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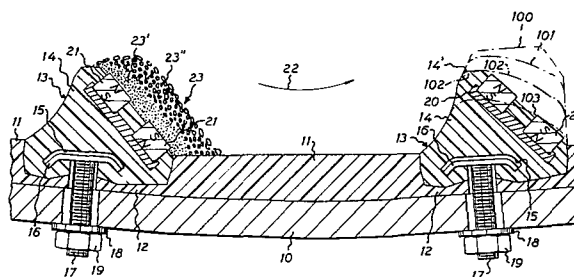
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54 **Wear and abrasion resistant wall structure, particularly for mills for grinding a charge comprising magnetic material.**

57 An abrasion or wear resistant wall structure, particularly a wall in a mill for grinding a charge including magnetic material, has at least the side subjected to abrasion formed by an abrasion resistant wall material, for example in the form of shell plates (11) and lifters (13). The wall structure has magnet means (21) so placed as to attract magnetic particles in the charge and retain said particles as an additional, automatically regenerating abrasion protective layer (23) on the side of the wall subjected to abrasion.



WEAR AND ABRASION RESISTANT WALL STRUCTURE, PARTICULARLY
FOR MILLS FOR GRINDING A CHARGE COMPRISING MAGNETIC MAG-
TERIAL

The present invention relates to a wear and abra-
sion resistant wall structure which in use is subjected
to abrasion by lump or particulate material comprising
magnetic particles. Such walls may have the form of
5 wall surfaces in chutes, ducts, conveyor belt unloading
stations etc., but above all in mills. In the mining
industry use is thus made of mills for grinding ore,
in which the walls are subjected to heavy wear and are
therefore constituted by or coated with a wear and
10 abrasion resistant wall material. Such mills may com-
prise ball or rod mills for grinding ore containing a
given amount of magnetic material. The mills may be
of the type for primary and secondary grinding in which
the material to be ground consists of magnetic material,
15 for example magnetite, and in which the coarse material
of the charge constitutes grinding balls or pebbles,
so-called autogenous grinding.

As already mentioned, the mills for such purposes
must have a wear and abrasion resistant inner side.
20 Therefore, the mills are often provided with a lining
of abrasion resistant material, such as elastomeric
or plastic material, ceramic material or sometimes
steel material. The lining of abrasion resistant ma-
terial is usually fastened by mechanical means such as
25 fastening bolts, clamping ribs or like means. How-
ever, in U.S. Patent 3,913,851 (October 21, 1975, Sven
E. Andersson) the inventor suggests that a wear re-
sistant rubber lining for mills and chutes be mag-
netically retained to the inner side of the mill bar-
30 rel or chute in that the side of the wear resistant
rubber layer facing the barrel or chute has been laminated
with a layer of permanent-magnetic material.

Mill linings mainly have two tasks. One is to provide a protection for the mill barrel and the end walls thereof against mechanical and corrosive abrasion, and the other is to transmit energy from the mill to the charge.

5 This implies that the appearance of the inner side of the mill, the so-called profile, is of great importance to the grinding capacity, particularly in secondary grinding (fine grinding).

It has also been tried to improve the function and
10 durability of the mill lining in various ways and use has been made of sundry materials having different profiles on the inner side of the lining. Especially in handling hard minerals, such as sulphide and the like ores, steel material has had a relatively short life
15 because a not negligible loss of material has arisen by corrosion in wet grinding apart from the factual and virtual mechanical abrasion. It has therefore been tried to use rubber as a substitute for steel linings. In addition to its good wear resistant properties, compared to steel, rubber has a better resistance to
20 corrosion and also a sound reducing effect on the grinding operation. Further, the rubber lining is considerably more lightweight than steel linings. However, an inherent disadvantage of rubber is its lesser ability
25 to withstand sliding abrasion, as compared to steel. In conventional mill linings having longitudinal shell plates and so-called lifters, it is important that said lifters are replaced when they have been subjected to so heavy an abrasion that the charge begins to
30 slide along the lining. When the lifters are exposed to sliding abrasion, they are thus subjected to accelerated wear, and as a consequence the interjacent shell plates will also commence to be rapidly worn. To realize a good lining economy the lifters therefore have
35 to be replaced in due time; usually three to four sets of lifters are worn out for each set of shell plates. Change of lifters is effected at a time when the lining

profile is better than that of a new lining, as for capacity and fine-grinding properties. After a change of lifters the grinding capacity may often be lowered by 10-20%.

5 Rubber lifters thus suffer from the drawbacks that the grinding capacity will vary considerably during their life of use and that the lifters will have to be changed when the lining profile is at its best; in other words, one must allow for a running-in period of
10 lower capacity and undesirable coarse rests in the discharged material ground. This particularly applies to fine grinding operations in mills running at a speed of over 75% of the so-called critical speed.

