Sept. 13, 1949. J. STEVENS 2,482,034

MARKING DEVICE

Filed Dec. 31, 1947 9 Sheets-Sheet 1

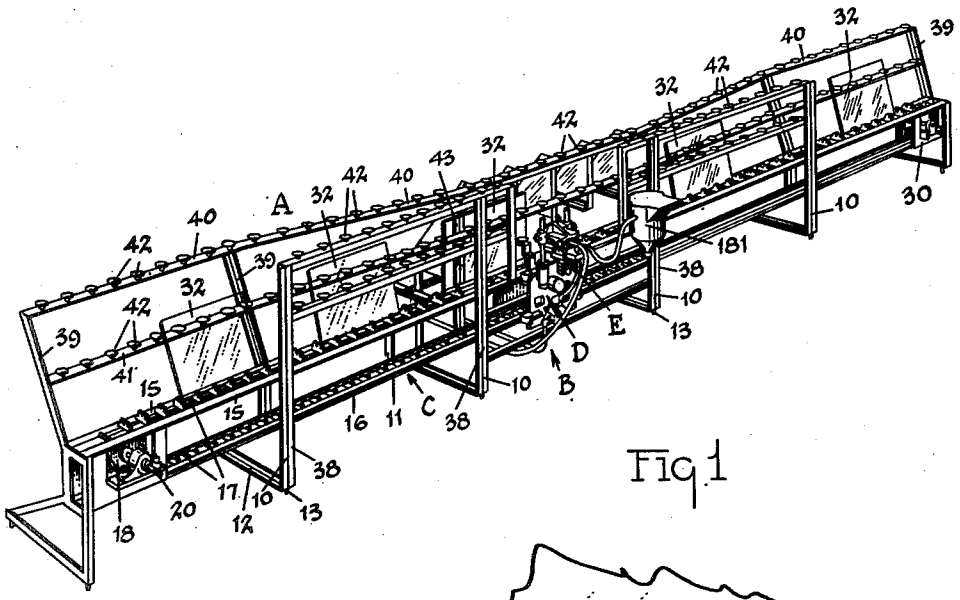

Fig 1

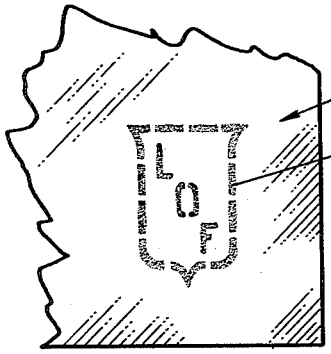

Fig 2

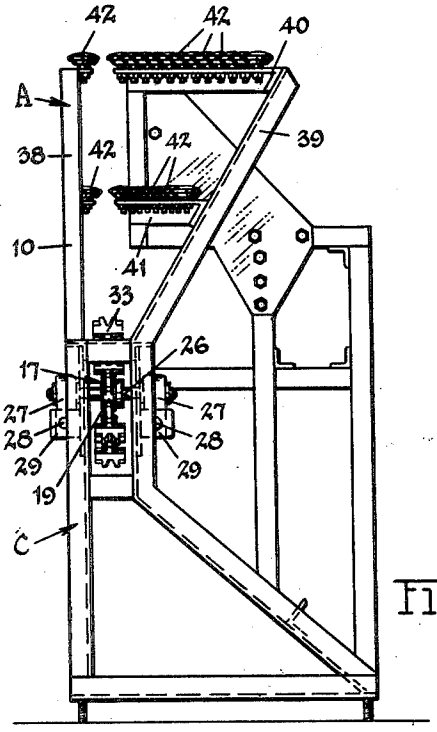

Fig 3

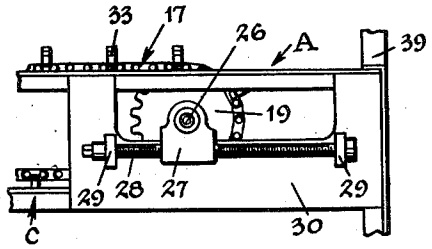

Fig 4

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MARKING DEVICE

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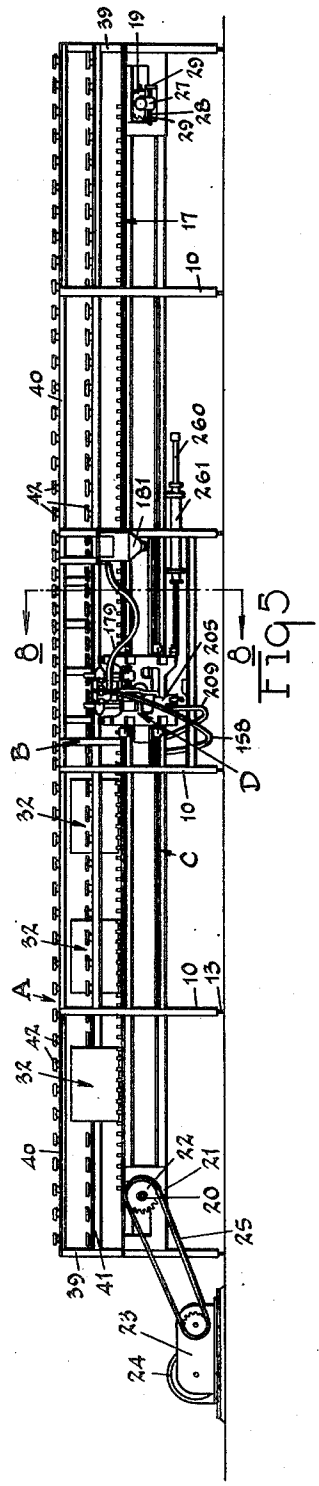

Fig 5

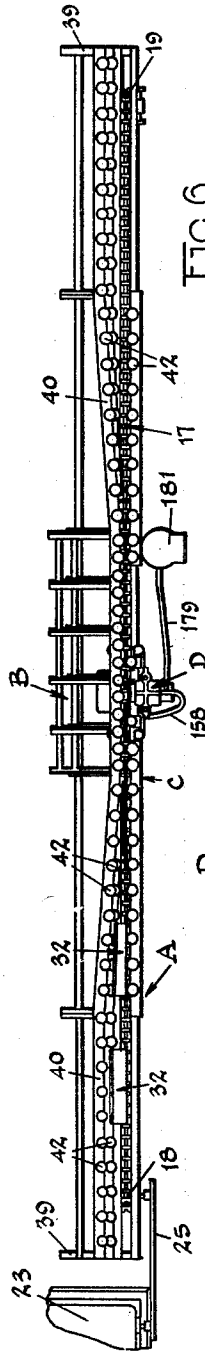

Fig 6

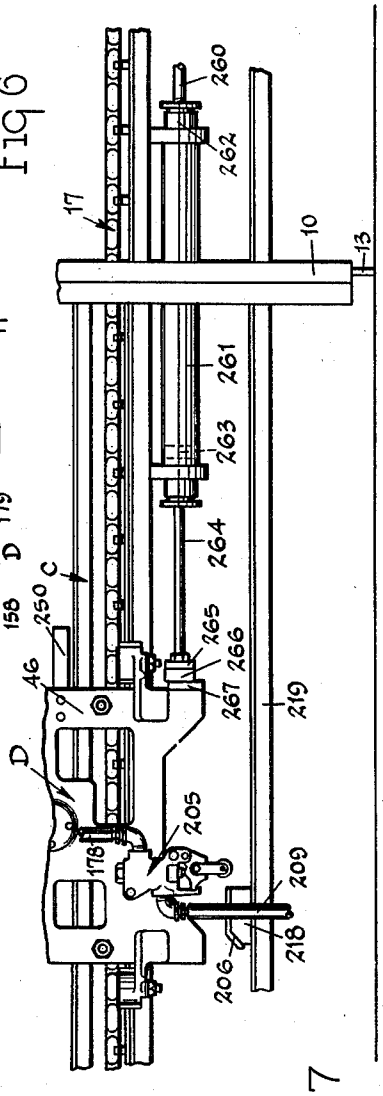

Fig 7

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MARKING DEVICE

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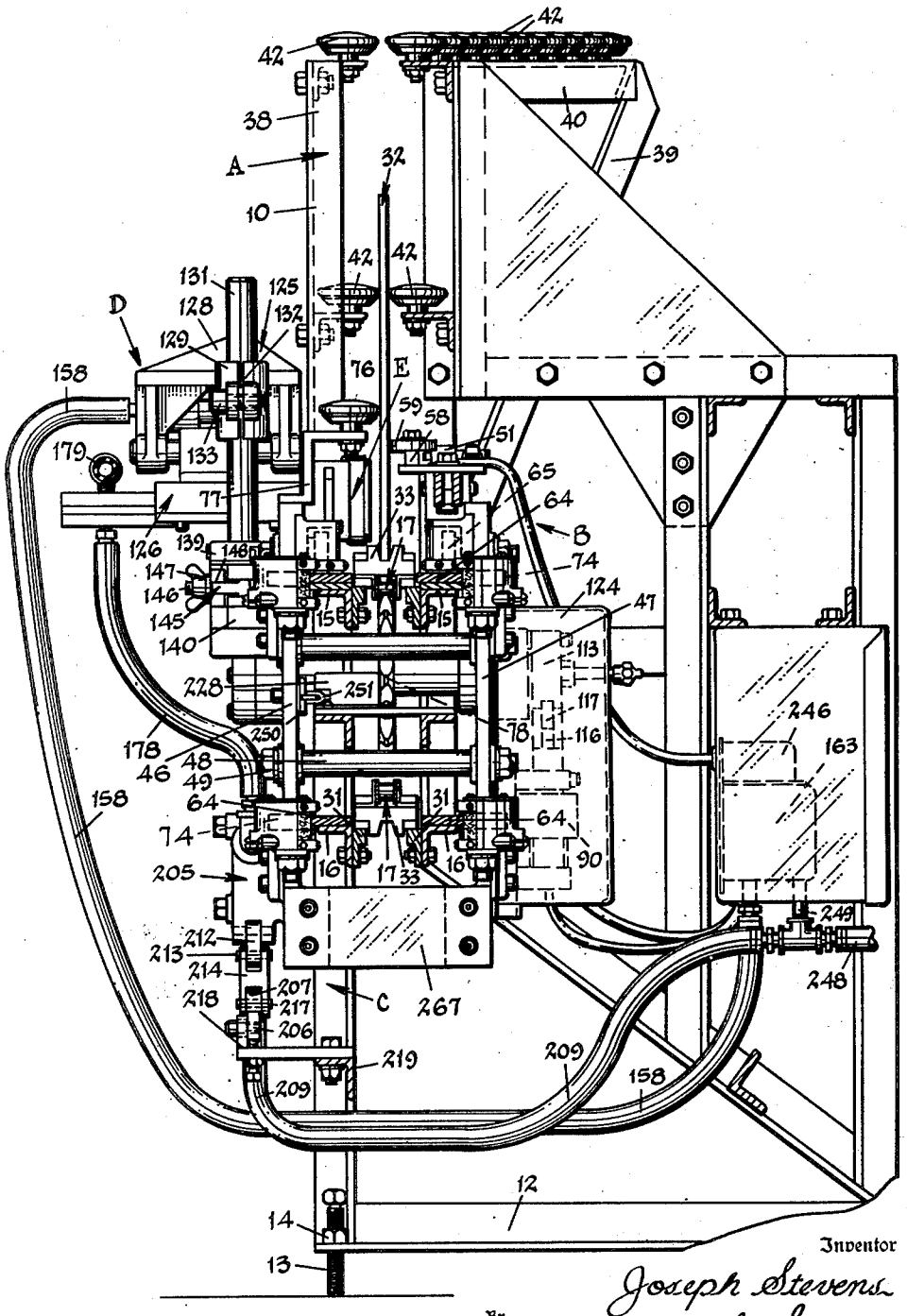

