

- [54] **POWDER MARKER**
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118/308, 33/9 A**
- [51] Int. Cl. **B05c 1/16**
- [58] Field of Search **118/2, 8, 9, 308,
118/7, 301; 33/9 A**

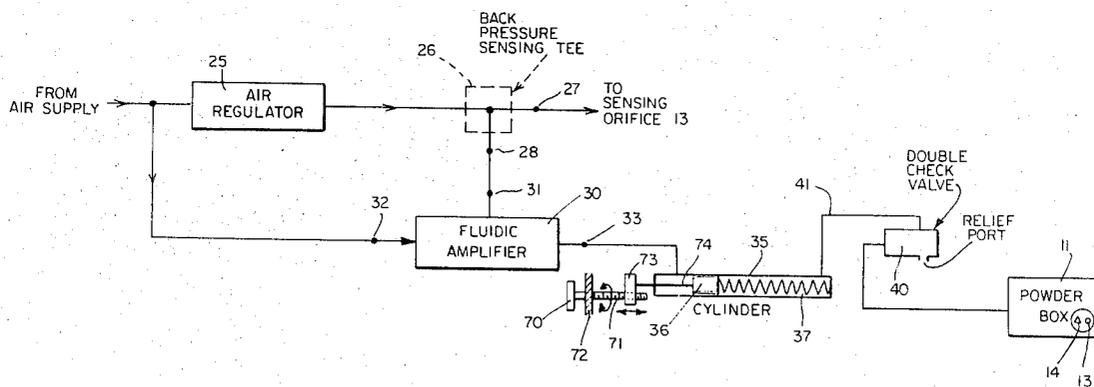
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[57] **ABSTRACT**

A marking device is disclosed for producing a powder mark upon a fabric piece when it is positioned against the device, having sensing orifice which normally projects a flow of low pressure air, the positioned fabric piece obstructing the low pressure flow and thereby causing a back air pressure which is sensed and amplified, the amplified air signal activating a cylinder which produces a pulse of compressed air which is communicated to the interior of a powder box. The powder box houses a supply of marking powder and contains, on the front face thereof, the sensing orifice and an immediately adjacent marking port, such that when the fabric piece is positioned at the marking port it also obstructs the sensing orifice, causing an exact amount of powder to be expelled out of the port and to be impinged upon the fabric at the point desired to be marked.

