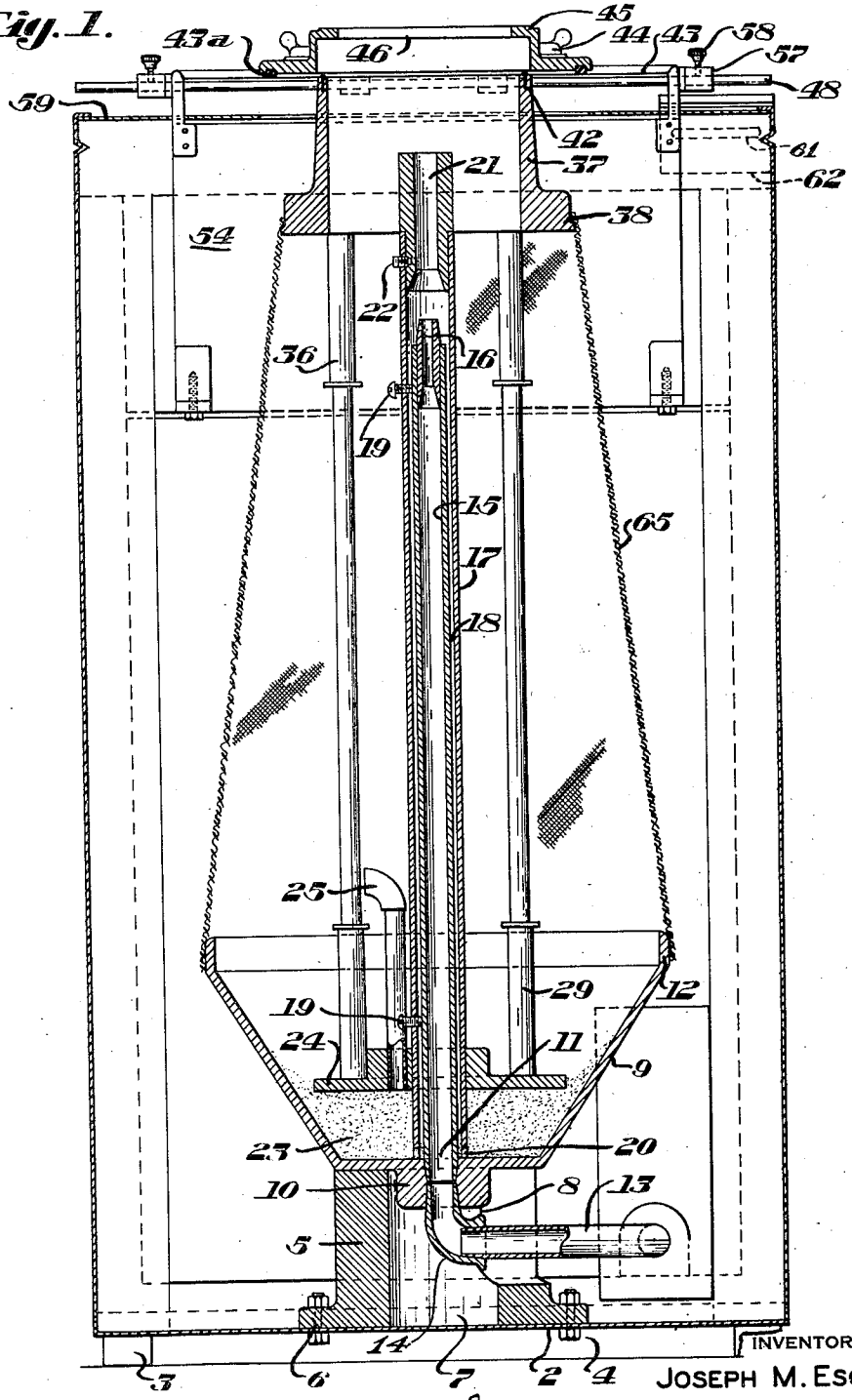
Sept. 12, 1950 J. M. ESCHER 2,521,782

ABRASIVE BLAST MARKING MACHINE

Filed May 28, 1947 2 Sheets-Sheet 1

Fig. 1.



