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Eskijian

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[54] **DUSTLESS SAND BLASTER**

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[52] **U.S. Cl.** **51/11,** 51/273

[51] **Int. Cl.** **B24c 3/06,** B24c 5/00, B24c 9/00

[58] **Field of Search** 51/8, 9, 11, 177, 51/180, 273

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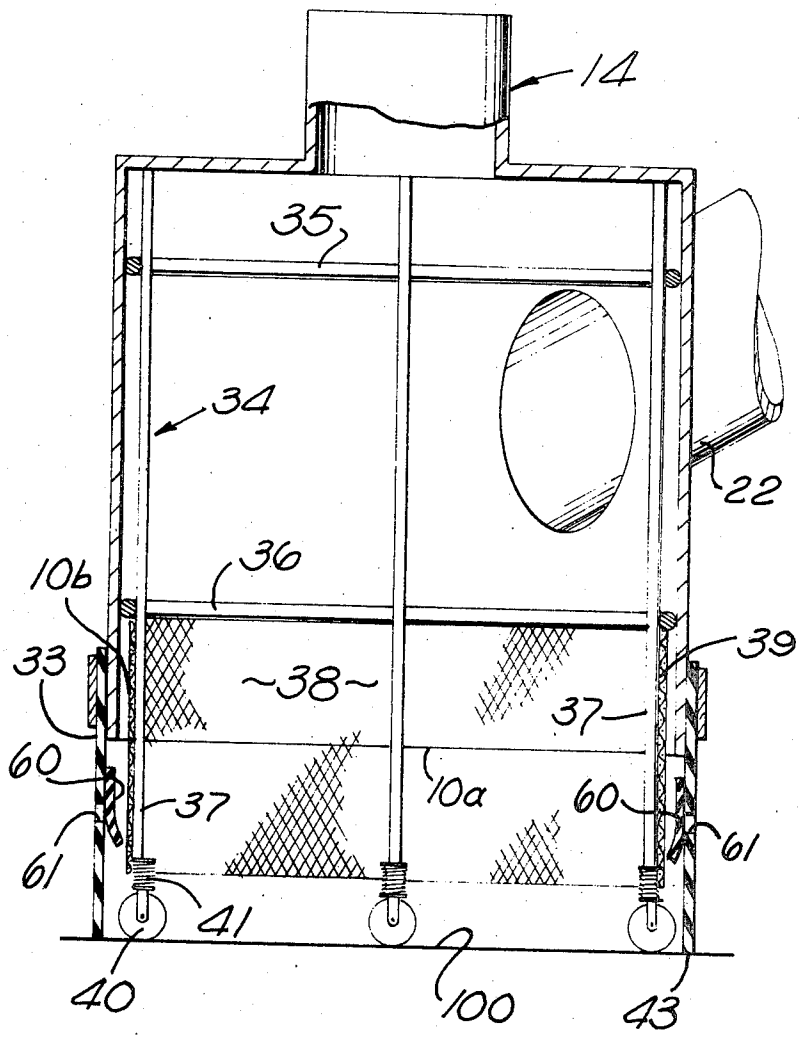
[57] **ABSTRACT**

Sand or grit blasting equipment with a work-engaging chamber having a nozzle inlet. The chamber is positioned and moved parallel to a work surface by multiple spring-biased caster supports and is connected to a suction device, which may include a venturi to aid in maintaining reduced chamber pressure. A flexible, slit skirt extends about the work-engaging open end of the chamber to prevent escape of grit particles while allowing air streams to pass into the chamber. An open-work frame within the skirt limits inward deflection of the skirt.

