

## United States Patent Office

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3,031,802

## BLAST MACHINE SEALING MEANS

Raymond M. Leliaert, South Bend, Ind., assignor to Bell Intercontinental Corporation, South Bend, Ind.  
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This invention relates to blast machines, such as are used for abrading, polishing, peening, cleaning, surface hardening, and the like. Specifically, the invention relates to improved means for sealing the passageways or openings through which workpieces are admitted or discharged from the chambers or enclosures within which the blasting operations are performed by machines of such types as are shown for example in U.S. Patents 2,338,591, 2,460,989 and 2,924,911.

Such blasting machines as are used for example in de-scaling, deburring, deflashing, or cleaning and polishing of weldments or castings of metal and other materials, as well as for shot-peening and similar operations, require the use of effectively sealed cabinets or enclosures surrounding the blasting operations, both to protect attendant personnel and to prevent loss or waste of the shot or other abrasive media. It has long been a problem to effectively seal access holes and workpiece inlet-outlet openings in such machines especially for working on long workpieces which must be progressively fed through the blast chamber, or when fed by a conveyor moving workpieces continuously through the blast chamber; and previously developed mechanical sealing means such as flaps of rubber, labyrinth baffles, and so forth, all have serious shortcomings. The problem is especially difficult when using relatively heavy iron or steel shot as the blasting media, because under such circumstances the prior art seal devices do not perform efficiently even when new, and, tend to deteriorate in use under the impact and abrasion effects of the blasting particles.

In my recently issued Patent No. 2,924,911, I disclosed an improved type of seal for such purposes, which I call a magnetic type seal; but it is an object of the present invention to provide a still further improved type of magnetic seal means for sealing blast enclosures through which are moving workpiece carrying conveyors of certain shapes of long workpieces such as H beams, channels, I beams, and the like, which will operate in improved manner to prevent escape of the blasting media from the enclosures.

Another object of the invention is to provide an improved sealing means as aforesaid which comprises a sealing curtain of novel form which is self-sustaining and conformable with improved efficiency to a wide variety of moving conveyor or workpiece shapes.

Other objects and advantages of the invention will appear from the specification hereafter and the accompanying drawings wherein:

FIG. 1 is a vertical sectional view of a shot blasting machine utilizing one form of the sealing means of the invention;

FIG. 2 is a fragmentary sectional view, on enlarged scale, taken on line II—II of FIG. 1;

FIG. 3 is a fragmentary sectional view taken along line III—III of FIG. 2;

FIG. 4 is a sectional view taken on line IV—IV of FIG. 3;

FIG. 5 is a view corresponding to FIG. 2 but of another form of sealing means of the invention;

FIG. 6 is a section taken on line VI—VI of FIG. 5;

FIG. 7 is an enlarged scale sectional view of one of the seal components, taken on line VII—VII of FIG. 8 and illustrating the magnetic operation thereof;

FIG. 8 is a fragmentary longitudinal sectional view, partly in elevation, of a seal component of the invention;

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FIG. 9 is a view corresponding to FIG. 8, but of a modified form of sealing component of the invention;

FIG. 10 is a view corresponding to FIG. 3 but showing use of another form of sealing component; and

FIG. 11 is a section taken on line XI—XI of FIG. 10.

As set forth in my prior patent 2,924,911 it has been discovered that where a ferrous or other magnetizable particle media is being used in a blasting operation, an improved sealing arrangement may be provided by using the media itself as the sealant. In such case the magnetizable quality of the abrasive media is utilized by subjecting it to the effects of a magnetizing arrangement adjacent the opening to be sealed, thereby setting up a magnetic field across the opening and causing the blast media particles to accrete and close off the opening. The present invention utilizes the same phenomenon, but provides a supplemental blast media support, making the seal more effective in connection with deeply recessed workpieces or conveyors moving through the machine cabinet.