Exchange of lifters and barrel plates involves quite
15 some costs in terms of dismounting and mounting as well as standstill costs.

It would be highly desirable that a mill lining could be worn to the same extent all over the lining and that the life thereof could be extended to periods
20 of one year or more so that the necessary exchanges could be performed during normal standstill periods, that is the holiday period.

To eliminate the need for lifters in ball mills, Norwegian Patent 22,213 suggest the use of electromagnets
25 for lifting, during the rotation of the mill, the grinding balls of magnetic material to the requisite height level and then letting them fall onto the material being ground. According to said Norwegian Patent the electromagnets are arranged close to the outer side of
30 a mill barrel consisting of lamellae of magnetizable material, the arrangement being such that the grinding balls are retained against the mill barrel solely as they are lifted to a suitable level.

In mills for grinding non-magnetical material,
35 electromagnets have also been used for magnetic separation of undesirable magnetic substances in the material being ground. Such a magnetic separating apparatus

is disclosed by German Patent 482,598. In this case the electromagnets thus do not serve as a substitute for lifters but to separate the undesirable matter and safeguard that said matter is discharged through the respective outlet of the separating apparatus.

One object of the present invention therefore is to improve the linings of prior art mills and to permit extending their life.

Another object of the invention is to provide a wear protection for walls automatically regenerating itself.

A further object of the invention is to provide a mill barrel with means producing an automatically regenerating wear protection on the inner side of the mill barrel.

It is often desirable to have the possibility of increasing the speed of rotation of the mill since the grinding capacity rapidly increases, as the speed increases up to and over the so-called critical speed. At a speed of 80-85% and more of the critical speed the lining profile cannot comprise lifters but the lining must present a smooth inner side. During grinding the lining will thereby be exposed to sliding abrasion, from which an accelerated wear results. Comprehensive grinding experiments with secondary grinding (fine grinding) at so-called supercritical speed have proved to yield very good grinding results. However, this type of grinding could not be made economically profitable because the current lining materials would entail too high lining costs. To improve the life of the lining the wear due to sliding abrasion of the lining must be reduced. Still another object of the invention therefore is to reduce the wear due to said sliding abrasion also in this type of mills.

For the realization of the above objects the present invention provides a wear and abrasion resistant wall structure which in use is subjected to abrasion

by lump or particulate materials comprising magnetic particles. At least the side of the wall structure which is subjected to wear and abrasion is preferably constituted by or coated with an abrasion resistant wall material, for example in form of shell plates and lifters.

According to the invention, the wall structure shall have magnet means so placed as to attract magnetic particles in the charge and retain said particles in the form of an automatically regenerating abrasion protective layer on the surface of the wall structure subjected to wear and abrasion, within at least such zones as are normally exposed to a heavier abrasion than the other zones of the wall structure.

When the invention is utilized for mills driven at high speed and having a smooth inner side, the harmful sliding abrasion can be restricted by furnishing the smooth lining, in conformity with the present invention, with magnets in a system that provides an all-covering bed of magnetic particles, a "fluidized bed", which is magnetically retained in such a profile that the charge is raised to a suitable level for maximum grinding capacity. Abnormal shearing forces between the charge and the mill barrel are taken up in said fluidized bed, thereby preventing an exaggerated sliding directly against the inner side of the lining.

When the invention is to be utilized for the grinding of non-magnetic material, such as sulphide ores, one must add magnetic material, for example magnetite, to the charge to obtain the automatically regenerating abrasion protective layer on the lining. The magnetic material should be relatively fine-grained (up to about 5 mm). As the finer material will come to lie at the mill barrel the magnetic material will place itself at the zones on the lining to be coated with the automatically abrasion protective layer. Magnetic residues, if any accompanying the ground material out of the mill can be collected by causing the ground material to pass a simple

magnetic separating drum of conventional construction at the outlet of the mill. These residues can then again be introduced into the grinding cycle or be otherwise collected.

5 A great advantage which is inherent in the present invention is that the magnetic circuit when permanent magnets are used will be constantly closed, on the one hand, by metal inserts or the mill barrel or drum made from a magnetic metal material and, on the other hand, by the
10 fine-grained layer of magnetic particles attracted by the magnets. This will automatically provide a good safety against demagnetization.

As mentioned in the foregoing, it has already been suggested to use magnetism in conjunction with mill barrels. In the mill disclosed by U.S. Patent 3,913,851
15 the abrasion and wear resistant elastomer lining of the mill is kept in position against the inner side of the mill barrel by magnetism. In this case, the elastomer lining proper is thus kept in position by magnetic
20 forces replacing the normal mechanical anchorage of the lining. With the exception of the embodiment shown in Fig. 3 of this patent, there is no closed magnetic circuit on the side of the magnets remote from the mill barrel, and, thus, there is a great risk of successive demagnetization.
25

The present invention however is based on the realization that magnetism might be used to provide an automatically regenerating wear protection layer for the inner side of the mill barrel, which may in itself
30 self have been formed from an abrasion and wear resistant material, for example elastomeric material. The invention is thus based on a technical idea different from that of the U.S. Patent 3,913,851.