10 Claims, 8 Drawing Figures



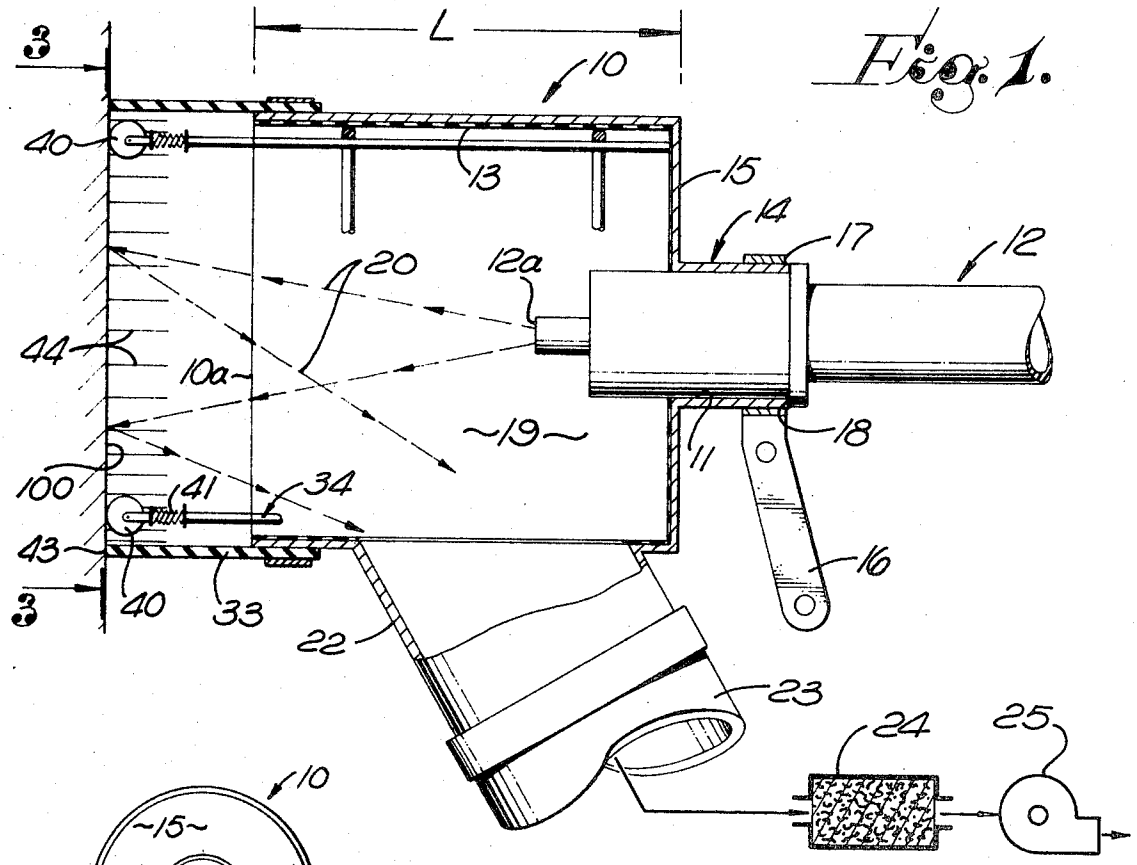


Fig. 1.

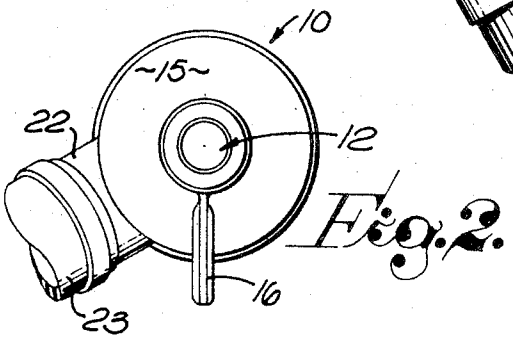


Fig. 2.