More specifically, FIGS. 1—4 illustrate an example of a blast chamber sealing means of the invention, which is arranged especially for workpieces having deep vertical recesses such as in the case of the I beam or H beam type; and wherein a machine housing 10 is provided with a centrifugal throwing wheel 12 mounted in its upper deck portion. The wheel 12 is fed abrasive or other blast material from a hopper 14 through a chute 16 and elevator 18. The lower side walls of the enclosure 10 incline to direct the spent blast media to flow into a trough-like bottom portion 19 of the enclosure, for delivery to the feed elevator 18 by means of a screw conveyor as indicated at 20.

As shown in FIG. 1, the housing 10 is provided with an opening or vestibule 22 at each end thereof so that a working carrying conveyor or a workpiece as indicated at 24 may be progressively fed therethrough. Hence, the lengths of the workpieces to be treated are not limited by the size of the cabinet 10. To be effective, the sealing means for these openings must closely surround and complement the sectional forms of the conveyor and/or workpieces; and in order that the seals be not limited to use with any one size or sectional shape of workpiece, they must be flexible and capable of adapting themselves to fit variously shaped and dimensioned workpieces while still providing optimum sealing effects.

In accordance with the present invention, flexible magnetized curtain means are disposed to close the openings while permitting free entrance and exit of workpieces therethrough. The magnetized curtain means include flexible magnetizable bristle-like components which magnetically attract the ambient blast media particles and cause them to accrete against the curtain components and between them and the workpieces passing therethrough, thereby forming an overall curtain of the media. I have found that such curtains of abrading media formed upon skeletons of flexible support members, provide intimate and tight and very effective seals against loss of blast media from the enclosure, while the workpieces and/or feeding conveyor may be readily pushed through the curtains while displacing only the magnetized particles they locally encounter. The blast media particles surrounding the sides of the workpieces maintain close, firm seals therearound which automatically shape and reshape themselves to objects being thrust therethrough without leaving openings through which media may escape.

As shown in FIGS. 1—4, the flexible support members may be formed of coiled steel spring form as indicated at 26 and are anchored at their root ends in sill plates 28—28 carried by top and bottom non-magnetic steel elements 30—30. The frame structure is completed by non-magnetic side plate members 31—31, assembled as

by means of screws 32, thus framing the workpiece access opening of the cabinet vestibule 22. The springs 26 are thereby disposed in cantilever extending relation from the top and bottom levels of the framed opening towards the horizontal center plane of the opening; and thus the upper and lower curtains of springs mutually abut at the center when no workpieces interfere. However, as shown in FIGS. 1, 3, when a workpiece such as shown at 24 is thrust into the opening the springs of the curtains flex and conform to the sectional shape of the workpiece while permitting it to be moved in any desired direction relative to the framed opening. Preferably, the workpiece will be supported upon rollers or the like as shown at 34 so as to be disposed to run through the framed opening at approximately its center, but it will be appreciated that the flexibility of the curtain springs will permit the curtains to adjust to any other disposition of the workpieces.

Means for magnetizing the springs 26 may be provided to comprise permanent magnets of bar form as indicated at 36, 38 disposed flatwise across the top and bottom sills of the frame piece 30, which are in turn capped (top and bottom) by pole pieces of metal as indicated at 40—40. Vertically standing pole pieces 42—42 are also provided at opposite sides of the opening (FIG. 2) and are insulated from the frame 30 by wooden spacers 43—43. Thus, magnetic flux paths as indicated at 44 (FIG. 2) are established so as to magnetically saturate the curtain springs 26. This magnetization of the curtain springs causes them to attract and hold the blast media particles which come into contact with the curtains; the springs being preferably relatively staggered and disposed to provide curtains of substantial depths as shown in FIG. 1 comprising labyrinths of magnetized bristle-like devices which function to trap any blast media impinging thereagainst.

FIGS. 5 and 6 correspond to FIGS. 2 and 3 but show an alternative disposition of the curtain springs 16 whereby they are mounted to extend horizontally from cantilever mountings at the opposite side walls of the frame 30 toward the center vertical plane of the opening. Thus, the springs 16 are better adapted to extend into deep lateral recesses; for example, into brush-sealing contact with the web portions of H or I beam type workpieces as indicated at 50. Thus it will be appreciated that various alternative arrangements for supporting and directing the curtain springs toward the workpieces to be handled may be employed. In any case, the object is to substantially fill the blast cabinet access opening with a curtain of resilient bristle-like devices which will permit workpieces to be moved therethrough and which are magnetized to induce accretion of shot blast media thereon so as to develop a barrier permeable to workpiece travel but substantially impermeable to blast shot escape.