In the mill disclosed by the above-mentioned Norwegian Patent 22,213 the grinding balls of iron shall
35 be lifted in relation to, and then be allowed to fall down onto, the material which is to be ground and which there-

fore shall not partake in the lifting operation in which the magnetic grinding balls of iron are attracted against the inner side of the mill barrel by the stationary electromagnets arranged outside the mill barrel. In
5 said prior art mill the object of the electromagnets is a different one from that of the magnets in the wall structure exposed to wear according to the present invention and besides the magnetization is supposed to be temporarily interrupted for release of the grind-
10 ing balls such that said balls can fall onto the material being ground, which stays by gravity in the lower region of the mill by sliding along the mill barrel, thereby exposing it to abrasion and necessitating a lining of abrasion resistant material even though the
15 wear caused by the grinding balls proper has been reduced. The present invention has another object namely that of providing a wear protection which protects the wall structure, particularly the mill wall, against abrasion and which automatically regenerates
20 itself.

These and further objects of the invention as well as the advantages gained thereby will appear in the course of the following description of some preferred embodiments illustrated in the accompanying drawings
25 in which:

Figs. 1-3 illustrate three embodiments of a mill having a wall structure in accordance with the present invention and show sections through part of the mill barrel and the lining fixed thereto;

30 Figs. 4 and 5 illustrate a further embodiment of a mill having a wall structure in accordance with the present invention, Fig. 5 showing a section on line V-V in Fig. 4;

Figs. 6-9 show sections of further embodiments of
35 mills having wall structures in accordance with the invention;

Figs. 10 and 11 illustrate an embodiment of a stan-

dardized wall element exploiting the principles of the invention, Fig. 10 showing a cross-section on line X-X in Fig. 11, and Fig. 11 showing a longitudinal section on line XI-XI in Fig. 10;

5 Fig. 12 shows a section corresponding to Fig. 10 when the standard element is mounted in a mill barrel; and

 Fig. 13 illustrates how the principles of the invention may be applied to protect other wall structures
10 than those in mill barrels.

 The mill shown in Fig. 1 has a mill barrel 10 with a lining clamped to the inner side thereof. Said lining comprises shell plates 11 of wear resistant rubber and has protruding fastening flanges 12. The lining also
15 comprises lifters 13 which include an elastomer or rubber portion 14 with an undercut groove 15 therein for accommodating a metal bar 16 with bolts 17 welded thereto which project through holes in the mill barrel and cooperate with washers 18 and nuts 19. T-bolts may be
20 substituted for said bolts and said bars. The mill lining 11, 13 is thus kept in position in that the protruding fastening flanges 12 of the barrel plates 11 are clamped to the mill barrel 10 by means of the metal bar 16 located in the undercut groove 15 of the lifters
25 14. Other methods for fastening the lining also fall within the scope of the invention.

 According to the invention, the lifters 13 have been provided with inserts 20, to which a number of permanent magnets 21 are secured. The permanent magnets project slightly from the surfaces of the lifters
30 13 at their leading sides when the mill rotates in the direction of the arrow 22. It may sometimes be advantageous however to have the permanent magnets terminate immediately below the surfaces of the lifters. The
35 south and north poles of the permanent magnets 21 are alternately facing outwards and the permanent magnets

will thus attract magnetic particles in the charge of the mill such that said particles are retained in the form of a layer 23. This layer serves as an automatically regenerating wear protection means for the lifters 13 since the charge impinges upon said layer and is prevented from exerting an equally heavy abrading effect on the lifters as if no layer 23 existed. The magnetic particles in the layer 23 may certainly come loose when the charge impinges upon the layer 23 but new magnetic particles in the charge will be attracted so that the protective layer 23 is maintained intact also during the continued rotation of the mill barrel.

In Fig. 1 the automatically regenerating wear protecting means of magnetic particles has been illustrated only on the left-hand lifter to make a comparison with conventional lifters appear more clearly. At the right-hand lifter it is shown by dash and dot lines 100, 101, 102 and 103 how a conventional lifter entirely of rubber material changed its profile during the course of a lengthy test in a mill where the inventive principle was tested simultaneously with the use of conventional lifters. The portions 14 of the lifters 13, the shell plates and the conventional lifters consisted of the same wear resistant rubber material. The mill had a diameter of 5.9 m and was continuously driven for secondary grinding with the aid of lumps of magnetite and of quartz in mixture (particle size maximum 60 mm), so-called pebbles. The conventional lifters originally had the profile represented by line 100, while lines 101, 102 and 103 represent the profiles of the remaining lifter rests after continuous operation for 7 months, 14 months and 21 months, respectively. When profile 103 had been reached, i.e. after 21 months, the time had come to insert new conventional lifters. After the same time the rubber portion 14 of the lifters 13 equipped with permanent magnets 21 had been subjected to wear in

a minor degree only, as has been shown by the dotted line 14' on the right-hand lifter in Fig. 1.