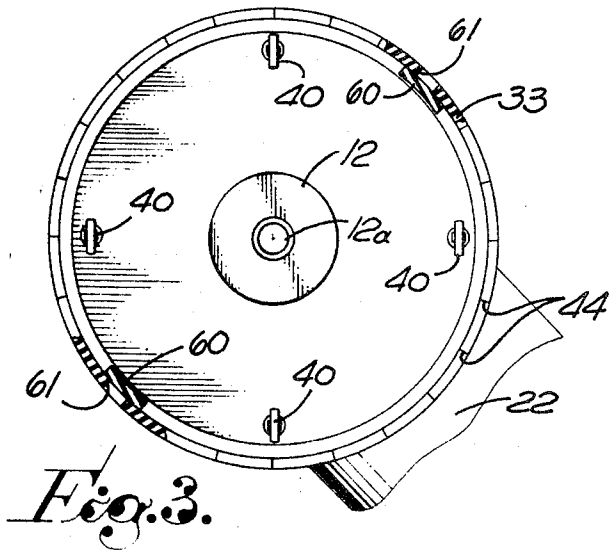
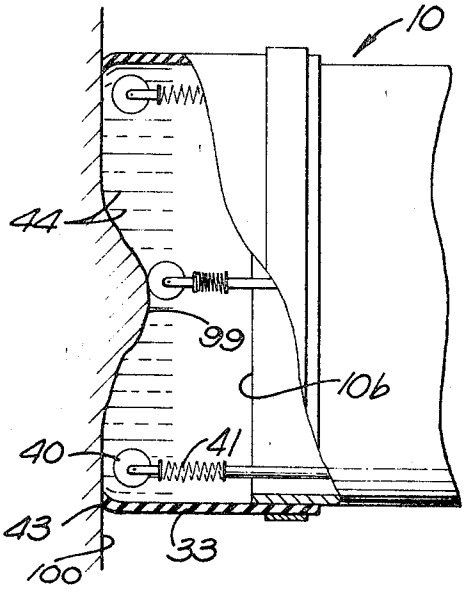


Fig. 3.

Fig. 4.



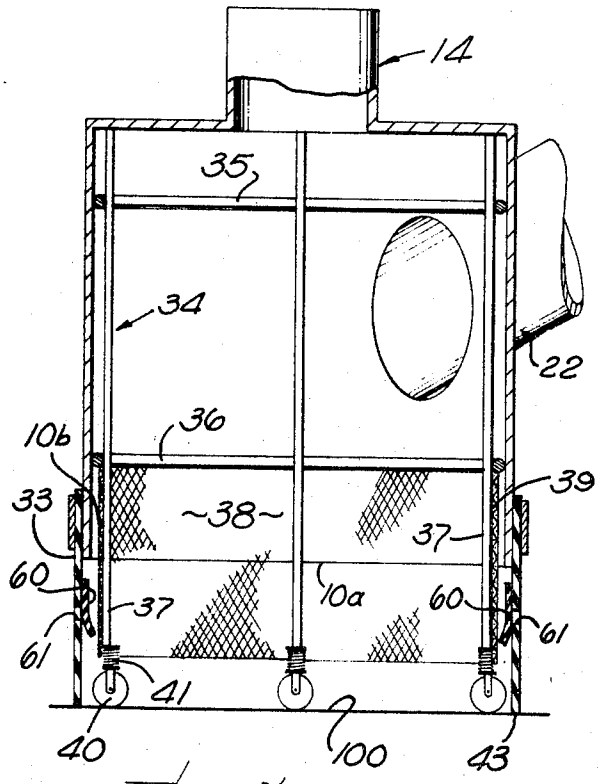
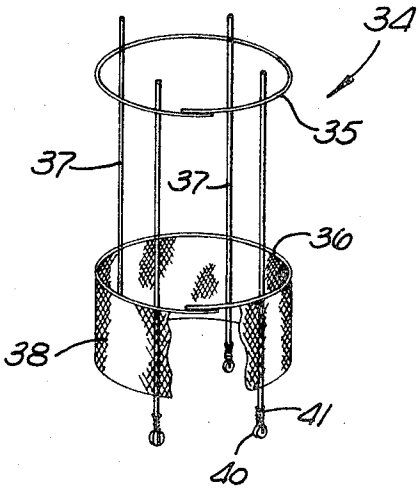


Fig. 5.

Fig. 6.