Whereas the spring devices 16 may be of simple leaf or coil spring form and magnetized as explained hereinabove, their magnetization characteristics may be provided and/or enhanced by using a hollow type spring and filling them with a magnetizing agent such as a plastic magnetic material. For this purpose a material known in the trade as "Indox 1" mixed with a plastic such as the Goodrich Corp. product known as "Koroseal Magnet Type 1" may be employed to provide a suitable vinyl-ceramic magnet mixture. FIGS. 7—8 of the drawing herewith illustrate at 52 disposition of such a magnetic material within the coil springs 26; and it will be appreciated that the plastic nature of the filler material 52 will permit the springs to flex for the purposes explained hereinabove while at the same time providing active magnetization of the curtain elements for entrapment of blast shot as explained hereinabove. FIG. 9 illustrates an alternative arrangement wherein magnetized marbles 54 of metal or ceramic or the like are loaded within coil springs 26 to effect magnetization thereof also without interfering with their flexibility characteristics.

As shown in FIGS. 10 and 11, the curtain spring devices may be provided in the form of batteries of brushes

60 comprising bristles of magnetizable spring steel or the like arranged in staggered gang relation; the bristles being rooted in clamp devices 62 carried in channels 64 which are spaced apart by steel bars 66. Thus, the assemblies are readily welded or otherwise suitably fastened to the aperture frame structure 68. As explained hereinabove in connection with FIGS. 1—3, the bristles of the brushes 60 may be magnetized by mounting permanent bars 70, 72, 74 above and below the top and bottom sills respectively of the frame 68; and by providing top and bottom pole pieces 76, 78, and side pole plates 80—80. Insulation cheek plates of aluminum alloy or the like as indicated at 82—82 may also be provided for the work loading aperture; and being of non-magnetic material will not interfere with proper flexing motions of adjacent bristles of the magnetized curtain.

As shown in FIG. 10, the magnetic curtain vestibule covering the workpiece loading aperture 84 of the blast cabinet may be provided if desired with a supplemental vestibule 85 enclosing a plurality of shot clean-off brushes 86. The brushes 86 may comprise bristles formed of nylon or the like, arranged to extend across the outer opening 88 of the magnetic sealing vestibule in such manner as to scrub against the workpieces as they pass by, to scrape off any blast shot still clinging to the workpiece. Thus, the recovered blast media may be collected below the supplemental vestibule 85 and returned to the blast operation by any suitable means.

It will of course be appreciated that although only a few forms of the invention have been shown and described in detail, various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, and a curtain of flexible magnetized members traversing said opening and projecting a magnetic field across the opening, whereby flying blast media will become entrained by said magnetic field and agglomerate on said flexible members to form a wall of media particles clinging together in such manner as to close said opening against passage therethrough of other projectile media particles while permitting penetration and/or withdrawal of workpieces therethrough.

2. A blast finishing machine comprising, a casing having reception openings at opposite sides thereof for workpieces of length dimensions greater than the width of said machine casing, a blasting media projecting machine discharging magnetizable media into the interior of said casing, flexible magnetizable curtain members substantially closing said openings and means operable to project a magnetic field spanning each of said openings, whereby magnetizable blast media will become entrained by said magnetic fields and cling to said curtain members to form walls of media particles reinforced by flexible members permitting penetration and/or withdrawal therethrough of workpieces while hugging the workpieces to block passage of other projectile media particles.

3. A blast finishing machine comprising, a casing having a workpiece accommodating opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, magnetizable flexible curtain devices across said opening, magnet means disposed to bracket said opening and operable to magnetize said curtain devices, whereby media from within said casing will become entrained by said magnetized curtain and agglomerate to form a wall of clinging media particles operable to block passage therethrough of other projectile media particles while permitting penetration and/or withdrawal therethrough of workpieces, the openings through said wall made by passage of workpieces being automatically self-healing.