It could be established during the testing period that the automatically regenerating wear protection layer

5 23 was not entirely homogeneous but comprised an inner per se homogeneous layer 23' of very fine-grained magnetic material and an outer inhomogeneous layer 23" of coarser magnetic mineral particles and heavily worn down magnetite grinding bodies or pebbles.

10 The tests made thus show that the invention results in an extraordinarily essential improvement of the life of the mill lining by the provision of the automatically regenerating wear protection layer 23 of magnetic fine-grained material contained in the charge.

15 Fig. 2 shows another example of how it has been found possible to utilize the invention for the protection of a mill barrel against wear. In this case the mill had been designed as a primary mill, i.e. a mill for grinding of coarse starting material. The mill lining had
20 been given wave shape in that the shell plates 24 had been formed as steps having a low portion 25 and a high portion 26 which is however lower than the upper side of the lifters 27. The fixation of the lifters and the shell plates had been realized in substantially the
25 same manner as in Fig. 1. In the embodiment according to Fig. 2, however, not only the lifters 27 but also the shell plates 24 had been provided with metal inserts 20 and permanent magnets 21 secured thereto. As a result, the permanent magnets placed on successively higher
30 levels will provide a slightly inclined surface profile with a protective layer 23 of magnetic particles which were attracted by the permanent magnets in the same way as in Fig. 1. Also in this case it could be established that the protective layer 23 had a laminar composition
35 including an inner fine-grained part layer and outer, coarser part layers. The layer 23, when tested in a mill having a diameter of 2,9 m, had a thickness of about 5 cm

and contained some worn down grinding balls. The layer 23 formed a continuous fluidized bed which offered an efficient protection against the abrasion of the lining.

Fig. 3 shows a further embodiment in which lifters 5 28 produced from a rubber or elastomeric material are vulcanized to a metal sheet 29 which protrudes in either direction. These lifters are kept in position with the aid of rubber or elastomer elements 30 having a metal profile member 31 vulcanized thereinto and co-
10 operating with T-bolts 32, washers 33 and nuts 34, said elements 30 clamping the metal sheet 29 to the mill barrel 10. Same as in the earlier described embodiments, the lifter 28 has permanent magnets 21 vulcanized thereinto. Said magnets 21 are mounted on a metal insert 20
15 and retain a regenerative, protective layer 23 which is formed by magnetic particles in the charge of the mill being attracted and retained by the permanent magnets 21. In this case the permanent magnets have been placed in such a manner that the protective layer 23
20 also extends a distance beyond the lifter proper, thus protecting also the low portion in front of the lifter where normally high abrasion occurs.

Figs. 4 and 5 show still another embodiment of the invention in which the lifters are otherwise designed
25 and provided with a protective shield. The mill barrel 10 is thus lined with shell plates 35 which are united with metal sheets 36 projecting in either direction. Between successive shell plates 35 there are arranged lifters 37 having an outer protective sheath 38 of non-
30 magnetic, wear resistant metallic material. Inwardly of the metal protective shield 38 there are provided permanent magnets 21 which are secured to an insert 20 of magnetic metallic material. The permanent magnets and the insert are kept in position with the aid of a poly-
35 urethane rubber layer 39. Other plastic or elastomeric materials are conceivable. The lifters are kept in position with the aid of a profile bar 40 inserted therein,

which is held clamped against the undercut groove formed in the lifters by means of bolts 41 and nuts 42 which penetrate the mill barrel 10. The permanent magnets 21 are arranged with their south and north poles
5 as indicated on the drawings such that a protective layer 23 of magnetic particles from the charge will be formed on the outer side of the protective shield 38.

The lifters 37 can be given a relatively short length,
10 for example of 100 mm. The requisite total lifter length is obtained by placing several lifters one after the other and retaining them with the aid of a common fastening bar 40 or with the aid of several such fastening bars following upon each other. This embodiment is especially
15 intended for use in rod grinding, i.e. grinding in mills where use is made of rod-shaped grinding bodies and in which there is the risk that worn spear-like rod ends will penetrate into the lifters and damage them. The magnet system is symmetrically designed, which means
20 that the rotation of the mill can be reversed.