Fig 8

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MARKING DEVICE

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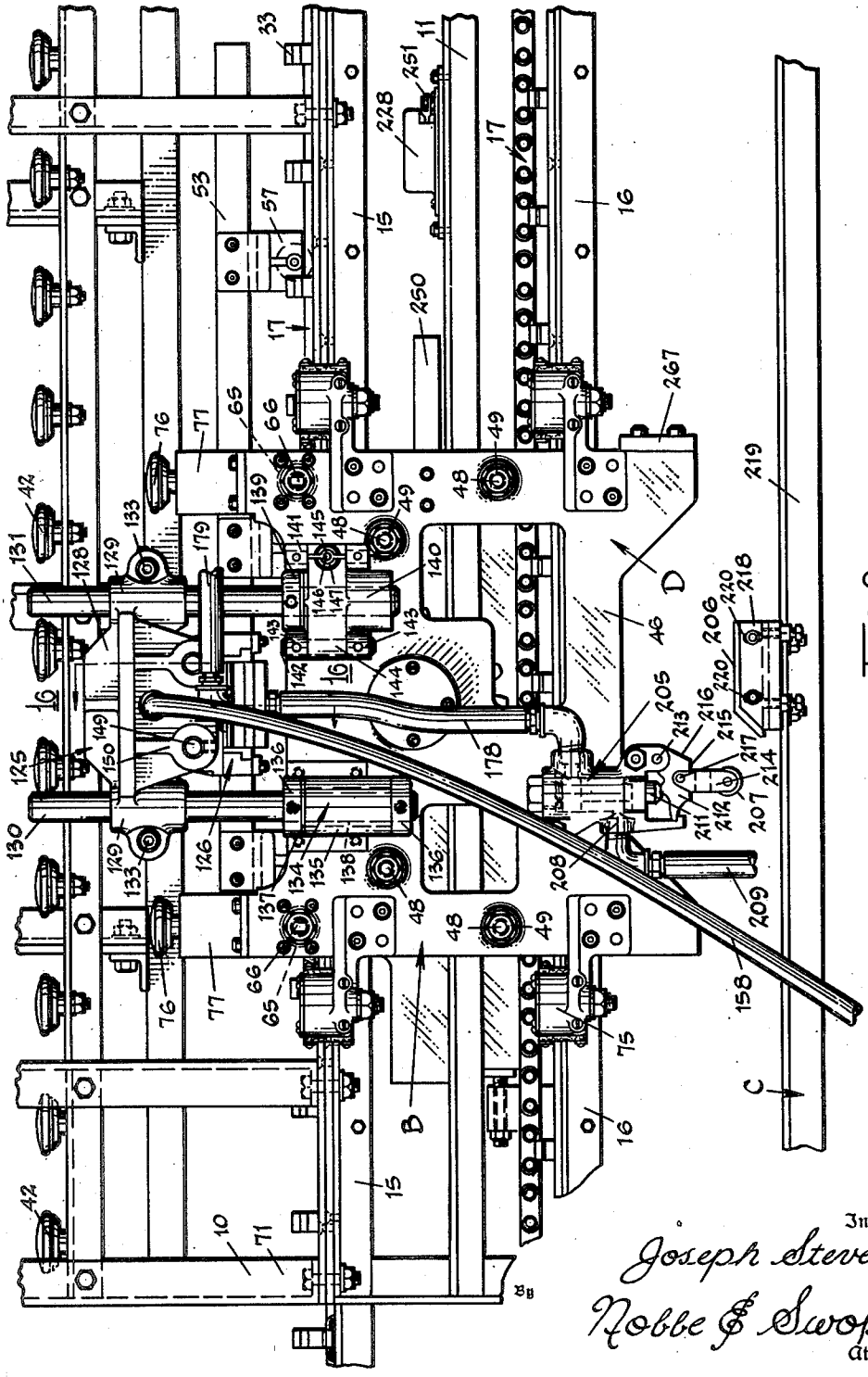

Fig 9

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MARKING DEVICE

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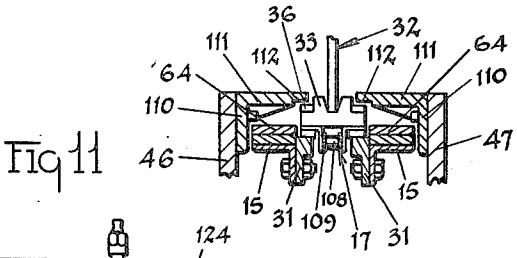