4. A machine comprising a casing enclosing projectile

magnetizable particles and having a workpiece reception opening, magnetizable flexible bristle means extending across said opening, and magnet means disposed adjacent said opening and operable to magnetize said bristles, whereby projectile media moving into the range of said magnetized bristles will become arrested thereby and agglomerate to form a wall of media particles clinging together in such manner as block passage therethrough of other projectile media particles while permitting penetration and withdrawal therethrough of workpieces.

5. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, magnetizable flexible bristle means extending across said opening, magnet means disposed adjacent said opening and operable to project a magnetic field extending from the marginal edge of said opening to the workpiece disposed therein, whereby media moving into the range of said magnetic field will become arrested thereby and agglomerate to form a seal of media particles clinging together in such manner as block passage therethrough of other projectile media particles while permitting relative movement between said machine and said workpiece.

6. A blast finishing machine adapted for relative movement operation upon a large workpiece surface, said machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, magnetizable flexible spinelike members extending across said opening and cooperating to substantially close the latter, and means operable to project a magnetic field extending inwardly from the marginal edges of said opening towards the workpiece when disposed in operative position, whereby projectile media moving into the range of said magnetic field will agglomerate to form a seal of media particles clinging together in such manner as to block passage therethrough of other projectile media particles while permitting relative movement between said machine and said workpiece.

7. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, magnetizable flexible curtain devices across said opening, magnet means disposed adjacent said opening and operable to establish a magnetic field extending from the marginal edge of said opening towards the workpiece disposed therein and means delivering media into the range of said magnetic field to form a sealing curtain of media particles blocking passage therethrough of other projectile media particles while permitting movements of workpieces relative to said opening.

8. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, and a curtain of flexible cantilever spine-like fingers across said opening and operable to substantially span the opening, whereby media will become entrained by said fingers and agglomerate to form a wall of media particles closing said opening against passage therethrough of other projectile media particles while permitting penetration and/or withdrawal therethrough of workpieces.

9. A blast finishing machine comprising, a casing having a reception opening at one side thereof for a workpiece of a length dimension greater than the width of said machine casing, a blasting media projecting machine discharging magnetizable media into the interior of said casing, flexible curtain members across said opening, magnet means operable to project a magnetic field spanning said opening whereby magnetizable media will become entrained by said magnetic field and cling together to form a wall of media particles permitting penetration

and/or withdrawal therethrough of workpieces while hugging the workpieces to block passage of other projectile media particles.

10. A blast finishing machine comprising, a casing having a workpiece accommodating opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, magnetizable wire spring devices mounted to project across said opening, magnet means disposed to bracket said opening and operable to magnetize said spring devices whereby media from within said casing will become entrained by said magnetized springs and agglomerate to form a wall of clinging media particles operable to block passage therethrough of other projectile media particles while permitting penetration and/or withdrawal therethrough of workpieces, the openings through said wall made by passage of workpieces being automatically self-healing.

11. A machine comprising a casing enclosing projectile magnetizable particles and having a workpiece reception opening, flexible bristle means extending across said opening, and magnet means disposed adjacent said opening and operable to project a magnetic field thereover whereby projectile media moving into the range of said bristles will become arrested thereby and agglomerate to form a wall of media particles clinging together in such manner as block passage therethrough of other projectile media particles while permitting penetration and withdrawal therethrough of workpieces.

12. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging magnetizable media into the interior of said casing, and a curtain formed of flexible magnetizable coil springs disposed to span said opening, and means operable to project a magnetic field across the opening, whereby media will become entrained by said magnetic field and said springs and agglomerate to form a wall of media particles clinging together in such manner as to close said opening against passage therethrough of other projectile media particles while permitting penetration and/or withdrawal therethrough of workpieces.