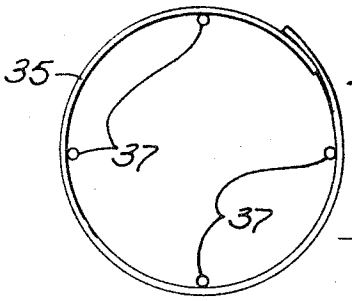
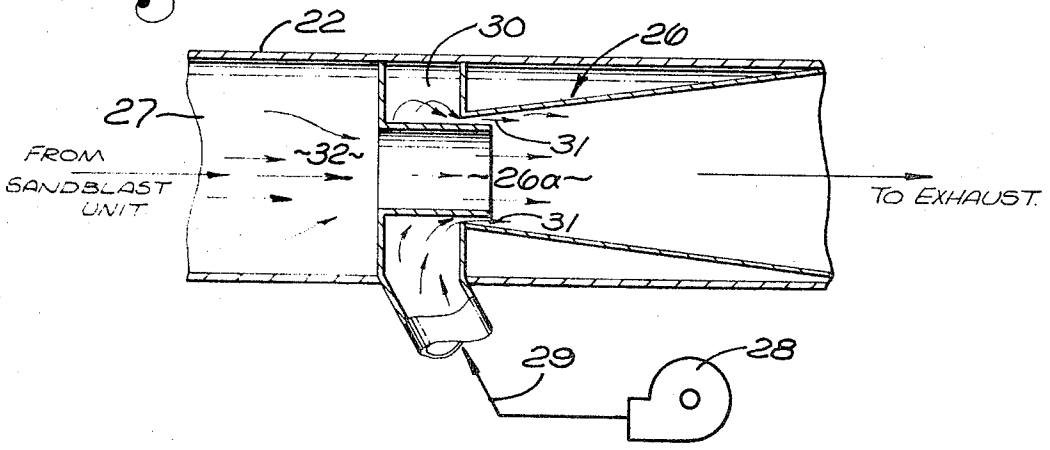


Fig. 7.

Fig. 8.



DUSTLESS SAND BLASTER

BACKGROUND OF THE INVENTION

This invention relates generally to sand or grit blasting blasting equipment, and more particularly concerns a dustless, sand blasting vacuum system characterized by numerous advantages in construction, mode of operation and results.

Air pollution control laws and agencies and occupational health and safety legislation are becoming increasingly strict in their requirements as regards dust emission from grit blasting equipment and dust concentration in the operator's environment. Great expense is involved in providing known equipment meeting such requirements, and as a result many businesses are faced with the prospect of closing. There is need for low-cost equipment that will meet these requirements and standards, and which will allow sand blasting to be down without dust emission into the atmosphere and also provide the operator with a clean atmospheric environment in which to operate.

SUMMARY OF THE INVENTION

It is a major object of the invention to provide low-cost equipment that will overcome the above referenced problems and difficulties. Basically, the invention is embodied in grit particle blasting equipment that includes:

a. a chamber having an inlet to receive a grit blasting nozzle, a forward end of the chamber being open for approaching a work surface toward which the nozzle is directed,

b. multiple supports carried by the chamber to engage said surface for movement parallel thereto and to limit the approach of said chamber open forward end toward said surface,

c. means to withdraw air and grit particles from the chamber interior creating reduced pressure conditions therein,

d. a flexible skirt extending about the open forward end of the chamber and projecting forwardly of the chamber to extend adjacent said work surface for confining grit particles against escape outwardly of the skirt, the skirt containing slits to pass air streams drawn into the chamber by said reduced pressure conditions, and

e. an openwork frame carried by the chamber to project forwardly and limit inward deflection of the skirt so that the skirt may remain adjacent said surface during chamber movement parallel to said surface.

As will be seen, the frame may advantageously include wiring spring-urged outwardly against the chamber inner surface for frictional retention, and a metallic screen projects from the chamber and at the inner side of the skirt to limit its inward flexing, except for the end portion of the skirt. Inwardly of the latter multiple supports in the form of casters may be carried by the frame to yieldably resist deflection toward the chamber, so as to accommodate to unevenness at the work surface over which the apparatus is traveled while remaining held against same by vacuum suction conditions created within the chamber.

Further, limited angular deflection of the nozzle within the chamber may be accommodated by a swivel or flexible joint connection to the chamber; and the air, grit and removed particle withdrawal means may include a venturi to the throat of which auxiliary air is supplied; and the skirt may incorporate flap controlled windows through which enough air may be delivered to ensure entrainment of the grit for removal, as described, and proper pressure balance in the chamber.