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Fig. 3.

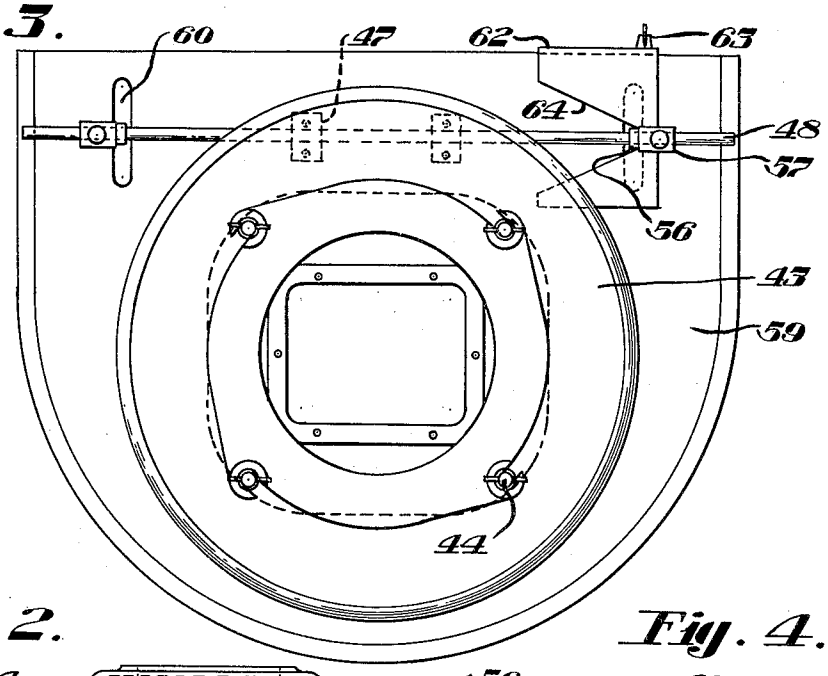


Fig. 2.

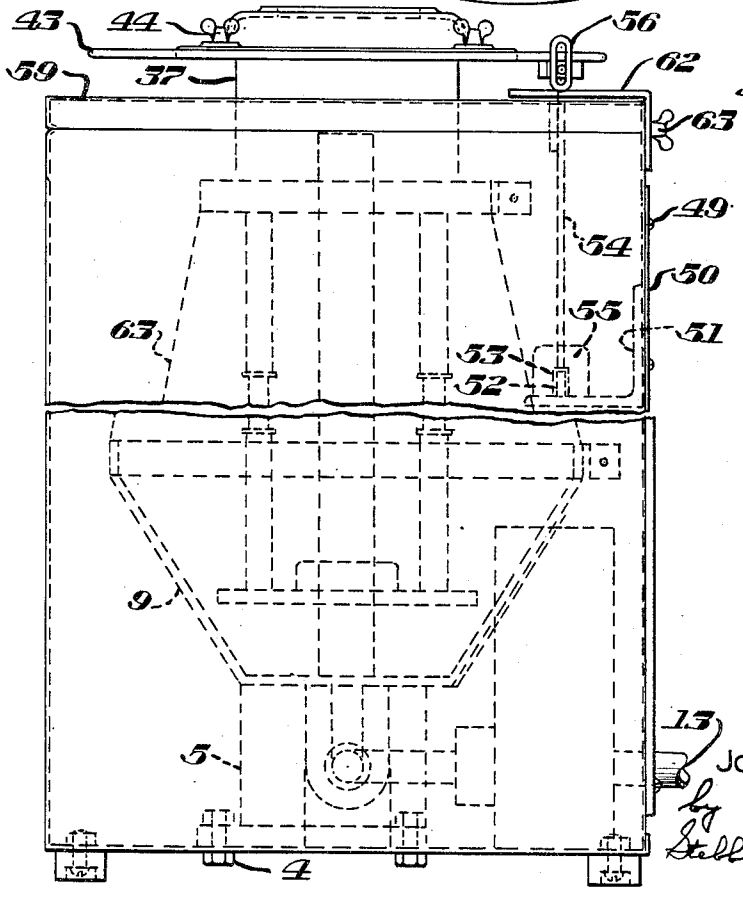
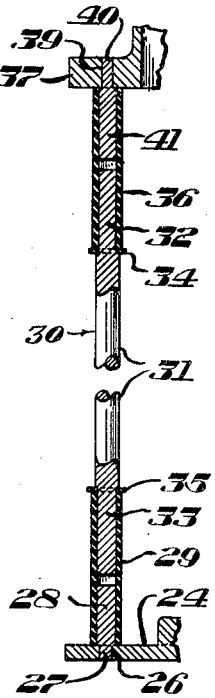