Fig. 6 shows a similar embodiment in which the permanent magnets are placed in a symmetrical arrangement. In this case the lifter 43 of rubber or other elastomeric material has a metal profile member 44 vulcanized there-
25 to, in which an undercut groove 45 is provided for co-operation with T-bolts 32 and nuts 34. The lifter clamps shell plates 35 in position with the aid of the metal sheets 36 vulcanized to said shell plates.

In the embodiment according to Fig. 6 the permanent magnets 21 are secured to an insert 20 and have
30 their active pole surfaces at the bottom of conical recesses 48. As a result, particulate magnetic material in the charge will fill out said conical recesses and thus serve as a regenerative, protective layer outside
35 the permanent magnets and also outside the rubber or elastomer portions of the lifters 43. In this case, too, the lifter is symmetrical, for which reason the direction

of rotation of the mill can be reversed.

In the embodiments earlier described, permanent magnets have been utilized to form the regenerative, protective layer of magnetic particles. In Fig. 7 is shown a further embodiment in which electromagnets are employed for the same purpose. Said embodiment resembles that of Figs. 4 and 5, but instead of a protective shield of non-magnetic material, use is made of embedded magnetic steel plates 49 which serve as pole plates on electromagnets 50 secured to a magnetic steel insert 20. The magnets 50, the insert 20 and the pole plates 49 are secured by casting in a polyurethane rubber layer 39 which protrudes from between the pole plates 49. With the aid of the electromagnets 50 which are connected by leads (not shown) to a power source (not shown), there is formed a regenerative, protective layer 23 of magnetic particles comprised in the charge. In this case also the lifter is symmetrical so that the direction of rotation of the mill can be reversed.

The embodiments illustrated, in which the magnets are secured to an insert vulcanized into elastomeric, plastic or rubber material, provide the great advantage that the magnets will be resiliently retained and as a consequence are capable of better withstanding heavy shocks from large pieces of material in the charge.

Figs. 8 and 9 show a still further embodiment of a wall structure according to the present invention, utilized in a ball mill. The lining comprises two types of standard elements, one type corresponding to the shell plates while the other type corresponds to the "lifters", even though this mill has no lifting means projecting into the interior of the mill. The elements 51 corresponding to the shell plates have metal sheets 52 vulcanized thereinto on their sides facing the mill barrel 10, and the rubber part 53 of the element extends with a layer 54 over said metal sheets. Permanent magnets 21 and metal inserts 20 connected to them

and serving as magnet cores are vulcanized into the elements 51. Protective plates 55 of non-magnetic metal material are secured to the outer sides of the permanent magnets 21 for their protection. The parts 53 of the
5 shell elements 51, which parts are formed from elastomeric material, have rib-shaped elevated portions 56 between the rows of permanent magnets to cause the layer of particles forming the protective layer 23 to curve arcuately upwards between adjacent magnets and to
10 reduce the risks of the protective layer 23 being caused, during the initial formation thereof, to slide along the lining because of shearing forces.

The wall elements 57 corresponding to the lifters similarly have permanent magnets 21, metal inserts
15 20 and protective plates 55 which together with a metal profile bar 58 having an undercut groove 59 are vulcanized or embedded in the elastomer portion 60 of the wall elements 57. The elastomer portion which may consist of polyurethane rubber, extends with a layer
20 61 beneath a part of the metal profile bar 58 and has a rib-shaped elevated portion 62. The wall elements 57 are secured to the mill barrel 10 by means of T-bolts 46 and nuts 47, thereby clamping the barrel plates 51 in position.

25 In the embodiment illustrated, each of the elements 51 and 57 comprises four permanent magnets and two metal inserts 20 such that the elements are relatively small and readily handled at the mounting thereof. They may of course be manufactured in optional lengths.

30 In the embodiment shown in Figs. 8 and 9, a continuous protective layer 23 of reasonably uniform thickness made up of magnetic particles in the material being ground will be retained against the lining. In the embodiment illustrated, the shell plates 51 have but
35 two rows of permanent magnets 21, but with broader barrel plates still more rows of magnets can of course be placed beside each other.

Figs. 10-12 show a lining which is used in a mill and is formed from standard elements. The standard elements 63 which are manufactured with the shape illustrated in Figs. 10 and 11, comprise permanent magnets 21 embedded in elastomeric material 64, preferably polyurethane rubber or some suitable plastic material, so that the elastomeric material will constitute elevated portions 65 with longitudinal V-shaped recesses 66 formed therein. The elastomeric material leaves one longitudinal side of the permanent magnets free such that the magnets slightly protrude from the elastomeric material. However, the magnets can be allowed to protrude from the elastomeric material also on the opposite longitudinal side. It will be realized that in this embodiment no metal insert of magnetic material is embedded in the elastomeric material. Instead, the magnetic circuit between the permanent magnets is closed by means of the metal wall, in the present instance a mill barrel, to be equipped with a wear protection means. This will appear from Fig. 12. In the said embodiment, magnetism is thus utilized not only to produce the protective layer 23 of magnetic particles but also to retain the lining against its support. The adaptation of the elements 63 to the arcuate shape of the mill barrel is facilitated by the recesses 66 and the bridges 67 of elastomeric material remaining beneath them, which serve as elastomer springs. The standard elements 63 are of unsymmetrical shape to facilitate a correct orientation of the elements and their permanent magnets in relation to the adjacent elements.

