed in claim **13** in which said pump means includes a flexible tube, a stop member against which said flexible tube is collapsed when said shipper handle engages the tube upon movement to off position, and in which said conduit means includes a one-way check valve on the outlet side of said flexible tube and operable to open position when said flexible tube is collapsed and a second one-way check valve positioned in said conduit means on the inlet side of said flexible tube and operable to open position when the shipper handle is moved to on position and said flexible tube returns to a relaxed position.

15. A system as claimed in claim **13** in which said marking liquid is a colored dye adapted to tint the selvage of the fabric whereby a visual tabulation of loom stops can be made.

16. A system as claimed in claim **13** wherein said marking liquid is a light reflective dye and including a light source-detecting means for recording the number of shots of marking liquid on the selvage of the fabric.

17. A system as claimed in claim **16** in which said light source-detecting means includes a collimated light source and a detector unit for detecting variations of reflected light intensity, said detector unit including an electrical pulse counter.

18. A system for auditing the performance of a loom with respect to the kinds of and number of loom stops during a particular run comprising in combination: a loom, means defining a plurality of marking stations where light reflective spots may be placed in predetermined positions on fabric being produced on the loom, each of said marking stations representing a different kind of loom stop and being utilized for only that kind of loom stop; and a light source-detecting means for individually recording the number of spots placed on the fabric at each of said marking stations, said light source-detecting means including a collimated light source in a detector unit for individually detecting spots made at each marking station, each detector unit including an electrical pulse counter.

19. A system for auditing the performance of a textile machine with respect to the kinds of and number of machine stops during a particular run comprising in combination: a textile machine, means defining a plurality of marking indicia wherein said indicia or a visible facsimile thereof may be placed in predetermined positions on textile goods being processed on the textile machine, each of said marking indicia representing a different kind of machine stop and being utilized for only that kind of stop, and an audit device mounted on the textile machine and adapted to automatically mark the textile goods with a general purpose audit mark each time the machine stops, each audit mark being substantially identical to each other audit mark; and means for individually recording the indicia and audit marks placed on said textile goods.

20. A system for auditing the performance of a loom with respect to the kinds of and number of loom stops during a particular run of greige goods comprising in combination: a loom, means defining a plurality of marking stations where visible indicia may be placed in predetermined positions on a moving surface as fabric is produced on the loom, each of said marking indicia representing a different kind of loom stop and being utilized for only that kind of loom stop, said means defining said marking stations including a template extending widthwise of the moving surface, said template having guides therein for each type of loom stop and through which the indicia may be applied to the moving surface; and means for detecting and individually recording the number and type of indicia on said moving surface.

21. A system as claimed in claim **20** in which said moving surface is fabric produced by said loom.

References Cited

UNITED STATES PATENTS

3,197,781	7/1965	Crouch.	
3,205,740	9/1965	Groves et al.	
3,227,190	1/1966	Richards	139—336

FOREIGN PATENTS

1,046,483	10/1966	Great Britain.

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U.S. Cl. X.R.

66—166; 139—336; 346—33