Fig. 4.



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UNITED STATES PATENT OFFICE

2,521,782

ABRASIVE BLAST MARKING MACHINE

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Application May 28, 1947, Serial No. 750,945

17 Claims. (Cl. 51—14)

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This invention relates to abrasive blast marking machines, especially such machines in which an abrasive blast is employed for marking articles, a perforated mask or stencil being disposed over the portion of the article toward which the blast is directed so that the article is predeterminedly marked by impingement of abrasive particles against the article through the perforations in the mask or stencil. Machines of the type mentioned are used widely for applying trademarks and other indicia to articles made of various materials, being primarily employed for the marking of metal articles.

Machines of the general type above referred to which have heretofore been employed have been subject to certain disadvantages. A relatively concentrated blast will treat only a small surface area at one time. Consequently it is desirable to provide for relative movement between the axis of the blast and the work being treated so that the blast will act on the area of the work which it is desired to treat. To that end it has heretofore been proposed to mount on the machine frame a slide against which work to be treated by the blast is adapted to be positioned, the slide being movable back and forth in guides. This is unsatisfactory first because the abrasive gets into the guides and interferes with free operation of the slide and second because the abrasive works its way out between the slide and the frame and contaminates the surrounding air to the detriment of the health of workmen and the cleanliness of the shop. Moreover, abrasive blast marking machines as heretofore proposed have been wasteful of abrasive, which may be quite expensive.

I have devised an abrasive blast marking machine obviating the disadvantages above pointed out which have been inherent in such machines as heretofore proposed. I provide for substantially frictionless movement of the head against which the work is positioned for treatment by the blast and I confine the abrasive within the machine so that it cannot work its way out into the surrounding atmosphere. I filter from the abrasive the air used for creating the blast and reuse the abrasive, maintaining it at all times in a chamber in the machine.

I provide, in an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including a flexible portion enabling substantially frictionless movement of the head relatively to the nozzle in a direction transverse of the direction of the blast. The supporting means for the head preferably includes an elongated supporting member at least a portion of which is flexible, said member extending generally parallel to the direction of the blast. I desirably em-

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ploy a plurality of elongated supporting members positioned generally about the nozzle and each having at least a portion which is flexible. The supporting members may take the form of posts each having at least a portion of its length consisting of a piece of flexible tubing. I may employ a plurality of posts connected with the base or frame of the machine disposed about the nozzle or blast conduit in generally parallel relationship thereto together with a plurality of posts connected with the head and a plurality of pieces of flexible tubing each embracing an end of one of the first mentioned posts and an end of one of the second mentioned posts. More specifically, each of the elongated supporting members for the head may comprise a rod at each end and a rod intermediate the first mentioned rods and two lengths of flexible tubing each embracing the opposed ends of one of the first mentioned rods and the second mentioned rod.