The invention has been described in the foregoing with reference to rotary mill barrels, but it is realized that the invention is also useful for vibratory mills and also for the protection of wall surfaces other than mill barrels.

The invention is thus useful for many different types of wall structures which are subjected to abrasion by

material containing magnetic particles which can form the contemplated, automatically regenerating protective layer. By way of example, reference is made to Fig. 13 which shows an unloading station 69 for a conveyor belt

5 70 which conveys particulate material containing magnetic particles, for example magnetic concentrates. Fig. 13 is only schematical, and the wall elements 68 can to advantage be formed in conformity with Figs. 10 and 11, although elevated portions 65 are not necessarily required. Alternatively, the wall elements can

10 be formed as shown in Figs. 8 and 9. As will appear from Fig. 13, the principles of the invention have been applied only to the most exposed parts of the unloading station 69 and the chute 71 beneath it, which may open

15 above a further conveyor 72, a carriage, a bin of material, a screen or like means.

CLAIMS

1. Abrasion and wear resistant wall structure which in use is subjected to abrasion by lump or particulate material comprising magnetic particles and which preferably consists of or is coated with an abrasion resistant wall material (11, 13; 24, 27, 28, 30, 35, 37; 43, 51, 57; 63; 68), characterized in that the wall structure has magnet means (21, 50) adapted to attract magnetic particles in the material and retain said particles in the form an automatically regenerating abrasion protective layer (23) to the surface of the wall structure subjected to abrasion within at least such zones of the wall structure as are normally exposed to heavier abrasion than the other zones of the wall structure.
2. A wall structure as claimed in claim 1, characterized in that the magnet means (21, 50) are embedded in said wall structure.
3. A wall structure as claimed in claim 1 or 2, in the form of a mill wall structure with lifters (13, 27, 28, 37, 43), characterized in that the magnet means (21, 50) are adapted to attract the magnetic particles in the material at least on the leading faces of said lifters.
4. A wall structure as claimed in claim 1, 2 or 3, in the form of a mill barrel wall, characterized in that the magnet means (21, 50) are spaced such distances apart that the entire surface of the wall (57, 63) during operation of the mill is covered by the automatically regenerating abrasion protective layer (23).
5. A wall structure as claimed in any of claims 1-4, characterized in that the magnets of the magnet means (21) are arranged with their active pole surfaces at the bottom of crater-like recesses (48) in

in the wall structure (43).

6. A wall structure as claimed in any of claims 1-5, characterized in that the magnets of the magnet means (21, 50) are permanent magnets (21).

5 7. A wall structure as claimed in any one of claims 1-5, characterized in that the magnets of the magnet means (21, 50) are electromagnets (50).

8. A wall structure as claimed in claim 7, characterized in that the magnets (50) has a
10 pole plate (49) of magnetic material on the side of the wall structure subjected to abrasion.

9. A wall structure as claimed in any one of claims 1-4, 6 and 7, characterized in that the magnets (21) of the magnet means are arranged behind a protective shield (38) or plate (55) of non-magnetic material.
15

10. Abrasion and wear resistant wall structure which in use is subjected to abrasion by lump or particulate material comprising magnetic particles and which preferably consists of or is coated with an abrasion resistant wall material, substantially as hereinbefore described and as shown in the accompanying drawings.