Fig 11

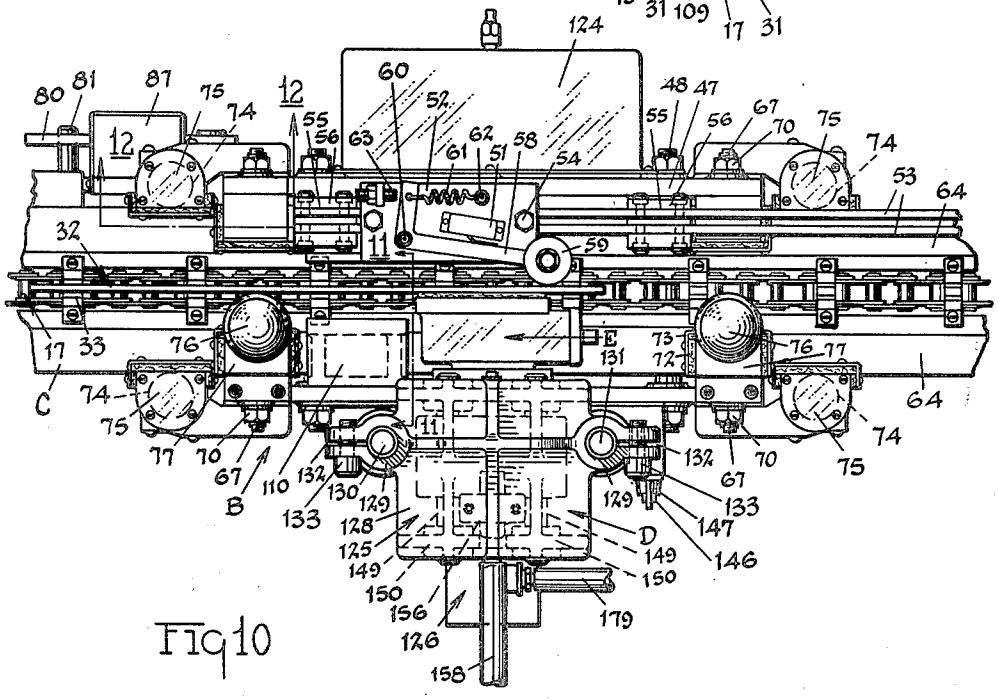

Fig 10

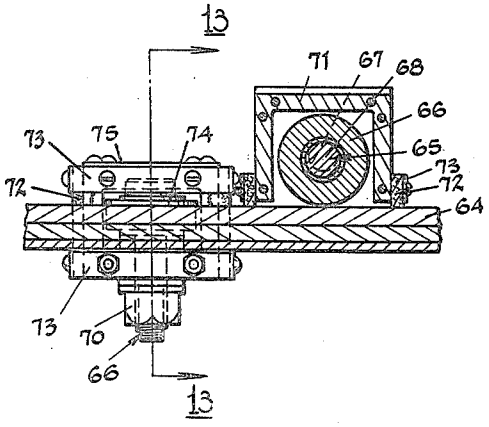

Fig 12

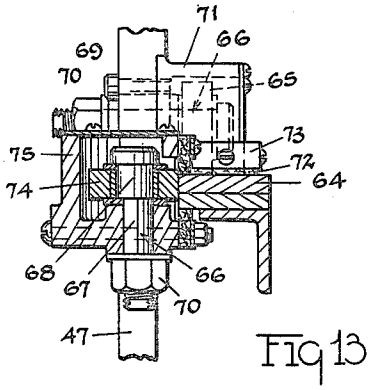

Fig 13

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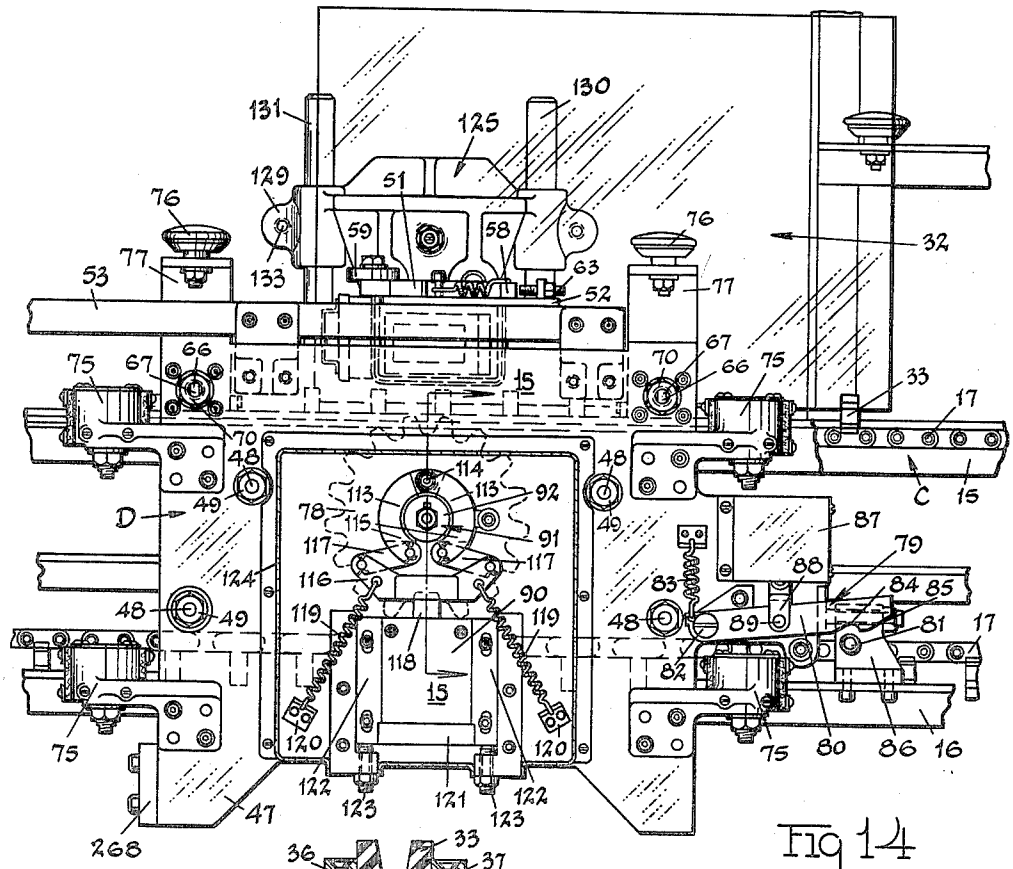

Fig 14

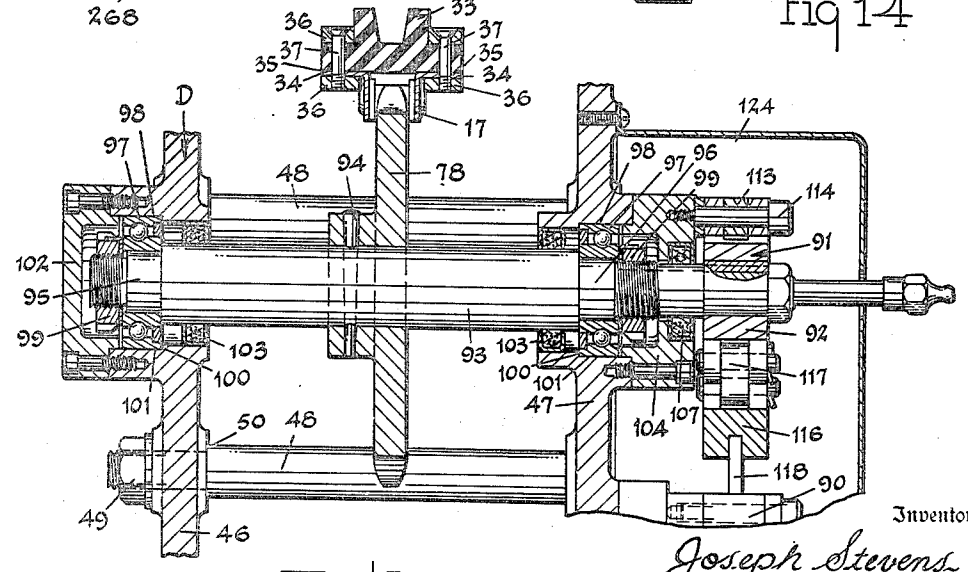

Fig 15

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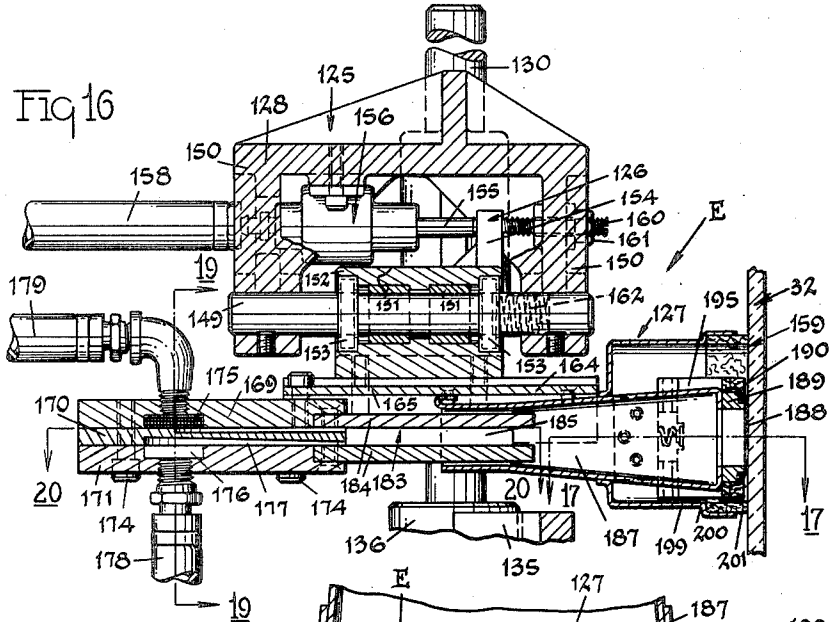
Fig 16



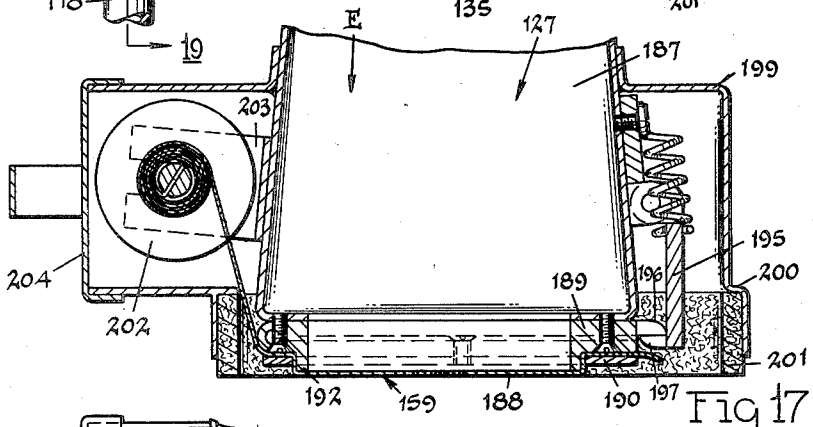


Fig 17

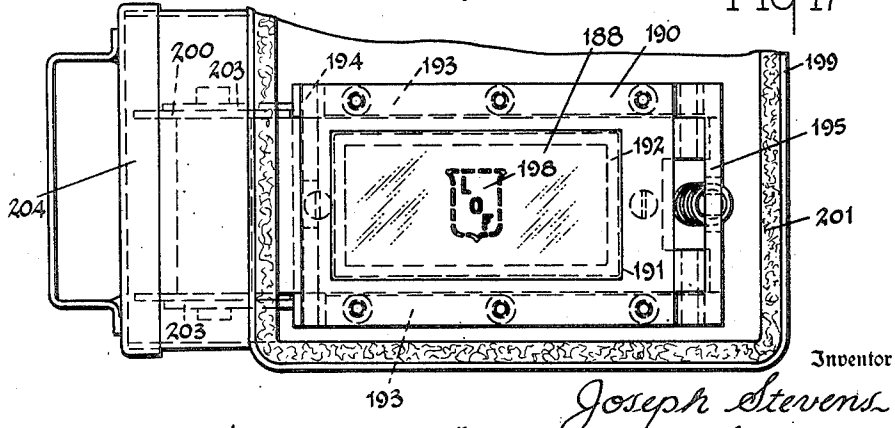


Fig 18

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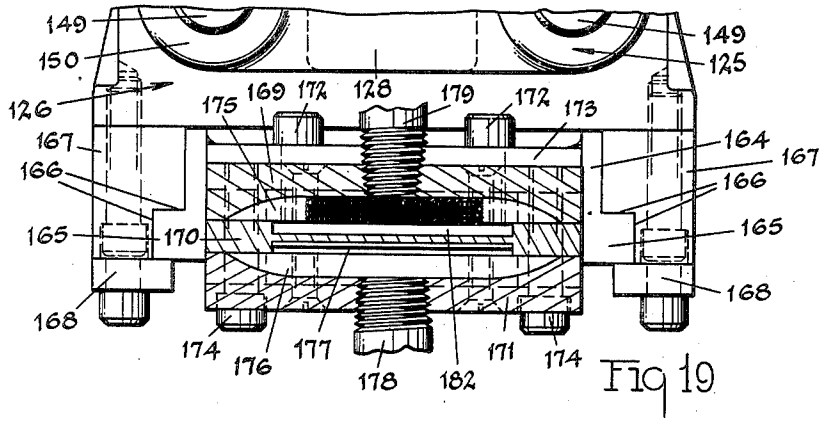