I further provide, in an abrasive blast marking machine having a nozzle, means for discharging through the nozzle a blast of air and abrasive and a head against which work to be treated by the blast may be positioned, an air-pervious chamber connected with the head and into which the nozzle discharges so that the air component of the blast passes out of said chamber while the abrasive component remains within said chamber. I desirably provide an abrasive receptacle, the air-pervious chamber communicating with the head and the receptacle so that the air component of the blast passes out of the chamber while the abrasive component is returned to the receptacle.

I still further provide, in an abrasive blast marking machine having an abrasive receptacle, an ejector extending upwardly through the abrasive receptacle, a source of compressed air, a connection from the source of compressed air to the ejector so that a blast of air with entrained abrasive from the receptacle is discharged upwardly through the ejector and a head against which work to be treated by the blast may be positioned, air-pervious material sealing the receptacle to the head to form an air-pervious chamber into which the ejector discharges so that the air component of the blast passes out of said chamber while the abrasive component drops back into the receptacle. The air-pervious materials is preferably flexible, the machine functioning to filter air from the entrained abrasive in the same manner as a vacuum cleaner filters air from the entrained dust and dirt which it draws in. The flexible air-pervious material is of especial advantage when sealed to the stationary abrasive receptacle at the bottom and the movable head at the top as there is thus formed a closed chamber which is maintained closed in all relative positions of the head and receptacle.

I preferably provide means for limiting move-

ment of the head transversely of the blast, such means being adjustable so that the movement of the head may at all times be confined between desired limits. I also provide for restraining the head against turning movement, allowing it freedom of movement in all directions in a plane generally perpendicular to the axis of the blast but with fixed orientation in that plane.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawings I have shown a present preferred embodiment of the invention, in which

Figure 1 is a vertical cross-sectional view through an abrasive blast marking machine;

Figure 2 is an elevational view of the marking machine as seen from the right in Figure 1;

Figure 3 is a top plan view of the marking machine; and

Figure 4 is a fragmentary vertical cross-sectional view of a portion of the machine.

Referring now more particularly to the drawings, there is provided a base 2 mounted on feet 3 and to which is bolted by bolts 4 a generally cylindrical support 5 having a flanged bottom 6 through which the bolts pass. The support 5 has a vertically arranged central bore 7 which is intersected by a lateral opening 8. Seated upon the support 5 is an abrasive receptacle 9 having at its bottom a downward projection 10 extending into the bore 7 of the support 5. Through the projection 10 is a vertical bore 11. The receptacle 9 flares from relatively small horizontal cross-section adjacent its bottom to relatively great horizontal cross-section adjacent its top and has at its top a vertical cylindrical rim 12.

There is provided a source of compressed air. The air may come from any suitable compressor and enters the marking machine through an air inlet pipe 13 which enters an elbow 14 which in turn enters the bore 11 in the downward projection 10 of the abrasive receptacle 9. An air tube 15 enters the top of the bore 11 and projects vertically, having an ejector 16 at its upper end whose function will presently be described. An abrasive tube 17 surrounds the air tube 15 and seats on the bottom of the receptacle 9. An annular passage 18 is provided between the outside of the air tube 15 and the inside of the abrasive tube 17 through which abrasive is adapted to be drawn upwardly by the ejector as will presently be described. Suitable set screws 19 are threaded into the abrasive tube and bear against the air tube to insure maintenance of the annular passage 18. At its bottom the abrasive tube 17 has a series of openings 20 through which the annular passage 18 communicates with the interior of the receptacle 9. At its upper end the abrasive tube 17 is provided with a blast nozzle 21 maintained in place by a set screw 22.

Disposed in the abrasive receptacle 9 is finely divided abrasive material 23. This may be any suitable abrasive material, as, for example, sand, metallic abrasive, etc. It lies in the receptacle 9 to a substantial depth, the abrasive adjacent the tube 17 being adapted to pass through the openings 20 to enter the annular passage 18. When compressed air passes upwardly through the tube 15 and the ejector 16 at high velocity it draws abrasive from the abrasive receptacle 9 through the openings 20 and upwardly through the passage 18 so that a blast of air and entrained abrasive issues at high velocity from the mouth of the nozzle 21. This abrasive blast is adapted to impinge on material to be marked, the impingement of the abrasive against the surface of the material marking it in characteristic manner. The abrasive produces a series of fine pits in the surface of the material giving the material an etched appearance.