FIG.1

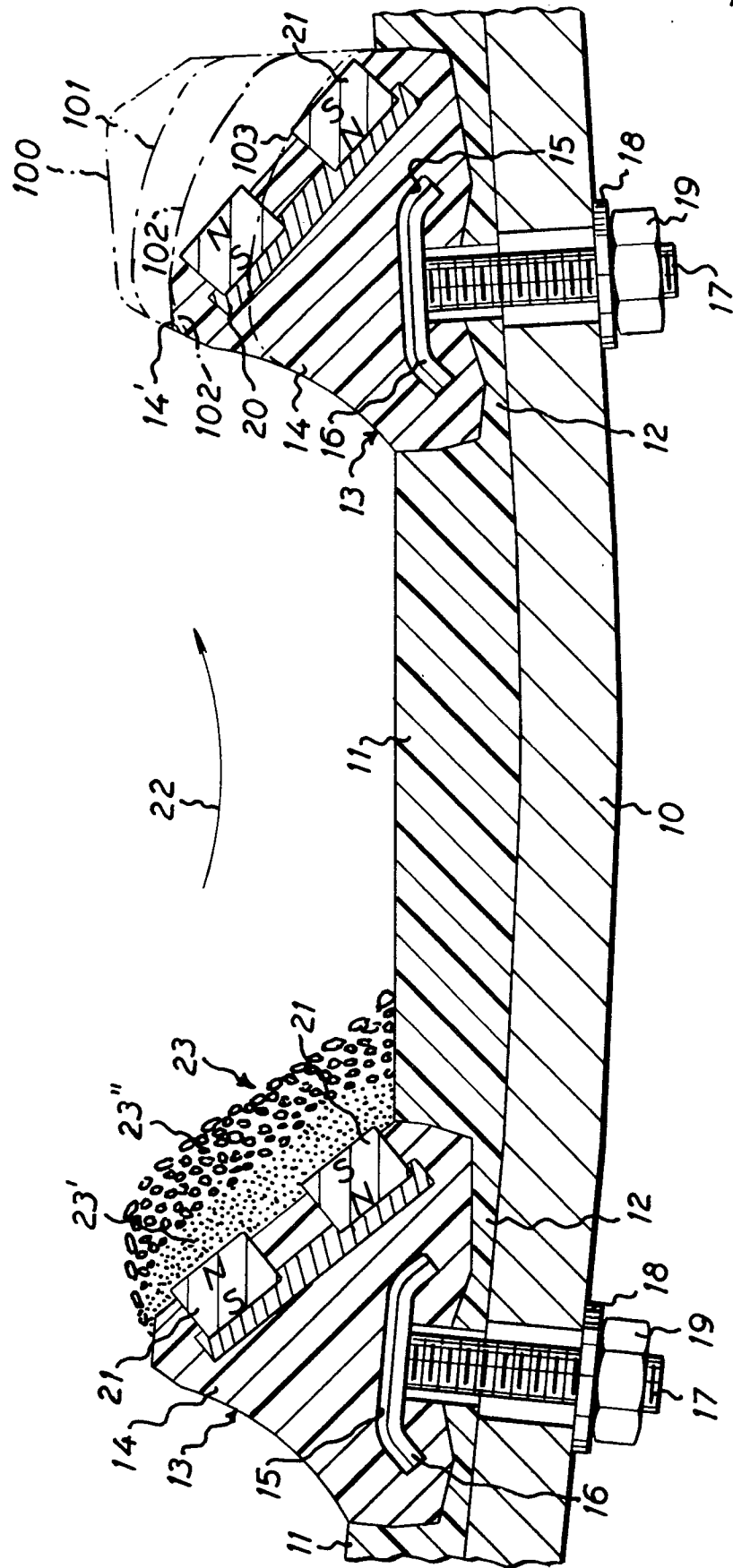