Fig 19

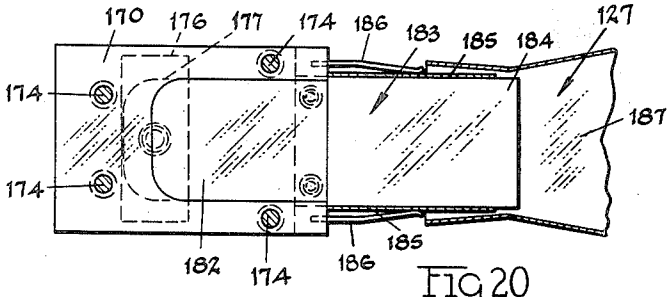

Fig 20

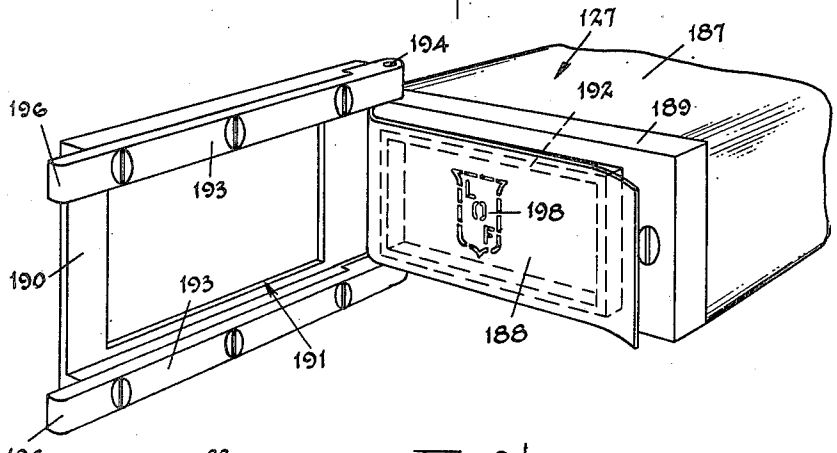

Fig 21

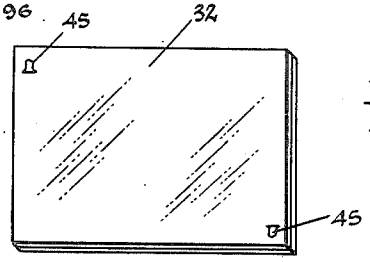

Fig 22

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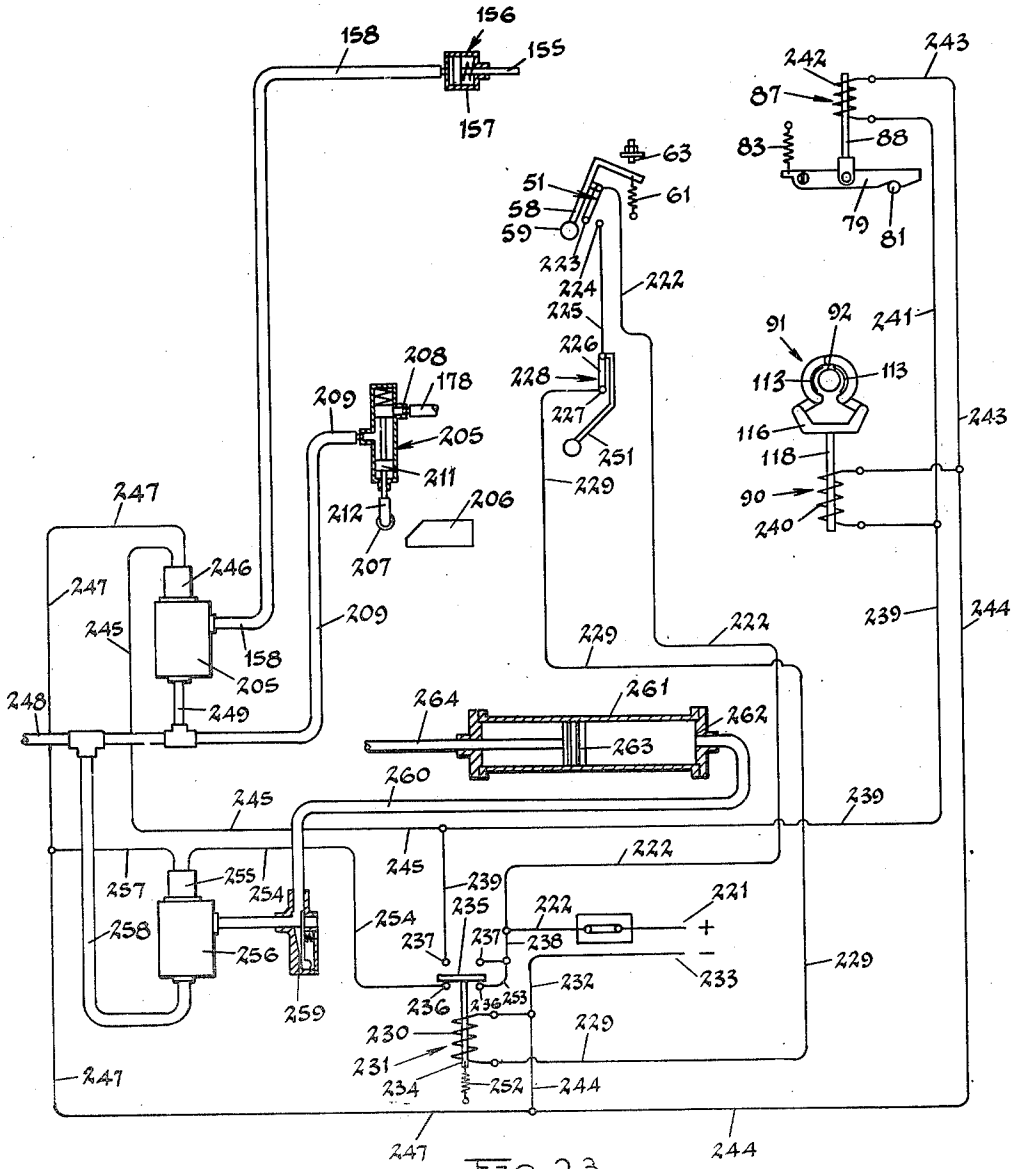

Fig 23

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Patented Sept. 13, 1949

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UNITED STATES PATENT OFFICE

2,482,034

MARKING DEVICE

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Application December 31, 1947, Serial No. 795,041

15 Claims. (Cl. 51—14)

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The present invention relates to the marking or decorating of surfaces, and more particularly to an improved apparatus for applying markings to a surface while the surface is continuously traveling along a definite predetermined path.

Although not restricted to any particular use, the invention has proved particularly valuable for use in sandblasting trade-marks onto sheets of laminated safety glass, and it will be described in that connection here.

Briefly stated, the apparatus as used for this purpose includes a special type of conveyor for the glass sheets to be sandblasted, and a novel sandblasting device cooperating therewith to produce a stenciled trade-mark on the glass sheets as they are moved along by the conveyor.

An important object of the invention is the provision of a conveyor for the glass sheets, and a sandblasting device movable with the glass sheets for cutting or etching a design on the moving glass.

Another object is to provide, in an apparatus of the above character, means for conveying a glass sheet to and from the effective area of the sandblasting device, with means associated with the conveyor for supporting the glass at an angle to the horizontal as it approaches the sandblasting area, for raising the sheet to a vertical position and for maintaining it there within the sandblasting area, and for again tilting it to an angle from the horizontal as it leaves the sandblasting area.

Another object of the invention is to provide means whereby the stencil, bearing the trade-mark or other insignia, will be firmly positioned with respect to the glass to assure complete reproduction. Obviously where the stenciled area is small and the characters are relatively minute, the stencil must be held in absolute aligning contact with the glass surface to prevent the blurring of any portion thereof. Irregularity, or blurring is, of course, highly objectionable since it would be an impossibility to again sandblast the identical area to correct any imperfection.

A further object is to provide a control system for automatically producing, in sequential order, the functions of the apparatus to the end that there will be no temporary halting of the equipment during the sandblasting operation. As herein provided, the functioning parts of the apparatus are supported by a carriage which is caused to travel, for a short period with the glass sheet and then return to a starting position for subsequent travel with glass sheets following in regular order. The object also encompasses means for producing the sandblasting cycle within the travel cycle of the carriage so that one operation will be initiated and terminated between the start and completion of the other. Due to the automatic functioning of the various parts of

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the apparatus, upon each completion of operation, the various parts will be reestablished in condition for a subsequent operation.

Still another object is to provide a sandblast apparatus wherein the functioning parts are immediately accessible for adjustment and repair or replacement. This is of particular importance with reference to stencil bearing film which in time becomes worn due to the abrasive effects of the sandblasting medium.

Other objects and advantages of the invention will become more apparent during the course of the following description, when taken in connection with the accompanying drawings.

In the drawings, wherein like numerals are employed to designate like parts throughout the same:

Fig. 1 is a perspective view of a conveyor line in which the machine of the invention is incorporated;

Fig. 2 is a fragmentary view of a corner of a glass sheet upon which an emblem or trade-mark has been produced by the device of this invention;

Fig. 3 is an end view of the sandblast machine;

Fig. 4 is a fragmentary detail view of the glass conveyor support;

Fig. 5 is a front elevational view of the sandblast machine and associated conveyor line;

Fig. 6 is a top, or plan, view of the machine shown in Fig. 5;

Fig. 7 is an enlarged side view of a central portion of the machine, showing in detail the sandblast carriage returning means;

Fig. 8 is a view of a section taken on the plane of the line 8—8 as indicated in Fig. 5;

Fig. 9 is a fragmentary front elevation of a part of the machine, and particularly the sandblast carriage shown in Fig. 8;

Fig. 10 is a top view of the sandblast carriage;

Fig. 11 is a section taken on the plane of the line 11—11 as indicated in Fig. 10 and illustrates the registration plates which prevent rising of the conveyor belt;

Fig. 12 is a section taken on the plane of the line 12—12 as indicated in Fig. 10 and illustrates the carriage supporting casters;

Fig. 13 is a section taken on the plane of the line 13—13 as indicated in Fig. 12 and illustrates, in detail, one of the carriage aligning casters;

Fig. 14 is a side view of the carriage, the view being taken on the opposite side from that shown in Fig. 9;

Fig. 15 is a view of a section taken on the plane of the line 15—15; as indicated in Fig. 14, and shows the interlocking mechanism for causing movement of the blast carriage with the glass conveyor;

Fig. 16 is a view of a section taken on the plane of the line 16—16 as indicated in Fig. 9. The sandblast head is herein shown in detail and the

automatically controlled carriage for presentation of the head to the glass;

Fig. 17 is a view of a section taken on the plane of the line 17—17 as indicated in Fig. 16 and illustrates in enlarged detail the film magazine for substitution of the stencil film when worn;

Fig. 18 is a face view of the sandblast head as shown in Fig. 17;

Fig. 19 is a view of a section taken on the plane of the line 19—19 as indicated in Fig. 16, and illustrates the delivery orifices for the air and sand connections into the sandblast head;

Fig. 20 is a view of a section showing further details of the sandblast head. The view is taken on the plane of the line 20—20 as indicated in Fig. 16;

Fig. 21 is a perspective view wherein the film frame is open and a new stencil is positioned across the mouth of the head;

Fig. 22 is a perspective view of a glass sheet upon which the sandblasted mark has been reproduced in two areas; and

Fig. 23 is a diagrammatic view illustrating the electric circuit required for sequential performance of the carriage and sandblast head.