Fastened to the outside of the tube 17 within the receptacle 9 is a flange 24 whose diameter is somewhat less than the diameter of the receptacle 9 in the vertical plane of the flange. A vent or breather tube 25 extends vertically through the flange 24 at a point near the tube 17 and has its upper end disposed above the top of the receptacle 9. The purpose of the tube 25 is to prevent the formation of a vacuum in the bottom of the abrasive receptacle 9 which might interfere with passage of the abrasive through the openings 20 and up through the annular passage 18.

The flange 24 is provided with a number of bores 26 spaced about the tube 17, four such bores being shown in the disclosed embodiment of my machine. Each bore 26 receives the reduced lower end 27 of a pin 28, the enlarged body portion of the pin projecting upwardly from the flange 24. A length of flexible tubing 29, as, for example, rubber tubing, is disposed about each pin 28 but projects upwardly a considerable distance above the top thereof. Four rods 30 are provided, each having an enlarged central portion 31 and reduced upper and lower extremities 32 and 33, respectively, with a flange 34 below the upper extremity 32 and a flange 35 above the lower extremity 33. The lower extremity 33 of each of the rods 30 fits into the upper end of one of the tubes 29, the flange seating on the top of the tube. A length of flexible tubing 36 fits over the upper end 32 of each of the rods 30 and seats against the flange 34.

The head of the machine comprises a generally cylindrical member 37 having at its bottom a flange 38 provided with four bores 39. The reduced upper end 40 of a pin 41 enters each of the bores 39 from the bottom and the body of each pin 41 projecting downwardly from the flange 38 fits into the upper end of one of the tubes 36. Thus the head is supported by the four elongated flexible supporting members or posts each comprising a pin 28, a tube 29, a rod 30, a tube 36 and a pin 41. The posts are made flexible by the provision of the tubes 29 and 36. The head is normally supported by the posts so as to be coaxial with the nozzle 21 but may be moved transversely with respect to the axis of the nozzle and hence transversely with respect to the direction of the blast to dispose different surface portions of the work to be marked in position to be acted on by the blast.

Screwed to the top of the member 37 by screws 42 is an annular plate 43. Screwed to the plate 43 by screws 44 is a cap member 45 having through its top a window or opening 46. A gasket 43a is disposed between the plate 43 and the cap member 45 to seal the same together. The member 45 may be replaced by similar members with different sized and shaped windows 46. The size and shape of the window 46 is determined by the size and shape of the markings to be applied by the machine. An article to be marked has a mask or stencil positioned over a surface thereof and the article and mask are laid on top of the member 45 with the mask downwardly so as to bridge across the window 46. The mask is perforated so that the blast will make the desired

marking on the article through the perforations in the mask.

Fastened to the under surface of the plate 43 by straps 47 is a rod 48. The rod lies in a horizontal plane and has both of its ends projecting from the plate 43 as shown in Figure 3. Fastened to the machine frame by screws 49 is a plate 50 to which is fastened at its inner surface an angle 51. Projecting upwardly from the angle 51 is a bar 52. Disposed about the top and side faces of the bar 52 is a U-shaped rubber strip 53. Mounted upon the rubber strip 53 is a plate 54 the bottom of which has a saddle 55 overlying and embracing the U-shaped rubber strip 53. Thus the plate 54 is in effect mounted for pivotal movement about a horizontal axis extending approximately along the top of the bar 52, the resiliency of the U-shaped rubber strip 53 enabling such movement of the plate 54.