Summarizing the advantages of the equipment, it enables sand blasting in a dust free menner by means of mobile and lightweight apparatus capable of use with existing auxiliary equipment at the job site; and filtration system can be used from a simple attachment at the end of the exhaust hose, to a bag house collection system; the nozzle distance is adjustable; the exhaust system is adjustable so as not to short circuit the blasted sand prior to its striking the work surface; there are no moving parts or hazardous electrical wiring; any type abrasive particulate can be used, and health and safety requirements are fully met.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following description and drawings, in which:

DRAWING DESCRIPTION

FIG. 1 is a vertical section taken through one form of apparatus embodying the invention, in use;

FIG. 2 is a reduced size and view of the FIG. 1 apparatus;

FIG. 3 is a section taken on lines 3—3 of FIG. 1;

FIG. 4 is a view like FIG. 1, but showing variable retraction of support wheels;

FIG. 5 is a section showing details of wire frame structure in the apparatus;

FIG. 6 is a perspective showing of the wire frame structure seen in FIG. 5;

FIG. 7 is an end view showing overlapping construction of the wire frame; and

FIG. 8 is an elevation showing a venturi device for reducing pressure in the interior of the FIG. 1 apparatus.

DETAIL DESCRIPTION

In accordance with the invention, a chamber **10** is provided to have an inlet **11** to receive a grit (as for example sand or other abrasive particulate) blasting nozzle **12**, the forward end of the chamber being open for approaching a work surface as seen at **100**. The chamber itself may be generally cylindrical in shape and may consist of light weight metal. Merely as illustrative, the chamber diameter may be between 10 and 14 inches, and its length L may be about the same. Further, the chamber may be lined with a thin elastomer sheet **13**, to withstand sand erosion of the chamber metal.

The inlet **11** may be defined by a tubular fitting **14** suitably attached to or carried by the chamber rear end wall **15**, and a handle **16** may be attached at **17** to the fitting **14**, to be grasped manually for maneuvering the chamber toward and away from, as well as parallel to, the work surface **100** such as a wall. The nozzle **12** is closely receivable into the fitting **14**, and engages a stop **18** on the latter to limit nozzle projection into the chamber interior **19**. For example, the nozzle tip **12***a* may be located around 12 inches from the work surface **100**, to produce a typically conical grit blast pattern indicated generally at **20**. If desired, fitting **14** may comprise a swivel or flexible joint limiting tilting of the nozzle relative to the chamber **10** to permit selective directing of the blast pattern **20** up, down or laterally relative to the work surface. Merely as an example, the nozzle may comprise Model CFSDX, a product of

Clemco-Clementina, Ltd., of San Francisco, California.

Means is provided to withdraw air and particulate from the chamber interior and creating reduced pressure conditions therein, so that removed particulate and grit are prevented from escape to the open exterior of the chamber. Such means may comprise an outlet tubular fitting **22** attached to the chamber side, as shown, a flexible hose **23** attached to the fitting leading to a suitable filter **24.** A pump or blower **25** may draw air from the filter, if desired; alternatively, a venturi **26** as seen in FIG. **8** may be installed in the fitting **22** with its throat **26***a* in series communication with the outlet **27** passage formed by the fitting **22.** Air from a pump or blower **28** supplied at **29** to the venturi header ring **30** escapes via annular outlet **31** into the throat in a downstream direction to draw air and particulate streams **32** through the venturi. Merely as illustrative, about 50 cubic feet per minute of air supplied via ring **30** to the venturi throat serves to draw 100 to 150 cfm of air flow from the blasting chamber interior, plus another 300 –400 cfm from the slits in the rubber skirt and the air intake vents in the skirt.

An open work frame is carried by the chamber **10** to project forwardly at the inner side of a flexible skirt **33** that extends about the open forward end of the chamber. One usually advantageous frame **34** includes heavy wiring removably received into the chamber via its open end **10***a* and spring urged outwardly against the chamber inner surface. Such frame wiring may include two steel rings **35** and **36** each having overlapping free ends, and four forwardly elongated heavy wire legs **37,** as seen in FIGS. **5–7.** The latter supports are equidistantly spaced about the chamber central axis, and each is welded or otherwise attached to the two rings **35** and **36.** The frame may also include a heavy metallic cylindrical screen **38** with sprially overlapping free ends, the screen carried by and at the outside of legs **37** and projecting from a point **39** within the chamber to a location **40** at a short distance (say about 1 inch) from the work surface **100.** As will be seen, the screen limits inward, suction inducted deflection of the flexible skirt **33,** and is easily removable from the chamber **10** along with the heavy wiring **34,** for maintenance purposes.