Heretofore it has been found necessary to provide manual labor for handling glass sheets, to subject certain areas thereof for sandblasting and for subsequent disposition onto a further conveying means. The sheets are stenciled for commercial identification with a suitable image, or trade-mark, to inform purchasers, and/or users, of the glass as to the manufacturer. However, it will become obvious that the spirit of the invention can be embodied in similar types of machines for reproducing stenciled images of varied nature. In one form of processing in which the sandblast operation may be advantageously utilized, glass sheets are desposited on a conveyor belt which originates in a cutting room, or an area in which, in the case of laminated safety glass, the glass sheets are removed from the processing elements, and terminates in a pack ing, washing or the inspection end of the production line.

Due to the necessity of impressing such an image in the form of a firm trade-mark, or other required data, upon the glass, it has heretofore been impossible to make the conveying element a continuous one. Instead, a series of conveyors were used, between which stationary sandblasting units were located. This has produced a time lag in the glass travel to its ultimate completion and it is, consequently, a prime endeavor of my invention to provide an apparatus wherein the glass is acted upon in an automatic manner so that there will be no impedance to the efficiency of its production.

As illustrated in Figs. 1 and 5 of the drawings, in the operation of the embodiment of the invention here illustrated, sheets of glass, traveling on a conveyor A, are carried through the sandblasting machine B. To protect the sheets from falling while traveling on the conveyor to and from the machine, they are supported at these points in an inclined position. As they approach the sandblasting machine B, the adjacent sections of the conveyor are designed to gradually raise the upper edge of the sheets so that as they reach the sandblast area they are supported in a substantially vertical plane. Passing from the sandblast area they are again lowered into an inclined plane.

The machine

The machine frame, generally indicated at C, is constructed of structural iron sections which may be bolted or suitably welded together. The upright or leg members 10 are interconnected by cross frame members 11 extending longitudinally of the machine frame and by base or foot members 12 extending transversely between the lowermost ends of the leg members 10. To level the various sections of the frame C with respect to each other, the foot members 12 may have setting bolts 13 threaded into their horizontally disposed sections and secured from rotation by lock nuts 14 as best shown in Fig. 8. Irregularities of the floor, or other supporting surface for the machine frame may thus be compensated for. The angle iron, or L-shaped members 15 and 16, comprising the cross frame 11 are spaced from each other in vertical relation a sufficient distance to provide supports for a conveyor chain belt 17 which carries the glass sheets. The chain or conveyor belt 17 is driven and supported in the ends of the frame C by and on sprocket wheels 18 and 19. The sprocket wheel 18 is keyed to a shaft 20 suitably journaled in gusset plates 21 forming a portion of one end of the frame C. A second sprocket wheel 22, mounted on the shaft 20, is operatively connected to the reduction unit 23 which is driven by an electric motor 24, through a chain belt 25. The sprocket wheel 19 located in the opposite end of the machine, and serving as an idler for returning the conveyor belt, is mounted on a shaft 26. The shaft 26 is journaled in bearing blocks 27, threadedly mounted on screw shafts 28 (Fig. 4). The shafts 28 are supported at their ends in lugs 29 forming a part of plates 30 of the frame. One end of each of the shafts 28 is formed square so that upon rotation of the shafts by suitable tools, the bearing blocks 27, and likewise the shaft 26 and sprocket wheel 19, may be moved longitudinally within the frame to maintain the desired degree of tension or slack in the conveyor belt. The belt 17, between the sprocket wheels 18 and 19 and moving along the frame members 15 and 16, is directly supported on a plurality of rails 31 which are secured at intervals by bolts to the vertically disposed legs of the members 15 and 16.

The glass support

To receive the glass sheet 32 and carry it without chipping the edges, the conveyor belt 17 is provided with grooved rubber blocks 33 at regularly spaced intervals. The blocks 33 are mounted on clip links 34 (Fig. 15) which are of a conventional type of link designed for attachment of various devices to chain belts for conveying purposes. The ends of the blocks are secured to the ears 35 of the links 34 by clamping plates 36 which are held in clamping relation by bolts 37. The surfaces of the lower plates 36 also serve as runners for supporting the belt 17 with respect to the rails 31 (Fig. 8).

To support the glass sheets as they are carried by the belt 17 in planes which vary from the diagonal, or inclined, to the vertical, the legs 10 on opposite sides of the longitudinal frame members 15 and 16 partake of differing angles of extension to each other. Thus, the legs 38 which support the frame members in what may be termed the face, or front, of the conveyor rise substantially vertically while the end legs 39, supporting mating back sections of the frame members 15 and 16, rise from the members 15 at an outward angle to provide for the desired angular support for the glass sheets. Upper longitudinal frame members 40 of angle iron cross

section connect the legs 39 at their upper ends while intermediate longitudinal members 41 extend between the legs midway between the intermediate frame members 15 and upper longitudinal members 40. The frame members 40 and 41 are provided with pivotally mounted rollers 42 which are rubber covered or tired. When the glass sheet is placed, at its lower edge, on the blocks 33, the upper surfaces will be received by the rollers 42 which freely pass the glass along their series without abrasion to the surface or friction caused by sliding along a less freely rotating means of support. The operator may thus deposit a sheet of glass on the conveyor without fear that it will sway from its support and topple from the machine.

In order to gradually bring the sheet 32 into a substantially vertical position in which it must be supported for sandblasting, the continuations of the frame members 40 and 41 extend between an angularly extending leg 39 to a leg 43 which rises from the frame 15 in parallel relation to an opposed vertical front leg 38. The continuation sections 44 have a continuing series of rollers 42 so that as the glass sheet moves along the rollers, it will gradually rise from the inclined plane until, as it approaches the vicinity of the leg 43, the rollers will have reduced its angularity from a vertical plane. To prevent swaying of the glass, the cross frame members between the legs 38 are provided with rollers 42 and as the sheet passes the leg 43, it will contact rollers on either or both of its surfaces. The glass sheet as it arrives at this area of the machine appears substantially as represented in Fig. 8 of the drawings, and is approaching the area in which it is sandblasted.

The exact instant of operation is determined by the extent of area or the specific area of the glass that is to be acted upon. As illustrated in Fig. 2 of the drawings, an image 45, in the form of a trade-mark or emblem, is to be worked onto the glass surface by the impinging abrasive particles of sand. The instant of operation therefore is determined by the desired location of this representative image from the leading edge of the sheet, while its height from the lower edge is established by the position of the sandblasting elements, as will be disclosed hereinafter.

The control means for initiating operation of the sandblast and the functioning elements thereof, is supported on a carriage, generally designated as D. To achieve the most positive relation between the glass and the sandblast head, generally designated at E, the carriage D is caused to travel in unison with the glass sheet 32 for a predetermined distance and to subsequently return to its starting position in readiness to travel with a succeeding glass sheet. Also and within this short period of united travel, means is provided for engagement of the sandblast head on a glass surface, the actual blasting of the image and retraction of the head before the carriage is automatically released from its traveling relation with the glass. In order to obtain the desired results from such an operation, a limit switch is positioned on the carriage D, so that it may be closed by the sheet of glass as it approaches. Obviously this closing action of the switch is predicated on the desired location of the image and accordingly the position of the switch will determine the instant of engagement by moving glass.

The sandblast carriage

The carriage D is formed of a pair of side frame plates 46 and 47 which are located along the outer sides of the frame members 15 and 16. The frames 46 and 47 are interconnected and secured together by threaded rods 48, suitable nuts 49 drawing the frames against shoulders 50 formed on the rods 48. In accordance with the desired functions of the machine as briefly described before, the limit switch 51 (Fig. 10) is mounted on one of the plates, means being provided for modification of its location. As shown in the drawings, Figs. 8 and 10, the switch 51 is mounted on a plate 52. The plate 52 rests on a pair of bars 53 and is secured thereto by bolts 54 which clamp the plate securely according to the desired position for the switch. The bars are located in the bifurcated ends 55 of brackets 56 that are mounted on and secured to the frame plate 47 of the carriage. The outer ends of the bars 53 extending beyond the sides of the carriage may be supported in a wheel mounted bracket 57 to prevent sagging of the bars.

Also mounted on the plate 52 is a switch actuating arm 58 having a contact roller 59. The arm 58 is biased in one direction about the pivot 60 by a spring 61 that is connected at its opposite end to a pin 62. An adjustable stop 63 may also be provided to prevent damage to the switch in the event that the arm is jammed or the glass does not engage the roller 59 properly. Thus, as the glass sheet contacts the roller 59 to cause closure of switch 51, a control circuit will be established to cause movement of the carriage with the glass until it causes the operation of a second switch to release the traveling association.

The side frame plates 46 and 47 of the carriage D are supported on the side frame members 15 and 16 and sustained in a parallel relation with respect to the members by a plurality of rotary elements which may be adjusted in their axial position with reference to the surfaces of the members so that the planes in which the carriage is supported or travels may be altered to reduce binding or dragging which would interfere with the desired freedom of movement. The intermediate side members 15 and lower side members 16 have rails 64 of machined steel secured to the horizontally extending portions of their cross section. The side frames 46 and 47 are suspended, or hung, on the rails 64 on the side members 15 by casters 65 which are located in the corners of the frames. The casters are mounted on shafts 66 (Figs. 12 and 13). The shafts 66 have axially offset portions 67 and 68, the shaft part 67 extending through the wall of the frame and secured therein by a lock washer 69 and nut 70. The shaft portion 68 which supports the caster 65 is located within a housing 71 mounted on the frame to enclose the caster. The lower edge of the housing is closed to the entrance of abrasive dust by a strip of felt 72 that is held in position by a metal band 73. Preferably, the threaded end of the shaft portion 67 is flattened for easy manipulation to revolve the shaft portion 68 once the nut 70 is loosened. As shown in Fig. 11, rotation of the shaft portion 68 will raise or lower the intimate corner of the frame 46 or 47 and thereby alter the "hang" of the carriage on the rails 64.