10 Claims, 5 Drawing Figures



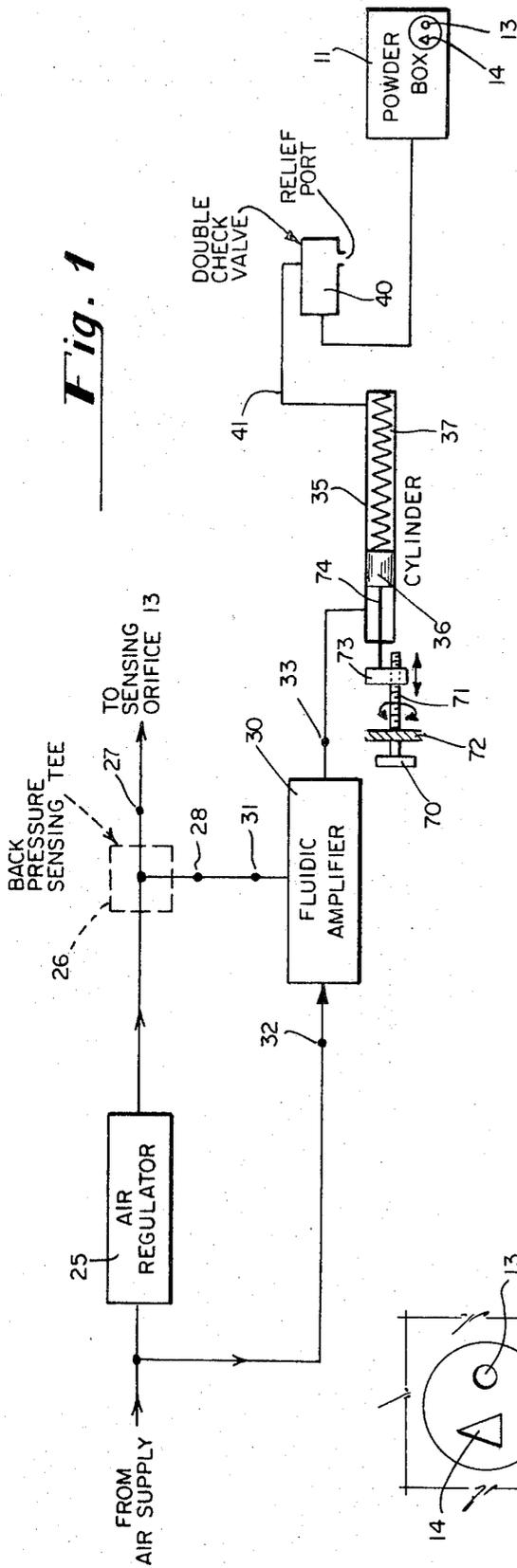


Fig. 1

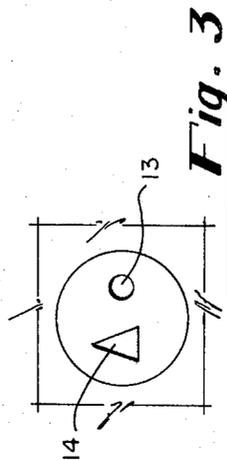


Fig. 3

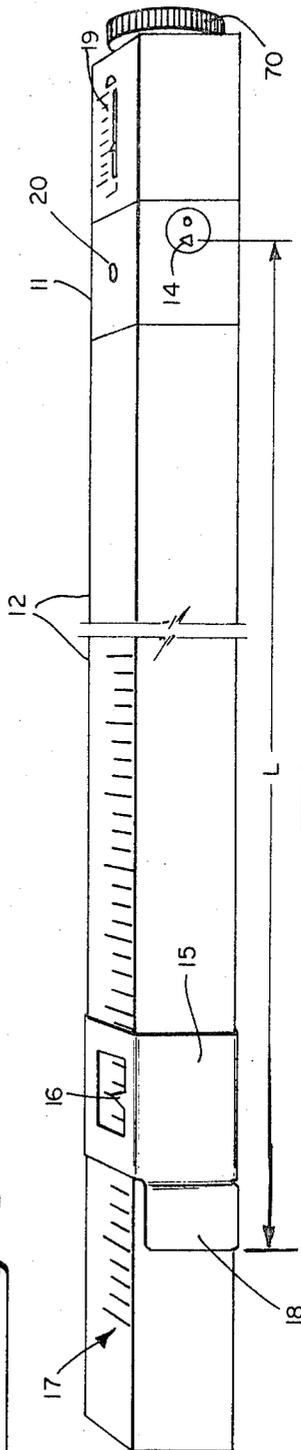


Fig. 2

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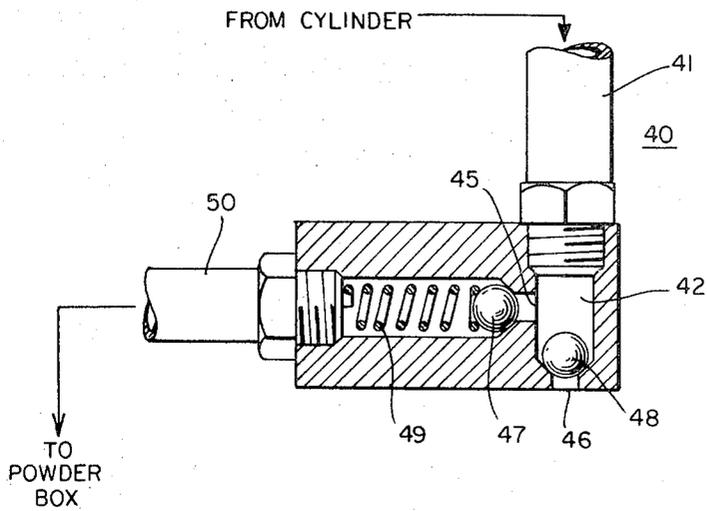