13. A blast finishing machine comprising, a casing having a reception opening at one side thereof for a workpiece of a length dimension greater than the width of said machine casing, a blasting media projecting machine discharging magnetizable media into the interior of said casing, and a flexible curtain formed of coil springs traversing said opening, and magnetized filler means carried by said coil springs interiorly thereof whereby projectile blast media will become attracted to said curtain and cling together to form a wall of media particles permitting penetration and/or withdrawal therethrough of workpieces while hugging the workpieces to block passage of other projectile media particles.

14. A blast finishing machine adapted for relative movement operation upon a large workpiece surface, said machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine discharging paramagnetic media into the interior of said casing, a curtain formed of flexible elongate spring devices extending across said opening, and magnet means carried by said spring devices whereby projectile media moving into the range of said magnet devices will agglomerate to form a seal of media particles clinging together in such manner as block passage therethrough of other projectile media particles while permitting relative movement between said machine and said workpiece.

15. A blast finishing machine comprising, a casing having a workpiece reception opening, a blasting media projecting machine for discharging magnetizable media into the interior of said casing, a plurality of bristle-like magnetizable spring elements secured in cantilever fashion to oppositely disposed portions of said casing defining said workpiece reception opening therein, said spring

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elements being of lengths such as to substantially close said opening and to substantially meet along a line extending through the central region of said opening, means mounted on said casing adjacent said workpiece opening for establishing a magnetic field through said spring members tending to align the same across said opening, and means for supporting a workpiece for intro-

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duction into said casing through the central region of said opening whereat said spring elements tend to meet.

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R. M. LELIAERT

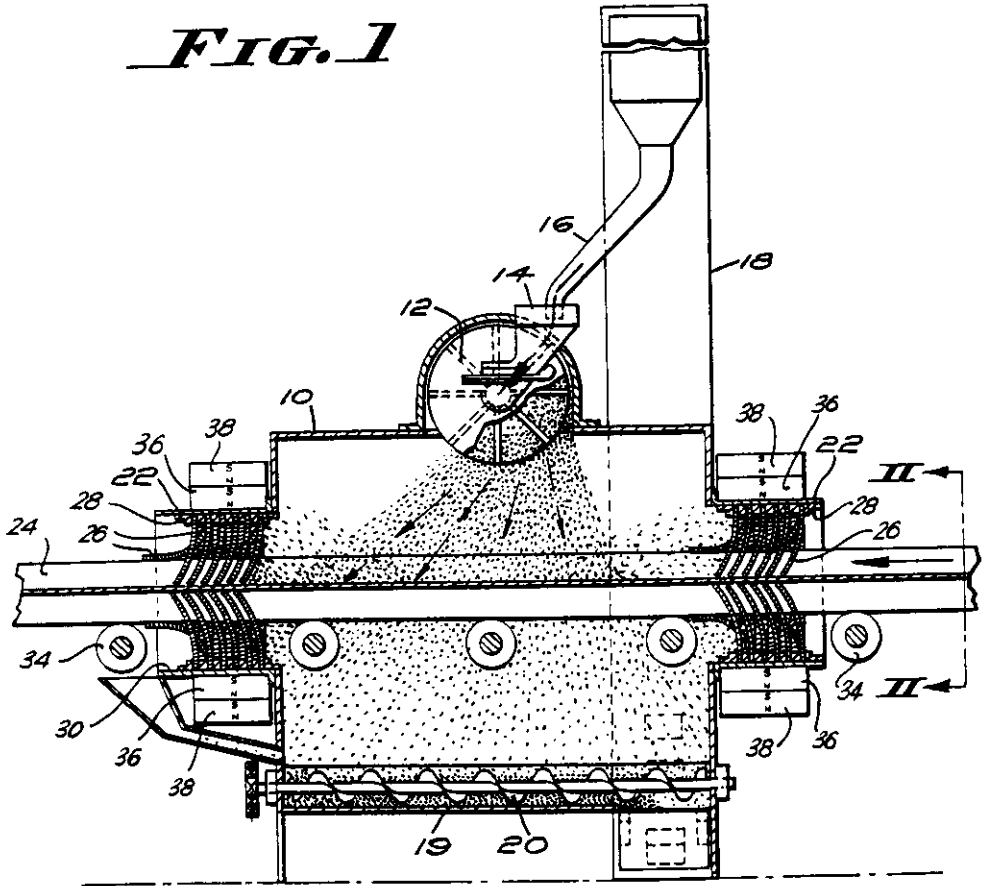
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BLAST MACHINE SEALING MEANS