A similarly mounted and adjustable caster 74 is provided in each corner of the frame D as illustrated in Fig. 12, and contacts the outer edges of the rails 64 on the side members 15 and 16 (Fig. 8), to prevent sidewise angular movement of the carriage and afford means for reducing any bind or looseness of movements as the carriage travels with the glass. The casters 74 are pivot-

ally mounted in brackets 75 which are secured to the side frames 46 and 47 to support the casters in rolling contact with the edge surfaces of the rails 64. The carriage is thus freely supported on the rails by the casters 65 and 74 and the mobile relation thus established may be modified to obtain the desired balance for assuring movement of the carriage with a minimum of displacement. The sandblast head E, mounted on the carriage D, is thus also moved with the glass sheet during a designated period of its travel through the machine. Simultaneous with the movement of the carriage, the functioning elements of the sandblast head E are actuated, means being afforded for presenting the contacting surface of the head to the glass and for retraction therefrom in a cycle, initiated subsequent to movement of the carriage and terminated before release of the carriage from its traveling association with the glass and its supporting medium. While the glass sheet is moving with the carriage D and to maintain one surface against the series of rollers 42, a pair of similar rollers 76 (Fig. 8), located adjacent the ends of the side frame 46 engage the opposite surface to maintain its vertical position. The rollers 76 are rotatably supported on brackets 77 which are secured by bolts to the upper surface of the frame 46.

The carriage D is provided with a rotatable member, such as the sprocket wheel 78 (Fig. 15), located between the side frames 46 and 47 so as to engage the belt 17. During idle periods of the carriage, the sprocket wheel 78 rotates freely as the links of the belt contact its teeth; however, when the switch 51 is closed, means is provided for establishing a lock to the rotation of the sprocket wheel so that the contacting teeth form motivating elements for moving the carriage with the belt 17. Also during the idle periods of its operation, the carriage is latched from movement thereby assuring one point of starting engagement between the glass sheet 32 and the roller 59 of the switch arm 58. The latch 79 (Fig. 14) comprises a pivotally mounted bar 80 and pin 81. The bar 80 is mounted on the side frame 47 on a pin 82 and is urged into engagement with the pin by a spring 83; the latching contact being created as the pin enters a notch 84 formed in one edge of the bar. The surface of the edge between the notch 84 and the end of the bar is preferably beveled, as at 85, to permit the bar to ride over the pin 81 upon return of the carriage to its starting position. The pin 81 is secured in a bracket 86 mounted on a frame member 16. Upon closure of the switch 51, the bar 80 is raised from engagement from the pin 81 by a solenoid 87, the armature 88 of the solenoid being connected to the bar 80 by a pintle 89. The solenoid 87 is energized by the switch 51 simultaneously with the coil of a solenoid 90 which effects a resistance to rotation of the sprocket wheel 78 by means of a brake 91 (Figs. 14 and 15). The brake 91 has a drum part 92 mounted on the shaft 93 to which the sprocket wheel 78 is keyed. The sprocket wheel may be keyed or otherwise secured to the shaft 93 as by the taper pin 94. The ends 95 and 96 of the shaft 93 are located in journals 97 located in bosses formed in the walls of the side frames 46 and 47. Preferably, to protect the journals, or bearings, 97 from loose abrasive, the shaft ends 95 and 96 are contained in chambers 98, as illustrated in Fig. 15. In one of the chambers 98, the end 95 of the shaft 93 is secured against the inner race of the bearing 97 by a conventional type of lock nut 99. The outer race of the bearing is positioned in a shoulder 100 formed in the wall 101 of the chamber 98. The outer end of the chamber may be closed by a cap 102 and the inner end by a gasket seal 103.

The opposite end 96 of the shaft 93 on which the drum 92 is mounted, is similarly journaled in a bearing 96 but the closure cap 104 has a central opening 105 for the extension 106 of the shaft 93, the opening being closed between its annular wall and the periphery of the shaft by a gasket seal 107. The sprocket wheel 78 is thus freely rotatably mounted on the shaft 93 which is supported in the bearings 97 and between the side frames 46 and 47 of the carriage.

Since the resistant force or the inertia of the entire sandblast carriage D must be overcome and movement thereof produced by the spacing rollers 108 between the links 109 which comprise the chain belt 17 and particularly those immediately engaging the teeth of the sprocket 78, there may be a resultant tendency of the chain belt to rise from the sprocket so as to produce slipping or disengagement of the rollers 108 from the sprocket teeth. Such an action would cause misalignment of the glass sheet with respect to the desired placing of the sandblasted image to be produced thereon. While it is possible to provide suitable clamping elements that may be actuated to positively grip the chain and that are completely disassociated therefrom during the inactive period of the carriage, the structure as represented in the drawings has been found to effect the desired results with equal efficiency. As shown in Figs. 10 and 11, surfaces are provided against which the clamping plates 36, which secure the blocks 33 to the chain belt 17, will ride in the event that they are forced to rise from their normal level of operation. The said surfaces are afforded by brackets 110 carried by the side frames 46 and 47. The brackets have outwardly projecting flanges 111 which face each other, sufficient spacing being allowed to permit free movement of the chain belt 17 therebetween. The under surface 112 of each flange 111 is so positioned above the path of the clamping plates 36 as to be contacted before the rollers 108 can rise from the sprocket teeth. Obviously, when this contingency does not occur, there will be no engagement and the belt 17 will pass freely beneath the flanges 111. Thus, at the instant of closure of the switch 51 by contact of the glass sheet 32 with the switch arm 58, the immediate portions of the chain belt 17 will produce the desired movement of the carriage D without slippage and the sandblasting operation will be effected within the proper area.

During the inactive periods of the carriage D and while it is secured from movement by the latch 79, the sprocket wheel 78 is turned idly by the belt 17 and rotates the commonly mounted brake drum 92. The drum revolves between the shoes 113 of the brake 91 which are pivotally supported on a common pin 114. As shown in Fig. 14, the pin 114 may be an ordinary shoulder bolt that is threaded into the cap 104 for mounting the brake shoes. The shoes are connected at their lower, or free, ends 115 to a yoke bar 116 by links 117. The yoke bar 116 is located on the end of the armature 118 of the solenoid 90 and is biased to one direction of movement by the springs 119 that are connected at their opposite ends to bracket clips 120 bolted to the side frame 47. Thus, the coil of the solenoid 90 will influence the armature 118 to urge the

brake shoes 113 to clamping relation with the drum 92 so that the shaft 93 will be restrained from rotation; and, upon opening of the switch 51, the solenoid will be deenergized, allowing the springs 119 to release the brake shoes from the drum 92 so that the shaft 93 may rotate freely.

The solenoid 90 is mounted on a base plate 121 which is located along its side edges in gib plates 122. The base plate 121 may also be seated on adjusting screws 123 in order to provide for modification of the clamping effect of the brake shoes 113. The brake 91 and the solenoid 90 may be enclosed in a suitable cabinet 124 to maintain the functioning parts in as clean a condition as possible. The cabinet is supported by screws on the side frame 47.

The sandblast head

As briefly described above, the carriage D supports the sandblast head E. As illustrated, particularly in Figs. 9, 10 and 16 of the drawings, the blast head comprises a supporting structure 125, a movable frame 126 carried thereon and a sand delivery and directing chamber 127. The supporting structure 125 has a base 128 which is mounted on the side frame 46 by suitable members to permit its movement in vertical directions to properly position the chamber 127 with reference to the desired height of the area from the edge of the glass sheet. (In some contemplated usages of the machine, the sandblasted image may be placed along an upper edge of a glass sheet. Such a procedure would be advantageous for sheets which are to be cut into smaller sizes at a later time. The sheet would move through one machine, or cause the operation of one carriage, to receive one image and subsequently, or concurrently, proceed through a second machine, or cause the operation of a second carriage, to receive the second image in another area as illustrated in Fig. 22. Obviously, in such proposed constructions, the image stencil, or reproducing film, would be inverted in its position at one instance from the desired position in the other instance so that the sheet when severed would produce two smaller lights of glass bearing a trade-mark image in substantially the same area.)

As shown in the drawings, only one image 45 is produced on the glass sheet and the base 128 is located to present the chamber 127 to the glass in the vicinity of one corner. The base has ear portions 129 formed along its sides. The ears 129 may be bored to receive annular columns or posts 130 and 131, and are slit as at 132 so that as bolts 133 are tightened, the separated portions of the ears 129 will engage the posts 130 and 131 to establish a rigid mount. The posts 130 and 131 are attached at their lower ends in members which are constructed to form a hinge 134. The base 128 and the parts carried therein may thus be swung outwardly from the side frame 46 for repair or adjustment of any of the functioning parts. The post 130 is accordingly located in pivotal relation to bracket 135 secured to the frame 46. To prevent movement of the post from the bracket and to allow for alteration of its position, the post has lock collars 136 mounted thereon above and below the ends of the bracket. A suitable anti-friction washer 137 may be placed on the upper end of the bracket for freely supporting one collar 136 while the bore of the bracket may be provided with a bearing sleeve 138.

The post 131, secured along the opposite side of the base 128, has one lock collar 139 which is supported on the upper surface of a clamping block 140, pivotally mounted in a base plate 141 by the pin 142 extending through bosses 143 and a lug 144 of the block 140 positioned therebetween. The base plate 141 is secured by bolts to the side frame 46 and has formed in its end portion opposite the pin supporting bosses 143, a latch 145 for locking the block 140 in clamping engagement with the post 131. The latch 145 comprises a pivotally mounted bolt 146 and a wing nut 147 threaded thereon. When in locking position, the shank of the bolt 146 extends through a slot 148 formed in the proximate end of the clamping block 140 and the wing nut 147 is threaded along the bolt 146 against the block 140.