Fig. 4

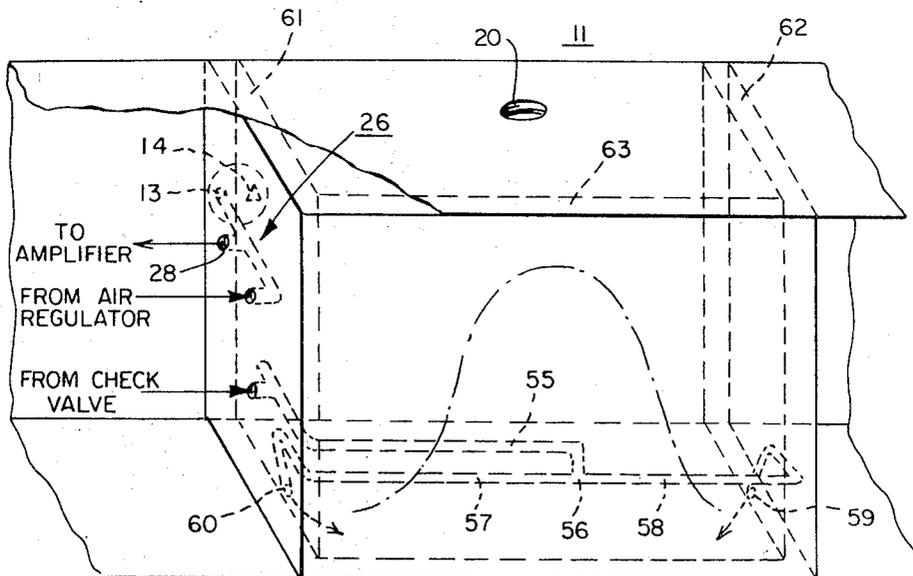


Fig. 5

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POWDER MARKER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to powder marking apparatus and, in particular, to back pressure-actuated apparatus for producing a powder mark in response to the sensed presence of the object to be marked.

2. Description of the Prior Art

In many textile operations, particularly in the manufacture and altering of clothing, it is necessary to mark the clothing at a particular spot or spots, so as to indicate the place where a subsequent sewing, stitching or like operation is to be performed. Thus, in the manufacture of trousers, a given operator may have the job of stitching seat seams into waistbands. The normal procedure which is followed is to pick up the waistband, measure its midway point and, while holding such midway point with one hand, reach with the other hand to obtain a crayon or other marking device with which to mark the point. This operation is then repeated continuously on successive waistbands, the thusly marked waistbands being passed on to be seamed in the next operation. As is well known, this relatively crude procedure permits of substantial error in marking, due to the limitations imposed by the operator's relative inability to accurately locate the desired point with his finger, the relatively wide marker or crayon which is used, and the relative inability of a human operator to draw a precise marking point or line with such crayon.

In view of the above, there is a clearly felt need in the clothes manufacturing industry, as well as elsewhere, for an automatic device permitting an operator, or worker, to lay out a piece of work material to a measured length, and to have such piece automatically marked at the measured point at the very time that the piece is so laid out. As used on fabric pieces suitable for clothing, it is of course required that the mark be made with a substance which is clearly seen and yet readily removable or washable from the fabric material.

SUMMARY OF THE INVENTION

It is the prime object of this invention to provide an automatic marker which will enable a worker to have a mark imprinted upon a fabric piece simultaneously with the step of measuring the location on such piece which is to be marked, thereby eliminating the error introduced when the worker is required in a first step to locate the point to be marked, and in a second subsequent step to manually place a mark on such point.

Accordingly, this invention provides apparatus for automatically marking an object at a desired point when the object is positioned in registry with the apparatus, having a powder box for expelling an exact amount of marking powder through a marker port onto the piece, a low pressure air sensor for sensing when such piece is in position to be marked, an air supply for providing air under pressure, a cylinder and piston activated by the sensor and producing an air pulse output which is communicated to the powder box, the output of the cylinder being communicated unidirectionally into the powder box, causing marking powder to be expelled out of the box and impinged onto the piece. The sensor includes a sensing orifice which normally passes a small volume of air under low pressure, which orifice is immediately adjacent to the marking port so that it

is obstructed when the piece is held in registry with the port, thereby causing a back pressure which, when amplified, activates the piston to produce the air pulse which causes the expulsion of powder from the powder box.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating the component parts of the powder marker of this invention.

FIG. 2 is a perspective front diagrammatic view showing the environment of the powder marker of this invention.

FIG. 3 is an exploded fragmentary view showing the configuration of the back pressure orifice and the powder hole as used in this invention.

FIG. 4 is a detailed view, partly in cross section, of the double check valve used in this invention.