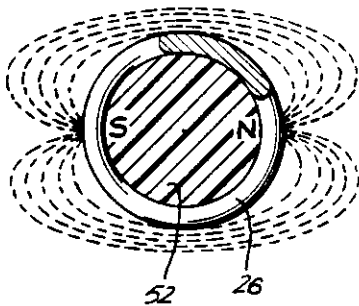
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4 Sheets-Sheet 1

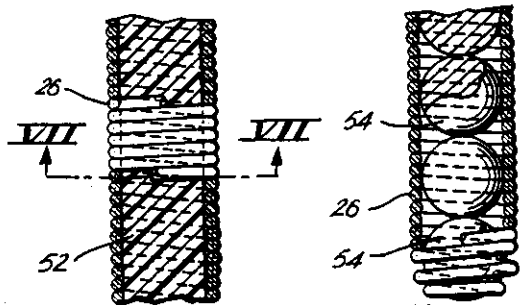
**FIG. 1**



**FIG. 7**



**FIG. 8 FIG. 9**



INVENTOR:  
RAYMOND M. LELIAERT  
Beau, Brooks, Buckley & Beau,  
ATTORNEYS.

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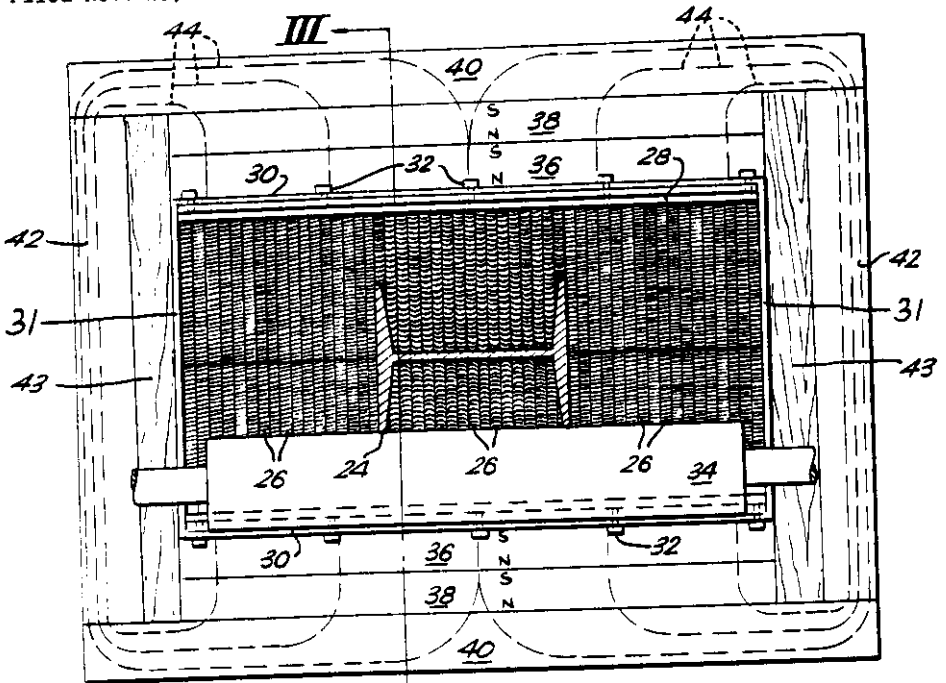