The movable frame 126 is slidably mounted on shafts 149, the ends of which extend through and are secured in ear portions 150 depending from opposite ends of the base 128 of the supporting structure 125. The relation of the base 125 and frame 126 may best be seen in Fig. 16 which illustrates a section taken in Fig. 9. The frame 126 is reciprocally moved between the ear portions 150 in one direction by a pneumatic force and returned by a spring which is compressed by movement of the frame. The frame 126 has bearing sleeves 151, through which the shafts 149 extend, located in opposite ends of bosses 152 formed on the upper surface of the frame (Fig. 19). The ends of the bosses may be closed by gasket seals 153 to prevent entrance of abrading particles into the bearing area. A web 154 extends between the bosses 152 at one end of the frame and rises sufficiently in its central portion to afford an engaging surface for the plunger 155 of a pneumatically actuated device 156. The cylinder 157 of the device 156 is secured by bolts to the base 128 and is connected by a flexible hose 158 to a source of air pressure, suitable control valves being located in the hose to cause actuation of the plunger 155 at desired intervals. When air under pressure is supplied to the pneumatic device 156, the plunger 155 moves the face 159 of the chamber 127, suspended from the frame 126, against the glass surface, and means is provided, through a limiting stop 160, for gaging the distance of movement traversed by the chamber 127. The stop 160 is threaded into one of the depending ear portions 150 and, after adjustment, may be locked in position by a lock nut 161. Upon release of the plunger from pressure, the frame 126 will be returned to its original position by a spring 162 which is located between and seated in counterbores in the end of the base 128 and the adjacent ear portion 150 of the frame 126. The effective cycle of movement is determined by the period of travel of the carriage D with the glass sheet 32. Therefore, the control period for actuation and release of the pneumatic device 156 is of such duration as to begin after the carriage starts its associated travel and to stop before the carriage travel is terminated.

To this end the pneumatic device 156 is connected by the hose 158 to an electrically operated valve mechanism 163 (Fig. 8). An electric control for the valve mechanism 163 is connected in series with the coils 87 and 90 (Figs. 8 and 14) so as to open a pressure line from its source of pneumatic pressure to the device 156 immediately following release of the latch 79 and setting of the brake 91 as will be more clearly hereinafter explained.

The end of the chamber 127 is formed to provide delivery orifices for abrasive dust or particles and air under pressure. As shown in Fig. 16 of the drawings and Figs. 19 and 20 which are representative illustrations of sections taken in Fig. 16, the orifices are provided by recesses formed in assembled plates which are secured together and to a mounting frame by suitable bolts. The supporting frame 164 for the chamber 127 has gibs 165 located along the longitudinal sides, and slidably mounted in guide surfaces 166 finished on depending ribs 167 of the frame 126. Clamping plates 168 retain the gibs 165 in the guide surfaces 166 and, when thoroughly tightened, rigidly connect the frame 164 to the under surface of the base 128. The plates 169, 170 and 171 are secured to the frame 164 by bolts 172 which extend through the web 173 of the frame and into the plate 169. The plates 169, 170 and 171 are secured together by a plurality of bolts 174. The upper, 169, and lower plate 171 have entry slots 175 and 176, respectively therein, each of which communicate with passageways provided in the proximate surfaces of the intermediate plate 170 (Fig. 16). Thus the slot 176, in the lower plate 171, communicates with the passageway 177 in the under surface of the plate 170 and permits flow of air into the chamber 127 from the hose 178.

The slot 175 in the upper plate 169 is connected by the hose 179 and pipe fitting 180 (Fig. 19) to a receptacle of the abrasive 181 (Fig. 5) which may be supported on an adjacent part of the machine frame C. The abrasive is drawn into and carried by the hose 179 due to the vacuous condition produced by the air forced under pressure through the passageway 177 (Fig. 19) and effecting a low pressure condition at the end of the plate 170 and in the vicinity of the passageway 182 provided in the upper surface of the plate 170. The passageway extends to the slot 175 in the upper plate 169, and thus under the influence of the air draft the abrasive particles will be forced under pressure into a channeled mixing zone 183 (Figs. 16 and 20). The mixing zone is defined by upper and lower walls afforded by plates 184 secured to the plates 169 and 171 and side walls formed by strips 185 which are held by spring clips 186 against the edges of the plates 184. The mixing zone 183, thus defined, extends from the ends of the plates 169, 170 and 171 well into a rectangular funnel member 187 which comprises the directing medium for the abrasive to an image reproducing film covering the open end of the funnel 187.

To support the film or tape 188 on the end of the funnel, a rectangular frame 189 is mounted on the funnel. The frame 189 has a hinged plate 190 pivotally supported thereon, the plate having a matching central aperture or opening 191 to receive and stretch portions of the film 188 over a flange 192 formed on the outer surface of the frame 189. The plate 190 is secured along its upper and lower edges to bars 193 which are mounted at one end by a pintle 194 on the frame 189. The opposite ends of the bars are engaged by a spring actuated latch plate 195 (Fig. 17), the ends of the bars 193 and the plate having cam surfaces 196 and 197, respectively, for easy engagement of the parts into a latching relation. As the latching condition is effected, the film 188 will thus be drawn taut across the opening of the frame 189 with the image stenciled area 198 properly located in a centralized position. One representation of such an image stencil is illustrated in Figs. 18 and 21, with the abrasively produced image as a result of the sandblast shown in Fig. 2.

The forward end of the funnel 187 is located within a housing 199 which may be bolted, or secured by welding to walls of the funnel 187. The edges of the housing 199, describing a chambering frame about the film 188 are flanged, as at 200, to receive and suitably retain a felt strip 201 which contacts the surface of the glass, as shown in Fig. 16, to act as a buffer, or shock absorbing medium, when the sandblast chamber 127 is moved outwardly toward the glass and, at the same time, serve, during the sandblast operation, as a resilient retaining means for confining the loose-blowing abrasive.

While various types of film and a support therefor have been experimented with, a simple form is shown in Figs. 17 and 18, wherein the film 188 is withdrawn from a spool 202. The spool 202 is pivotally mounted in ears 203, extended from a wall of the funnel 187. The housing 199 may also have a lid 204, closing one side, for easy access to the spool 202 for replacement. When the film has become worn from repeated impacts of the abrasive, the bars 193 may be released from the latch 195 and a fresh portion of the film 188 be unwound from the spool 202 into the exposure area defined by the frame 189 and plate 190.

It may also be found expedient to individually mount the stencil film on a firmer backing material and replace the entire amount when the stenciled area 198 has become worn. This is an advantage as an additional feature when several glass sheets, or a specific run thereof, are to receive a differing image from that regularly used in production.

The sandblasting of the glass sheet is effected during travel of the valve mechanism 205, mounted on the carriage D, through the control area of a cam 206 (Fig. 9), and while a roller 207 is in contact with the surface of the cam.

The cam operated valve mechanism 205 is mounted on the side frame 46 as shown in Fig. 9, its inlet 208 being connected to a suitable source of air under pressure by the pipe 209 while the outlet of the valve is connected to the sandblast chamber 177 by the hose 178. The valve stem 211 of the mechanism 205 is spring biased into position of closure and is moved to an open position by a lever 212 fulcrumed on the valve casing as at 213. The lever 212 is provided with a pivoted arm 214 and has a surface 215 which restricts movement of the arm in one direction while a sloped surface 216 permits free movement of the arm about its supporting pin 217 to allow closure of the valve mechanism. Thus, when the carriage is moving with the glass, the arm 214 will be restricted in its movement to force the valve stem 211 to open the valve mechanism by the cam 206. The roller 207, which contacts the cam 206, is mounted on the arm 214 and operates, during movement of the carriage, to swing the lever 212 and lift the valve stem 211. The cam 206 is mounted on a bracket 218 secured to a frame member 219 of the machine frame C. Preferably the bracket 218 is provided with slots 220 in order that the cam 206 may be raised or lowered with respect to the bracket to alter the extent of lift transmitted to the valve stem 211. The hose 209 is connected by a suitable pipe fitting to the rear end of the chamber 127. When the roller 207 is carried past

the cam 206, the spring biased valve stem 211 halts the air flow to the sandblast chamber 127.

The complete operating cycle

The sequence of operations in which a design or emblem is sandblasted onto a glass sheet can best be understood by reference to the wiring diagram in Fig. 23. The glass sheets 32 are supported during their movement on the conveyor A on the blocks 33 of the conveyor belt 17 (Fig. 1). As the glass sheets reach the sandblast area of the machine and are in proper position relative to the sandblast machine B, they will contact the roller 59 to temporarily close the limit switch 51 (Fig. 10) and initiate the sandblast cycle.

As illustrated in Fig. 23, closing of the switch 51 by a glass sheet will complete the electrical circuit from the positive line 221 through a line 222, contacts 223 and 224 of the switch 51, line 225 contacts 226 and 227 of switch 228, line 229, coil 230 of the solenoid switch 231, and line 232, to the negative line 233. Completion of this circuit energizes the armature 234 to move the bar contact 235 from the fixed contacts 236 of a switch 231 to the fixed contacts 237 thereof.

Closing of the contacts 237 by the bar 235 completes a circuit from the source or positive line 221, through line 222, branch 238, and distribution line 239 to the coil 240 of the solenoid 90 and through branch line 241 to the coil 242 of the solenoid 87, then out through lines 243, 244 and 232 to the negative side 233. At the same time current also flows from the distribution line 239, through a branch line 245 to the electrical control 246 for the valve mechanism 163, then out to the negative side 233 through lines 247, 244 and 232.

Thus, the closing of the limit switch 51 by the glass sheet, when it is in position to be sandblasted, will simultaneously (1) energize the coil 242 to release the latch 79 from the pin 81 and permit the carriage D to move; (2) energize the coil 240 to cause the brake shoes 113 of the brake 91 to grip the drum 92 and cause the carriage D to be moved with the glass sheet by the conveyor 17; and (3) energize the control 246 to actuate the valve mechanism 163 and so direct air under pressure from a source 248 through pipe 249 and hose 158 to the cylinder 157 of the pneumatic actuated device 156 which will advance the frame 126 to move the chamber 127 and sandblast head E (Fig. 16) into engagement with the glass surface.