Projecting upwardly from the plate 54 are two spaced apart vertically elongated eyelets 56 through which the rod 48 passes. A stop member 57 in the form of a sleeve is slipped over each end of the rod 48 and maintained in adjusted position by a set screw 58. The machine frame has a top 59 in which are formed two parallel elongated openings 60 through which the eyelets 56 pass. Pivotal movement of the plate 54 is accompanied by movement of the rod 48 generally in a horizontal direction perpendicular to the axis of the rod, such movement of the rod being accompanied by consonant movement of the head of the machine. The head may also be moved back and forth in the direction of the length of the rod 48, the rod sliding within the eyelets 56. The eyelets 56 are vertically elongated to provide for angular movement of the plate 54 while the head moves in a generally horizontal direction perpendicular to the bar 52. Movement of the head in the direction of the length of the rod 48 is limited by the stop members 57 one of which at each limit of such movement strikes one of the eyelets 56.

The frame has a horizontal slot 61 in its rear face near its top. An L-shaped member 62 has one leg extending downwardly from the top of the machine overlapping the slot 61 and another leg overlying the top 59 of the frame. A set screw 63 passes through the downwardly extending leg of the member 62 and enters the slot 61 and is adapted to maintain the member 62 in desired adjusted position longitudinally of the slot 61. The horizontal flange of the member 62 has a V-shaped notch 64 therein, one of the eyelets 56 lying within that notch. The member 62 limits movement of the head generally horizontally at right angles to the length of the rod 48. With respect to Figure 3, the farther to the right the member 62 is positioned the greater will be the amplitude of movement allowed the head in the horizontal direction perpendicular to the length of the rod 48.

The stop members 57 and 62 as shown in the drawings are positioned to hold the head stationary so that it cannot partake of any horizontal movement. Each of the stops 57 is touching the outer surface of one of the eyelets 56, this preventing movement of the rod 48 longitudinally, and the member 62 is disposed as far as it will go toward the left, viewing Figure 3, so that the eyelet 56 is disposed at the bottom of the crotch of the V, thus holding the head against movement in a horizontal plane at right angles to the length of the rod 48. Any desired amplitude of movement of the head longitudinally of the rod 48 may be provided for by moving the stop members 57 outwardly on the rod. Any desired movement of the head horizontally at right angles to the rod 48 may be provided for by moving the member 62 toward the right, viewing Figure 3, thus positioning a wider part of the V-shaped notch 64 opposite the eyelet 56 and allowing greater amplitude of generally pivotal movement of the plate 54.

There is formed between the flange 38 of the head and the rim 12 of the receptacle 9 an abrasive confining chamber by disposing a bag of flexible air-pervious material therebetween. The structure of the bag does not constitute the present invention so it is not shown or described in detail. The bag is shown more or less diagrammatically in Figure 1 as a tapered sleeve open at both ends. The air-pervious bag or sleeve is designated by reference numeral 65 and may, for example, be of fabric such as the material commonly used for making vacuum cleaner bags. The sleeve 65 is applied with sufficient fullness that movement of the head as far as the mechanism will permit does not stretch the sleeve. The air from the blast is filtered through the sleeve 65, the abrasive at all times remaining in the chamber formed thereby. The top and bottom of the sleeve may be clamped respectively to the flange 38 and the rim 12 by any suitable clamping means, not shown.

There is provided a valve for opening and closing the air inlet 13, that valve conveniently being controlled, electrically or otherwise, by a treadle adapted to be depressed by the operator's foot and operative when depressed to open the valve. The operator positions atop the head and so as to bridge the window 46 an article to be marked with a mask over its bottom surface and then opens the air valve. The air moves upwardly through the air tube 15 at high velocity and passes through the ejector 16 and the nozzle 21. The ejector creates a vacuum in the annular passage 18 between the air tube 15 and the abrasive tube 17 and abrasive is drawn up through that annular passage and is entrained with the air at the upper extremity of the ejector 16 so that a blast of air with entrained abrasive is discharged upwardly through the nozzle 21. If it is desired to mark a wider area of the work than can be marked when the head is stationary with respect to the nozzle the head is moved relatively to the nozzle in a generally horizontal plane far enough to allow the blast to impinge on all of the surface of the work which is to be marked. To prevent greater movement of the head than is necessary for complete marking of the article the stops 57 and 62 are appropriately set. The abrasive after impinging on the work drops back down within the chamber to the receptacle 9, the air being filtered out through the sleeve 65. Thus the abrasive is at all times confined within the chamber and is continually reused. The air is filtered out and there is no contamination by abrasive of the atmosphere of the shop. As long as the work is held tightly over the window 46 there is no way for abrasive to escape into the atmosphere. The head may be very easily moved by slight pressure of the operator's hands, its movement being substantially frictionless by reason of the provision of the flexible tubes 29 and 36.