FIG. 2 III

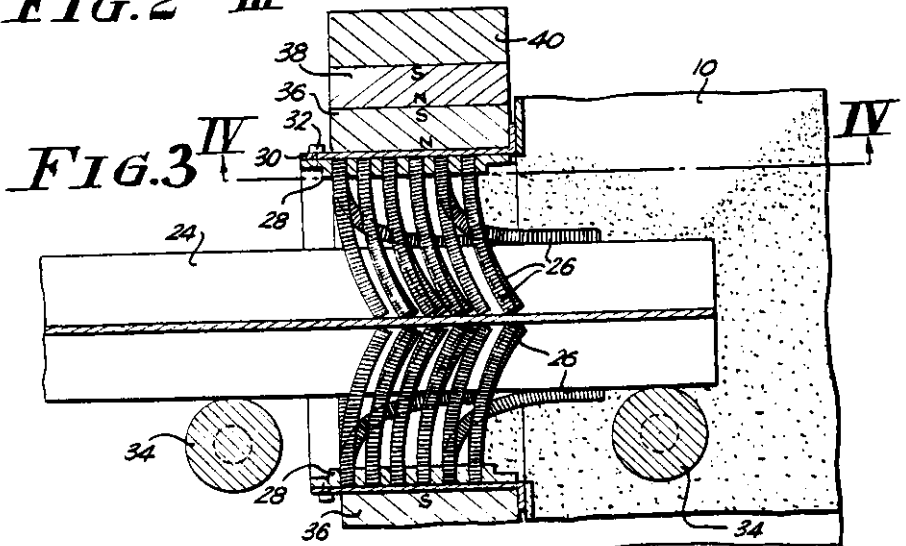


FIG. 3 IV

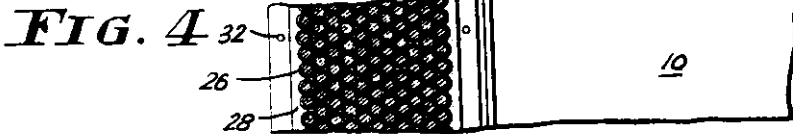


FIG. 4

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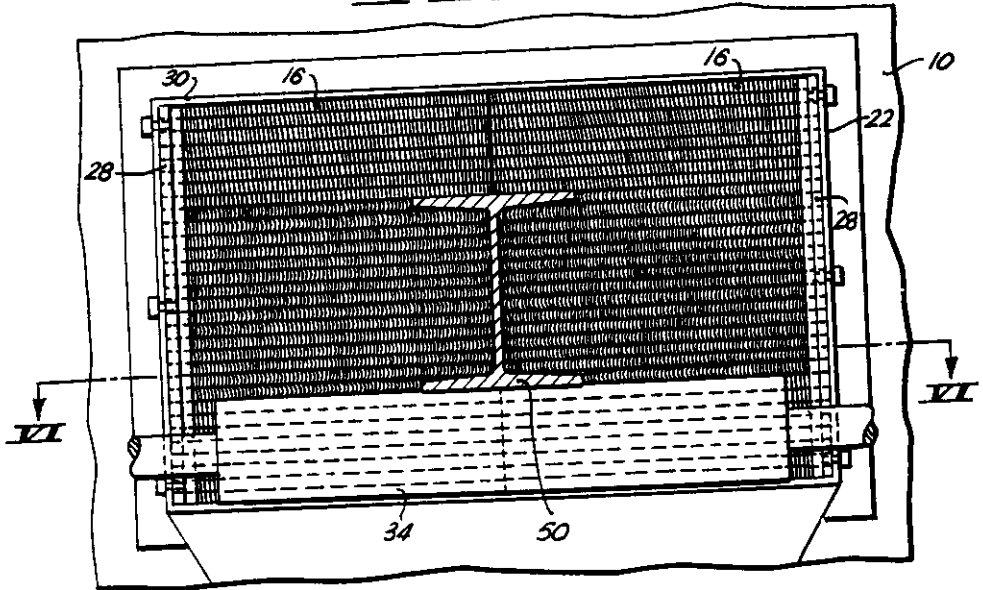
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BLAST MACHINE SEALING MEANS