With the carriage D moving with the glass sheet and the blast head E in contact therewith, the several parts are in position for the actual sandblasting. This will be accomplished by engagement of the roller 207 of the cam actuated valve mechanism 205 with the cam 206 (Fig. 9). As seen in Fig. 23, when this takes place the valve will open and air under pressure from the supply pipe 209 will be fed to the air chamber of the sandblast head E and will act to draw abrasive particles from the receptacle 181 (Fig. 5) and create the blasting air force in the funnel 187 (Fig. 16) to blow the particles through the stenciled image area 198 of the film 188 (Fig. 18). As the carriage D continues its movement, the roller 207 will pass off the end of the cam 206, closing the valve in the valve mechanism 205 and cutting off the air supply to the hose 210 to stop the sandblast.

Immediately thereafter, a bar 250, carried by the side frame 46 of the carriage D, engages the arm 251 of the limit switch 228 (Fig. 9). The limit switch 228 is mounted on one of the cross members 11 of the machine frame C. The bar 250 may be suitably slotted to provide for its adjustment and thereby the distance between the bar and the switch arm 251 with a resultant shortening or lengthening of the period during which the carriage D travels with the glass sheet. As shown in Fig. 23, this opens the contacts 226 and 227 of the switch 228 and breaks the circuit to the coil 230 of the switch 231, allowing the spring 252 to move the bar contact 235 on the armature 234 from the contacts 237 to the contacts 236. This in turn breaks the circuit to the coil 240 of the solenoid 90, the coil 242 of the solenoid 87 and the control 246 of the valve mechanism 163. Whereupon the latch 79 is free to be moved downwardly by the spring 83 for subsequent reengagement with the pin 81, the brake shoes 113 release the drum 92 to stop travel of the carriage, and the valve mechanism 163 is reversed to shut off the supply of air to the hose 158 permitting the blast head E to be retracted by spring 162 (Fig. 16).

With the carriage D released from the conveyor, the glass sheet 32 passes beyond the sandblast area of the conveyor to a removal area or into a glass washing machine as desired.

The retraction of the bar contact 235, as described, into engagement with fixed contacts 236 completes a circuit from the positive line 221, through lines 222, 238, 253, and line 254 to an electrical control 255 for a valve mechanism 256, and then out through by lines 257 and 247 to the negative line 233. Completion of this circuit operates the valve mechanism 256 to permit air under pressure to be transmitted from the source 248 through pipe 258 to a clapper type valve 259 and thence through a pipe 260 to a cylinder 261 which is mounted on the machine frame C (as shown in Fig. 7).

The air entering the end 262 of the cylinder 261 acts on the piston 263 carrying the rod 264 to force the piston and rod outwardly and thus return the carriage D to its starting position. For this purpose, as shown in Fig. 7, the piston rod 264 carries a block 265 on its outer end which is provided with a cushioning or shock absorbing element 266 adapted to engage the striker plate 267 carried by the carriage.

Upon return of the carriage to its starting position it will be locked by engagement of the latch 79 and pin 81 to await the arrival of the next glass (Fig. 14).

During the next movement of the carriage D by the conveyor, the piston rod 264 will be returned into the cylinder 261 by pressure of the moving carriage and the piston 263 will force the air to exhaust from the cylinder 261 through the pipe 260 and the clap valve 259 which is normally spring biased into an exhausting position.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment of the same, but that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby and including means for projecting a marking fluid against said work, means

for normally locking said marking device in one position, means for releasing said locking means when the work reaches a predetermined position relative to the marking device, means for moving said marking device with said work during a portion of the movement of the work along said path, and means for initiating and subsequently discontinuing the projection of the marking fluid during movement of the marking device.

2. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby, means for establishing driving connection between said marking device and said conveyor, means operable by the work when it reaches a predetermined position in its path of movement for rendering said means effective whereby the marking device will be moved with the work by the conveyor, marking fluid projecting means carried by said marking device, and means for initiating and subsequently discontinuing the operation of said fluid projecting means during movement of the marking device with the work.

3. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby and including a sandblast nozzle, means for moving said marking device with said work during a portion of its movement along said path, and control means including means for moving said nozzle into engagement with the work, means for then projecting a sandblast through said nozzle, and means for discontinuing said blast all of said control means being operable during movement of the marking device with the work.

4. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby and including a marking fluid discharge nozzle, means for moving said marking device with said work during a portion of its movement along said path, and control means including means for moving said nozzle into engagement with the work, means for then projecting marking fluid through said nozzle, means for retracting said nozzle, and means for subsequently discontinuing the projection of marking fluid all of said control means being operable during movement of the marking device with the work.

5. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby and including a marking fluid discharge nozzle, and a hood around said nozzle and provided with an opening therein, means for moving said marking device with said work during a portion of its movement along said path, and control means including means for moving said hood into engagement with said work and with the opening therein surrounding the part of the work to be marked, means for then projecting marking fluid through said nozzle, and means for subsequently discontinuing the projection of marking fluid all of said control means being operable during movement of the marking device with the work.

6. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for marking work carried thereby and including a sandblast nozzle, and a hood having an open end surrounding the discharge outlet of said nozzle, means for moving said marking device with said work during a portion of its movement along said path, and control means including means for moving said hood and said sandblast nozzle into engagement with said work, means for projecting a blast of sand through said nozzle, means for subsequently discontinuing the projection of sand through the nozzle, and means for retracting said hood and said nozzle, all of said control means being operable during movement of the marking device with the work.

7. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby, said device including a sandblast nozzle, a stencil covering the outlet opening of said nozzle, and means for retaining the stencil thereagainst, means for moving said marking device with the work during a portion of its movement along said path, and control means including means for moving said nozzle to bring the stencil into engagement with the work, means for projecting a blast of sand through said stencil, means for discontinuing said blast and means for retracting said nozzle and stencil, all of said control members operable during movement of the marking device with the work.

8. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising a transversely elongated air chamber and a transversely elongated sand chamber arranged in superimposed relationship, a mixing chamber in advance of and communicating with said air and sand chambers, and a discharge chamber in advance of and communicating with said mixing chamber, means for moving said marking device with said work during a portion of its movement along said path, and means for introducing air under pressure into said air chamber and sand into said sand chamber whereby to project a blast of sand through and out of said discharge chamber during movement of the marking device with the work.

9. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising two outlet plates and one middle plate member secured together, a cut-out portion on one side of said middle plate defining a sand chamber, a cut-out portion on the opposite side of said middle plate defining an air chamber, a mixing chamber communicating with and in advance of said air and sand chambers, and a discharge chamber communicating with and in advance of said mixing chamber, means for moving said marking device with said work during a portion of its movement along said path, and means for introducing air under pressure into said air chamber and sand into said sand chamber whereby to project a blast of sand through and out of said discharge cham-

ber during movement of the marking device with the work.

10. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising two outer plates and one middle plate secured together, said middle plate being cut out to define a transversely elongated sand chamber on one side thereof and a transversely elongated air chamber on the other side, a discharge nozzle flared toward the exit end thereof, and a mixing chamber between said sand and air chambers and said discharge chamber, means for moving said marking device with said work during a portion of its movement along said path, means for introducing air under pressure through one of said outer plates into said air chamber and for introducing sand through the other outer plate into said sand chamber for projecting a blast of sand through and out of said discharge chamber during movement of the marking device with the work, and means for cutting off the supply of air and sand before said movement is stopped.

11. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising a transversely elongated air chamber and a transversely elongated sand chamber arranged in superimposed relationship, a mixing chamber in advance of and communicating with said air and sand chambers, and a discharge chamber in advance of and communicating with said mixing chamber, means for moving said marking device with said work during a portion of its movement along said path, and control means including means for moving said discharge chamber into contact with the work, means for introducing air under pressure into said air chamber and sand into said sand chamber whereby to project a blast of sand through and out of said discharge chamber, means for cutting off the supply of sand and air, and means for retracting said discharge chamber, all of said control means being operable during movement of the marking device with the work.

12. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising a transversely elongated air chamber and a transversely elongated sand chamber arranged in superimposed relationship, a mixing chamber in advance of and communicating with said air and sand chambers, and a discharge chamber in advance of and communicating with said mixing chamber, a stencil covering the discharge end of said discharge chamber, and means for retaining said stencil against said opening, means for moving said marking device with said work during a portion of its movement along said path, and control means comprising means for moving said sandblast nozzle into contact with said work, means for introducing air under pressure into said air chamber and sand into said sand chamber whereby to project a blast of sand through said stencil, means for subsequently cutting off the supply of air and sand, and means for retracting said nozzle.

13. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with said conveyor for operative association with the work carried thereby and including a sandblast nozzle comprising a transversely elongated air chamber and a transversely elongated sand chamber arranged in superimposed relationship, a mixing chamber in advance of and communicating with said air and sand chambers, and a discharge chamber in advance of and communicating with said mixing chamber, a stencil covering the open discharge end of said discharge chamber, means for retaining said stencil against said opening, and an open ended hood surrounding the discharge end of said discharge chamber, means for moving the marking device with said work during a portion of its movement along said path, and control means comprising means for moving said sandblast nozzle to bring said stencil and said hood into contact with the work, means for introducing air under pressure into said air chamber and sand into said sand chamber whereby to project a blast of sand through said stencil, means for subsequently cutting off the supply of air and sand, and means for retracting said nozzle.

14. A marking apparatus comprising a conveyor for continuously moving work to be marked along a definite predetermined path, a marking device associated with the conveyor for operative association therewith, said device including a carriage mounted to travel in a path parallel to the path of travel of the conveyor, a marking fluid projecting nozzle mounted on said carriage for movement toward and away from said work, means for causing said carriage to be moved by the conveyor, and means for moving said nozzle into engagement with said work and for supplying fluid thereto while said carriage is moving with said conveyor.

15. A marking apparatus comprising an endless chain type conveyor for continuously moving work to be marked along a definite predetermined path, a marking device comprising a pair of plate members mounted at either side of said conveyor for movement parallel therewith, a shaft extending between said plates and mounted therein for free rotary movement, a sprocket keyed to said shaft and in normally driven engagement with the chain of said conveyor, means for locking said shaft against rotation to permit the conveyor chain to drive said marking device, a sandblast nozzle mounted on said carriage and directed toward the work carried thereby, and control means comprising means for actuating said locking means and means for supplying sand under pressure to said nozzle during travel of said marking device with said conveyor.

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