Although the movement of the head has been referred to as substantially horizontal, the head may tilt somewhat during its generally horizontal movement. The movement is relatively limited

and although not exactly horizontal is substantially so and for practical purposes may be regarded as horizontal. The plate **54** with the eyelets **56** and the rod **48** restrain the head from twisting or turning movement so that the head is movable generally horizontally but with fixed orientation in the horizontal plane.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including a flexible supporting portion enabling substantially frictionless movement of the head relatively to the nozzle in a direction transverse of the direction of the blast.

2. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including an elongated supporting member at least a portion of which is flexible, said member extending generally parallel to the direction of the blast, whereby the head may be substantially frictionlessly moved relatively to the nozzle in a direction transverse of the direction of the blast.

3. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including a plurality of elongated supporting members positioned generally about the nozzle and each having at least a portion which is flexible, whereby the head may be substantially frictionlessly moved relatively to the nozzle in a direction transverse of the direction of the blast.

4. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including a plurality of posts positioned generally about the nozzle, at least a portion of the length of each of the posts consisting of a piece of flexible tubing, whereby the head may be substantially frictionlessly moved relatively to the nozzle in a direction transverse of the direction of the blast.

5. In an abrasive blast marking machine having a base, a blast conduit projecting from the base, means for discharging an abrasive blast through the conduit and a head against which work to be treated by the blast may be positioned, supporting means for the head including a plurality of posts connected with the base disposed about the conduit in generally parallel relationship thereto, a plurality of posts connected with the head and a plurality of pieces of flexible tubing each embracing an end of one of the first mentioned posts and an end of one of the second mentioned posts, whereby the head may be substantially frictionlessly moved relatively to the nozzle in a direction transverse of the direction of the blast.

6. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head including a plurality of elongated supporting members positioned generally about the nozzle in generally parallel relationship thereto, each of the elongated supporting members comprising a rod at each end and a rod intermediate the first mentioned rods and two lengths of flexible tubing each embracing the opposed ends of one of the first mentioned rods and the second mentioned rod, whereby the head may be substantially frictionlessly moved relatively to the nozzle in a direction transverse of the direction of the blast.

7. In an abrasive blast marking machine having a nozzle, means for discharging through the nozzle a blast of air and abrasive and a head against which work to be treated by the blast may be positioned, means mounting the head for movement transversely of the nozzle and an air-pervious flexible sleeve forming a flexible air-pervious chamber connected with the head and which flexes upon movement of the head and into which the nozzle discharges so that the air component of the blast passes out of said chamber while the abrasive component remains within said chamber.

8. In an abrasive blast marking machine having an abrasive receptacle, an ejector extending upwardly through the abrasive receptacle, a connection from a source of compressed air to the ejector so that a blast of air with entrained abrasive from the receptacle is discharged upwardly through the ejector and a head against which work to be treated by the blast may be positioned, a plurality of flexible elongated supporting members for the head, said members being positioned generally about the ejector in generally parallel relation thereto so that the head may be substantially frictionlessly moved relatively to the ejector in a direction transverse of the direction of the blast and air-pervious flexible material sealing the receptacle to the head to form an air-pervious chamber into which the ejector discharges so that the air component of the blast passes out of the chamber while the abrasive component drops back into the receptacle.