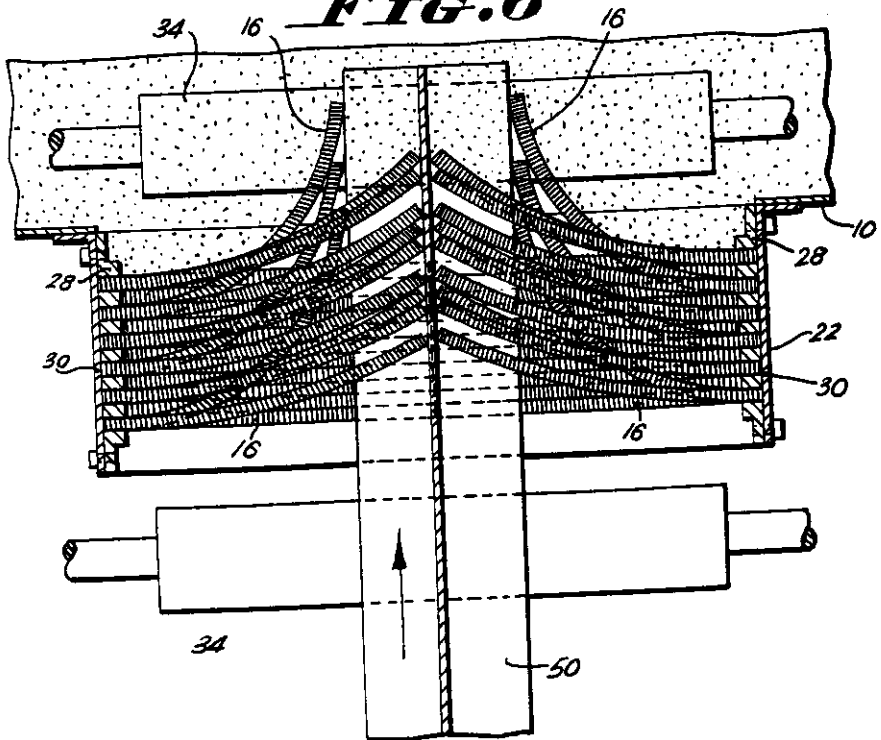
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**FIG. 5**



**FIG. 6**



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R. M. LELIAERT  
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FIG. II

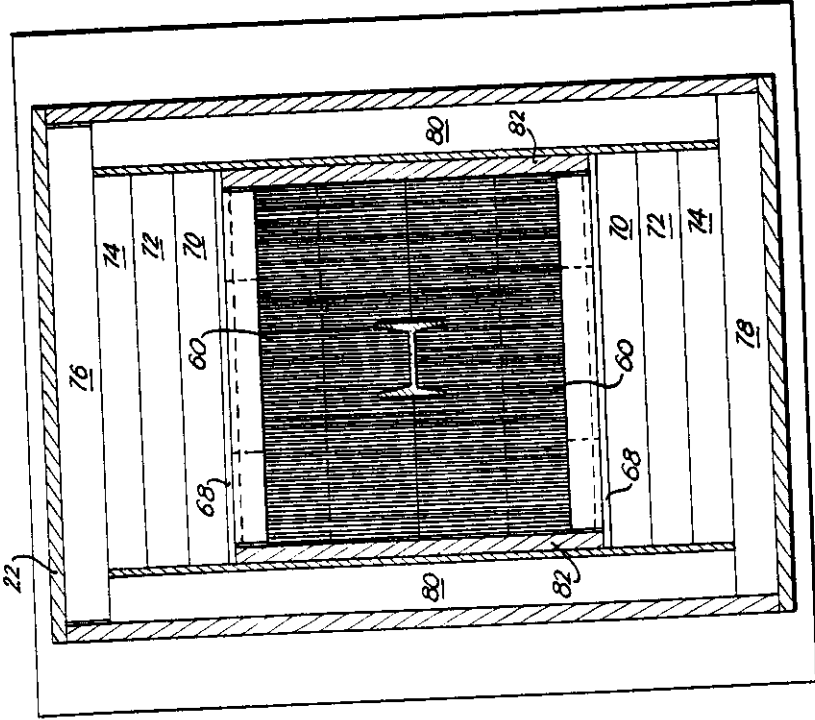


FIG. I