FIG. 5 is a perspective rear view of the powder box of this invention, with a dashed line indication of air flow channels within the box.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the apparatus of this invention is described hereinbelow as adapted to mark clothes, textile or fabric pieces, or other porous materials with a marking powder. This description is adopted for purposes of clarity, but it is noted that the apparatus is not limited in its application to such marking of such materials. It is further noted that the apparatus is illustrated as being fixed in position, with the object to be marked being positioned in registry with the apparatus. However, due to the small size of the apparatus, it can be constructed to be portable, such that the object to be marked may be fixed in position, with the marking apparatus being moved, or positioned, into registry with the object. Accordingly, as used herein, the phrase "the object is positioned in registry with the apparatus" may mean that either the object or apparatus is fixed in position, and the other is positioned relative thereto.

Referring now to FIGS. 1 and 2, a powder box 11 is shown which is adapted to contain a powder suitable for marking clothes or other porous materials, the powder having the property of being easily erased or washed from the fabric to which it is applied. Powder box 11 is desirably arranged physically as part of a solid rectangular housing 12, which may be built into the front upper edge of a work table or other similar structure being used by a worker. Powder box 11 contains on the front surface, facing the worker, a sensing orifice 13 to which is continuously provided a low pressure air, and a marker hole, or port 14 arranged generally in the form of an arrow head, through which powder under pressure may be emitted. Box 11 contains, on its top side, an opening 20, normally plugged, through which powder may be introduced.

In operation, when a worker has need to make a temporary mark upon fabric piece or the like, as to indicate where a stitching operation is to be performed, the worker aligns the fabric piece so that powder hole 14 registers with the point where the marking is desired. In so doing, orifice 13 is covered, causing a back pressure which is sensed by the mechanism described hereinbelow, whereupon a burst of powder is caused to be emitted through marker hole 14, thus providing the desired mark at the desired point.

In normal operation, the worker will desire to accurately measure the point for placement of the mark, and for such purposes a scale 17 is provided on housing 12 and in fixed spatial relationship to marker 14. A slider 15 attached to housing 12 and having a pointer 16 enables the worker to measure off any desired distance. For example, in measuring the location for stitching a seat seam in a waistband for a pair of trousers, the worker adjusts sliding element 15 to the desired waist length, attaches the hook found at one end of the waistband around the lip 18 of slider 15, and firmly extends the waistband to the marker opening 14. In this example, since the seam is to be stitched at the halfway point around the waistband, the distance designated as L in FIG. 2 is half the length of the desired waist. It is thus seen that it is a simple operation for the worker to measure off the desired distance and place the waistband in front of marker opening 14. Due to the adjacent position of sensing orifice 13, the back pressure is simultaneously detected and the powder mark is automatically made. The worker can repeat the process very quickly for each waistband which is to be marked. A provision is made for adjusting the intensity of the mark, as indicated generally at 19, the details of which are described hereinbelow.

The block diagram of FIG. 1 shows the interrelationship of the component parts of this invention. Compressed air, from a standard air supply, is delivered to an air regulator 25, which produces a very low output pressure, in the order of 5 to 20 inches of water. The air regulator is a standard commercially available item, the mechanism of which does not form any part of the claims of this invention. The output from air regulator 25 is fed into a back pressure sensing tee 26, which has outputs 27 and 28 (See also FIG. 5). Output 27 is on a direct line with the input to the tee, such that normally the air provided to tee 26 passes directly through the tee and out of outlet 27. Outlet 27 is coupled directly to sensing orifice 13, such that the low pressure air flow is normally directed out of orifice 13. Upon obstruction of orifice 13, as by holding fabric in front of it, the air coming into tee 26 is confined to passage out of opening 28 which is coupled through suitable tubing to fluidic amplifier 30. Amplifier 30 is also a commercially available shelf item, having the property of passing a relatively high pressure air flow upon sensing a relatively low air pressure. When the back pressure is sensed at the input 31 of amplifier 30, the relatively high pressure air supply which is connected to input 32 is permitted to pass through to output 33.

The high pressure air output of amplifier 30 is transmitted through suitable tubing or piping to cylinder 35, containing piston 36 in chamber 37. Upon receiving an input of high pressure air, piston 36 is driven forward, driving air out of cylinder 37, which driven air is coupled to double check valve 40. As described in more detail hereinbelow, valve 40 is designed to pass air being injected from cylinder 35 through to powder box 11, wherein the injected air causes ejection of powder through marker port 14. Valve 40 also provides for intake of air into cylinder chamber 37 when piston 36 retracts, while preventing any flow of powder from box 11 into cylinder 35. Thus, whenever the low pressure flow of air from orifice 13 is obstructed, the back pressure caused thereby produces a stroke of piston 36, in turn producing a burst of air under pressure into powder box 11 so as to force a controlled amount of powder

out of marker port 14 and cause the desired mark. As soon as the fabric obstructing orifice 13 is released, piston 36 is reprimed and the system is in a ready state to produce the next mark whenever called for.