Multiple supports are carried by the chamber **10,** as via the legs **37,** to engage the work surface **100** for movement parallel thereto and to limit approach of the chamber toward that surface, the skirt **33** accordingly functioning to seal off the gap between the chamber and surface **100** except for allowing limited ingress of air as will be seen. Such supports may advantageously take the form of casters **40** carried by the legs **37,** with springs **41** yieldably resisting retraction of the casters in a rightward direction relative to the legs. If desired, the springs may be attached to the legs and may be coiled to receive the caster shafts. Accordingly, the chamber may be universally tilted relative to the wall, to limited extent, during the blasting operation and during chamber movement parallel to the wall, to accommodate itself to surface irregularities, while the skirt remains in semisealing relation to the gap between the wall and the chamber **10.** FIG. **4** shows retraction of horizontal caster wheels as might occur during travel over an obstruction **99.**

The referenced skirt **33** may consist of elastomer and be wrapped spirally about the chamber forward end portion **10**b, with attachment thereto. Further, the skirt extends forwardly to engage at **43** the work surface **100,** and it contains longitudinal slits **44** to allow or control limited ingress of air to the chamber interior and directly about the work surface zone subject to blasting. The spiral wrapping of the skirt may be such that two layer of skirt material extend about that zone, with the slits in adjacent layers in non-registered relation.

The screen **38** limits inward deflection of the skirt except for the "curtain" sections between the slits adjacent the work surface, those sections deflecting inwardly to allow additional air flow radially inwardly adjacent the blast zone to balance the exhaust system's demands. Such deflection is limited by the resiliency of the elastomer to prevent outward escape of particulate.

Finally, FIGS. **3** and **5** show the provision of window flap valves **60** carried by the skirt **33** and adapted to swing inwardly as viewed in FIG. **5** to admit air inwardly through windows **61** in the skirt, to maintain a steady flow to the exhaust system. If the pressure in the chamber interior ever increases, the flap valves will swing against the skirt to close the windows, preventing egress of grit particles.

I claim:

1. In grit particle blasting equipment, the combination comprising

a. a chamber having an inlet to receive a grit blasting nozzle, a forward end of the chamber being open for approaching a work surface toward which the nozzle is directed,

b. multiple supports carried by the chamber to engage said surface for movement parallel thereto and to limit the approach of said chamber open forward end toward said surface,

c. means to withdraw air and grit particles from the chamber interior creating reduced pressure conditions therein,

d. a flexible skirt extending about the open forward end of the chamber and projecting forwardly of the chamber to extend adjacent said work surface for confining grit particles against escape outwardly of the skirt, the skirt containing slits to pass air streams drawn into the chamber by said reduced pressure conditions, and

e. an openwork frame carried by the chamber to project forwardly and limit inward deflection of the skirt so that the skirt may remain adjacent said surface during chamber movement parallel to said surface.

2. The combination of claim **1** wherein said frame is removably received into said chamber via said open end thereof.

3. The combination of claim **2** wherein said frame includes wiring spring-urged outwardly against the chamber inner surface for frictional retention, and a metallic screen projecting at the inner side of said skirt and forwardly of the open end of the chamber.

4. The combination of claim **1** wherein said multiple supports comprise casters carried by the frame to yieldably resist deflection toward the chamber.

5. The combination of claim **3** wherein said multiple supports comprise casters carried by the frame at the forward end thereof and spaced about an axis defined by the frame cylinder, and springs resisting caster deflection toward the chamber.

6. The combination of claim **1** wherein said air and grit withdrawal means comprises an outlet at the side of the chamber, and a venturi having a throat in com-

munication with said outlet and to which air may be supplied to draw air and grit from said chamber.

7. The combination of claim 1 including a swivel fitting at said inlet to accommodate limited angular deflection of the nozzle.

8. The combination of claim 1 including said nozzle received in said inlet.

9. The combination of claim 5 wherein said wiring includes at least two expansible wire rings and forwardly extending legs attached thereto, the legs carrying said casters.

10. The combination of claim 1 including a window opening in the skirt, and a flap valve closure for said window and carried to swing inwardly away from the window in response to air pressure reduction in the chamber interior.

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