9. In an abrasive blast marking machine, an upwardly open abrasive receptacle, an air tube extending upwardly through the receptacle with its interior out of communication with abrasive in the receptacle, an abrasive tube surrounding the air tube, the interior of the abrasive tube communicating with abrasive in the receptacle, means whereby a blast of air through the air tube causes abrasive to be drawn from the receptacle through the annular space between the abrasive tube and the air tube to be entrained with the air to form a blast of air and abrasive which is discharged upwardly, a head against which work to be treated by the blast may be positioned, a plurality of flexible elongated supporting members for the head, said members extending upwardly from within the receptacle and being positioned generally about the abrasive tube in generally parallel relation thereto so that the head may be substantially frictionlessly moved relatively thereto in a direction transverse of the direction of the blast, and air-pervious flexible material sealing the receptacle to the head to form an air-pervious chamber into which the blast is discharged so that the air component of the blast passes out of the chamber

while the abrasive component drops back into the receptacle.

10. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, supporting means for the head carrying the head for movement relatively to the nozzle generally in a plane transverse of the direction of the blast and means connected with the head permitting movement of the head in any direction generally in said plane but maintaining the head against substantial turning movement in said plane.

11. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast and guide means for the head maintaining it against substantial turning movement in said plane.

12. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast and means for limiting movement of the head generally in said plane in each of two directions generally at right angles to each other, said means being adjustable so that the limits of movement of the head in each of said directions may be changed as desired.

13. In an abrasive blast marking machine having a frame, a nozzle mounted in the frame, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast and guide means for the head including an elongated guide member connected with one of the frame and the head, a guide device connected with the other thereof cooperating with the elongated guide member for guiding the head for movement generally in the direction of the length of the elongated guide member and stop means on the elongated guide member adapted to engage the guide device to limit movement of the head in said direction, the stop means being adjustable along the elongated guide member so that the limits of movement of the head in said direction may be changed as desired.

14. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast, a member mounted for substantially pivotal movement about an axis substantially parallel to but offset from said plane, said member intersecting said plane, and connections between said member and the head permitting movement of the head in said plane but maintaining the head against substantial turning movement in said plane.

15. In an abrasive blast marking machine having a frame, a nozzle mounted in the frame, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast, a member mounted in the frame for substantially pivotal movement about an axis substantially parallel to but offset from said plane, said member intersecting said plane, an elongated guide member connected with one of said first mentioned member and the head and extending generally parallel to said axis, a guide device connected with the outer of said first mentioned member and the head cooperating with the elongated guide member for guiding the head for movement generally in the direction of the length of the elongated guide member, movement of the head at right angles to the length of the elongated guide member being accompanied by pivotal movement of said first mentioned member, said first mentioned member, the elongated guide member and the guide device cooperatively maintaining the head against substantial turning movement in said plane.

16. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle generally in a plane transverse of the direction of the blast, a member set in a flexible mounting and movable therein generally pivotally about an axis substantially parallel to but offset from said plane, said member intersecting said plane, and connections between said member and the head permitting movement of the head in said plane but maintaining the head against substantial turning movement in said plane.

17. In an abrasive blast marking machine having a nozzle, means for discharging an abrasive blast through the nozzle and a head against which work to be treated by the blast may be positioned, flexible supporting means for the head carrying the head for substantially frictionless movement relatively to the nozzle transverse of the direction of the blast, a generally V-shaped stop member for limiting movement of the head in one direction, said member being adjustably positionable generally along the bisector of the V whereby to change the limits of movement of the head in said direction.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
955,468	Motz	Apr. 19, 1910
1,819,331	Lytle	Aug. 18, 1931
2,009,589	Pedersen	July 30, 1935
2,328,350	Lindenmeyer	Aug. 31, 1943

FOREIGN PATENTS

Number	Country	Date
399,932	Great Britain	Oct. 14, 1933