Referring now to FIG. 4, showing the double check valve 40 as used in this invention, the central chamber 42, which is fed directly from the cylinder, has ports 45 and 46, normally blocked by spheres 47 and 48 respectively. Sphere 47 is normally held in blocking position by spring 49, the tension of which can be overcome when the air pressure from cylinder 35 provides a force greater than that of spring 49. Under these circumstances, with outlet 46 being blocked, the input air passes through port 45 and into the pipe or channel 50 which couples the valve to the powder box. Upon release of the air pressure from amplifier 30 into the cylinder, and return of piston 36, the air pressure from cylinder 35 decreases, permitting spring 49 to expand and push sphere 47 into its normally closed position. When piston 36 has retracted sufficiently to generate a relative suction in the cylinder, sphere 48, which is normally maintained in blocking position by gravity, is drawn upward, thus opening port 46 and permitting air flow in the reverse direction through valve 40 and out of coupling 41 back to cylinder space 37. Thus, when the piston returns to its normal position, there is no opening communicating between the cylinder and the powder box, so that no powder is able to penetrate the cylinder where, of course, it would have a detrimental effect.

The powder box, as viewed from the rear in FIG. 5, has a right wall 61, a left wall 62, and a rear wall 63, each of a sufficient thickness to house channels for passage of air. The tee 26 may conveniently be housed within right wall 61, as illustrated, communicating with sensing orifice 13 located in the front wall of the box. The output from check valve 40 is coupled into channel 55 which is contained within right side wall 61 and back wall 63 of powder box 11. Channel 55 terminates at roughly the midsection of back wall 63 at point 56, where it feeds oppositely directed channels 57 and 58 respectively. Channel 57 leads to the right through the back wall, forward through the right wall 61 to substantially the midsection of such wall, and then downwardly and toward the center of the box, terminating at opening 60. Channel 58 follows a complementary path of equal length, leading to the left along the back wall, forward to substantially the midsection of the left wall 62, and then downwardly and toward the center of the box 11, terminating at opening 59. Channels 57 and 58, being of equal length, provide substantially equal resistance to air flow, such that the air pressures at openings 59 and 60 are substantially equal. Box 11 is preferably constructed of metal, having walls of a sufficient thickness to contain the illustrated channels, which may be formed by drilling or any suitable technique.

The air flow emanating from openings 59 and 60, as indicated generally by the arrows, acts to produce a generally bilateral mound of powder within box 11, as indicated by dashed lines. This distribution creates an environment within the box wherein the interior is effectively saturated with powder, such that when a burst of air is delivered to the box, the increased air pressure immediately forces a limited amount of powder out of marker port 14. The equal channel box arrangement illustrated permits extremely efficient use of the powder.

The intensity of the mark may be adjusted by controlling the length of stroke of piston 36, through the mechanism illustrated schematically in FIG. 1. An adjustment knob 70, positioned at the extreme right end of the housing (FIG. 2), is integrally connected to a threaded bolt 71, which bolt is moved horizontally through end plate 72 of the housing as the knob is rotated. A piston rod stop is connected to bolt 71, and positioned to block the return movement of piston rod 74, thereby fixing the return of piston 36. By adjustment of knob 70, the operator can move the rod stop to the left or right, thereby adjusting the stroke of the piston. In this manner, the intensity of the pressure pulse communicated to the powder box, and the resulting output of powder, may be regulated very exactly. The pointer of indicator 19 may be driven by bolt 71 through suitable linkage not shown.

It is appreciated that refinements may be made to the invention as disclosed, without altering the nature of the invention. Thus, the exact configuration of channels 55, 57 and 58 within powder box 11 may be varied, so long as channels 57 and 58 are maintained substantially equal in length. It is appreciated that if these two channels are not substantially equal in length, the distribution of powder within the box would be different, in which event the interior environment of the box would not be as satisfactory for efficient marking and maximum powder utilization. A similar result would be produced if there were just one air pressure opening into the interior of the box.

While the invention has been described as primarily applicable in powder marking of fabric elements and/or other textiles, it is appreciated that the application of the invention may be extended to many other fields. For example, powder box 11 may be replaced with a fluid container, for holding ink or dye, and cylinder 35 may be replaced with a fluid pulse generator, generating a pulse of fluid pressure in response to an output from amplifier 30. With this arrangement, a suitable liquid marking may be applied to any desired object. Similarly, a transducer which converts air pressure into an electrical signal may be utilized in place of the fluid amplifier-cylinder arrangement, so as to provide the capability of electrically activating a marker device, e.g., a solenoid-actuated pen or dye marker.

As noted hereinabove, the marker of this invention may be designed to be a portable unit, suitably connected to an air supply through flexible hoses. In this embodiment, an operator may, for example, position a work piece on a bench or table, and place the marker port at exactly the desired point of marking.

We claim:

1. Apparatus for automatically marking an object at a desired point when the object is positioned in specific registry with the apparatus, comprising:

- a. marking means for expelling marking substance onto said object;
- b. sensing means, for sensing when an object is in position to be marked, and normally emitting a sensing signal;
- c. fluid supply means for providing a fluid under pressure;
- d. energizing means, connected to said sensing means and said fluid supply means, and having a fluid output connected to said marking means; and,
- e. said sensing means adapted to activate said energizing means when said object is positioned in reg-

istry therewith such as to obstruct said emission, the output of said energizing means causing said marking means to expel marking substance onto said object.

2. The apparatus as described in claim 1, wherein said energizing means contains an amplifier for producing a relatively high pressure output in response to a relatively low pressure signal from said sensing means, a cylinder and piston for producing a pulse of fluid pressure in response to an output from said amplifier, adjusting means for controlling the magnitude of said pulse of fluid pressure, and a double check valve for communicating said pulse to said powder box, and for providing air intake to said cylinder after said pulse, which air intake is free of any marking substance from said marking means.

3. The apparatus as described in claim 2, wherein said fluid is air, and said marking substance is powder.

4. The apparatus as described in claim 3, wherein said marking means is a box with a hollow interior housing said powder, having a marker port from which powder is expelled, and having equal length channels communicating from the output of said double check valve to oppositely located ports at the interior of said box, whereby to supply air pressure to the interior of said box in equal amounts from substantially opposite directions.

5. The apparatus as described in claim 4, wherein said sensing means comprises a back pressure orifice mounted on the front of said box and adjacent to said marker port, said back pressure orifice communicating with a tee through which low pressure air is passed to said orifice, said tee being adapted to pass low pressure air to said amplifier when said object is positioned so as to obstruct the flow of low pressure air out of said orifice.

6. The apparatus as described in claim 5, wherein said fluid supply means comprises an air regulator for providing a controlled low pressure air supply which is communicated to the input of said tee.

7. Apparatus for powder marking a fabric element at a desired point when such element is positioned in specific registry with the apparatus, comprising:

- a. air supply means, for providing a source of relatively high pressure air and a source of regulated relatively low pressure air;
- b. back pressure sensing means, having a sensing orifice in communication with said regulated source, for providing a low pressure signal when said orifice is obstructed by the positioning of said fabric element so as to generally block the flow of air therefrom;
- c. fluid amplifier means connected to said high pressure source, adapted to provide a high pressure output of air when said low pressure signal is connected to it;
- d. air pulse means, having a cylinder with piston contained therein, for providing a pulse of air under pressure in response to said high pressure output from said fluid amplifier;
- e. powder marker means, for issuing a pulse of marking powder in response to receiving said pulse of air; and
- f. a valve, for unilaterally passing said pulse from said cylinder to said marker means.

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8. Apparatus for automatically marking an object at a desired point when the object is positioned in specific registry with the apparatus, comprising:

- a. marking means for marking said object with a marking substance, having a housing containing said substance and having a marker port therein through which the substance is expelled;
- b. sensing means, providing a flow of low pressure air through an orifice adjacent to said marker port, for sensing when an object is in position to be marked;
- c. actuating means, connected to said sensing means, and having an output connected to said marking means; and
- d. said sensing means communicating a signal to said actuating means when said object is in position such that the air flow through said orifice is sub-

stantially obstructed, the actuating means producing an output which causes said marking means to expel marking substance, producing a mark on the object at said desired point in registry with the marker port.

9. The apparatus as described in claim 8, comprising adjusting means for adjusting the output of said actuating means, to cause said marking means to expel an exact amount of marking substance.

10. The apparatus as described in claim 9, wherein said actuating means comprises an air-driven piston, and said adjusting means comprises an adjustable piston stop element, the adjustable position of which controls the stroke of said piston.

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