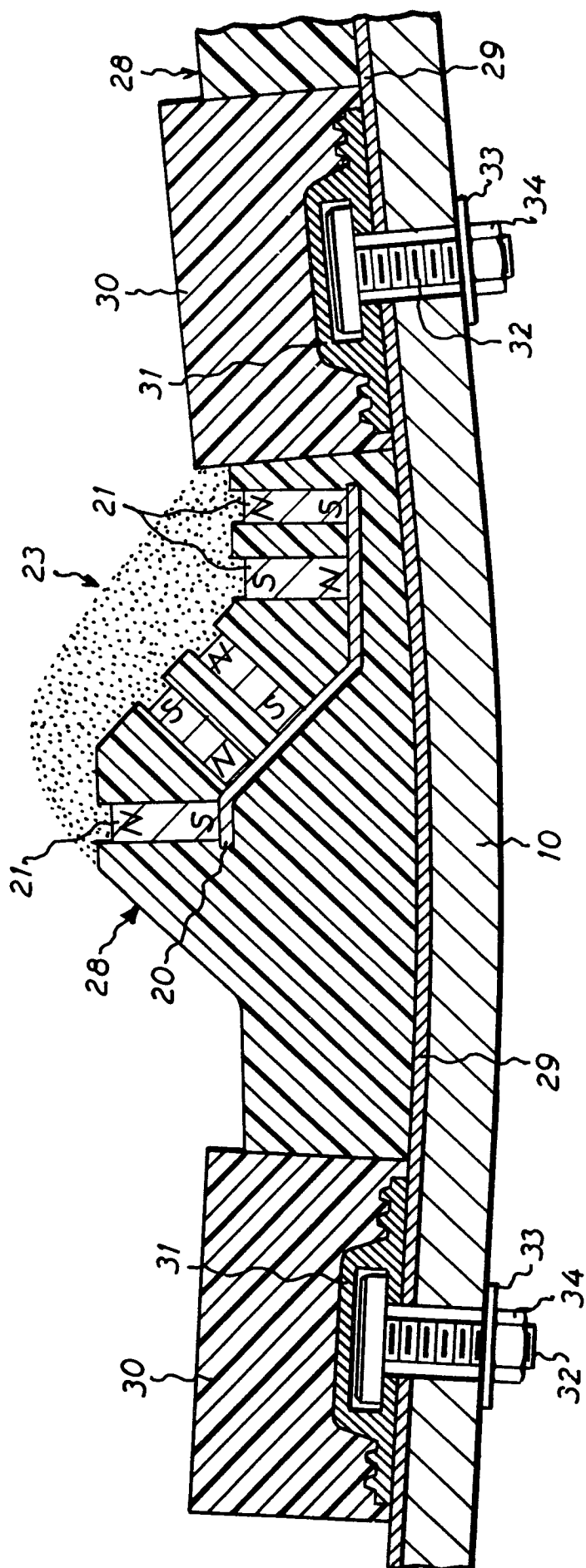
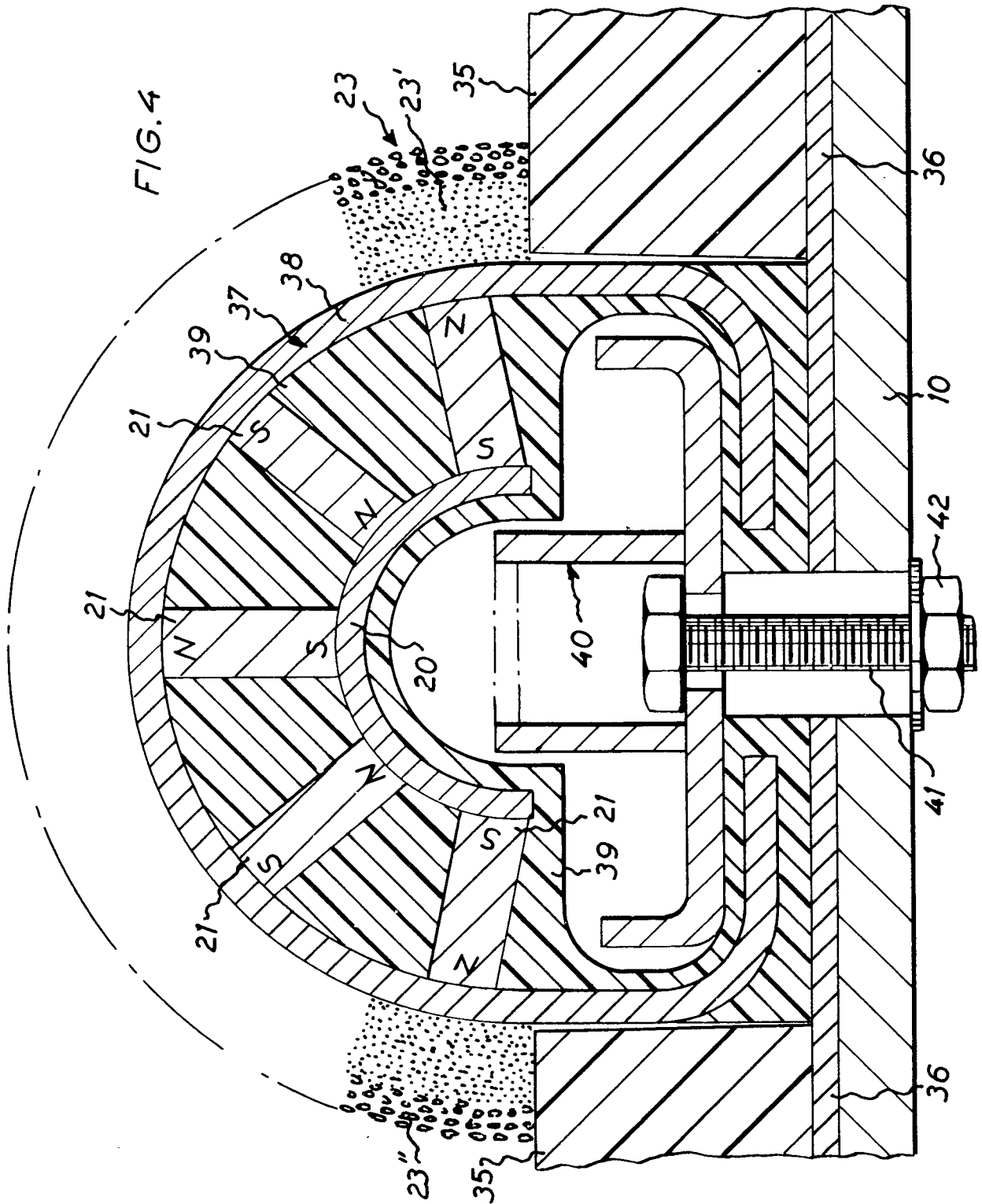
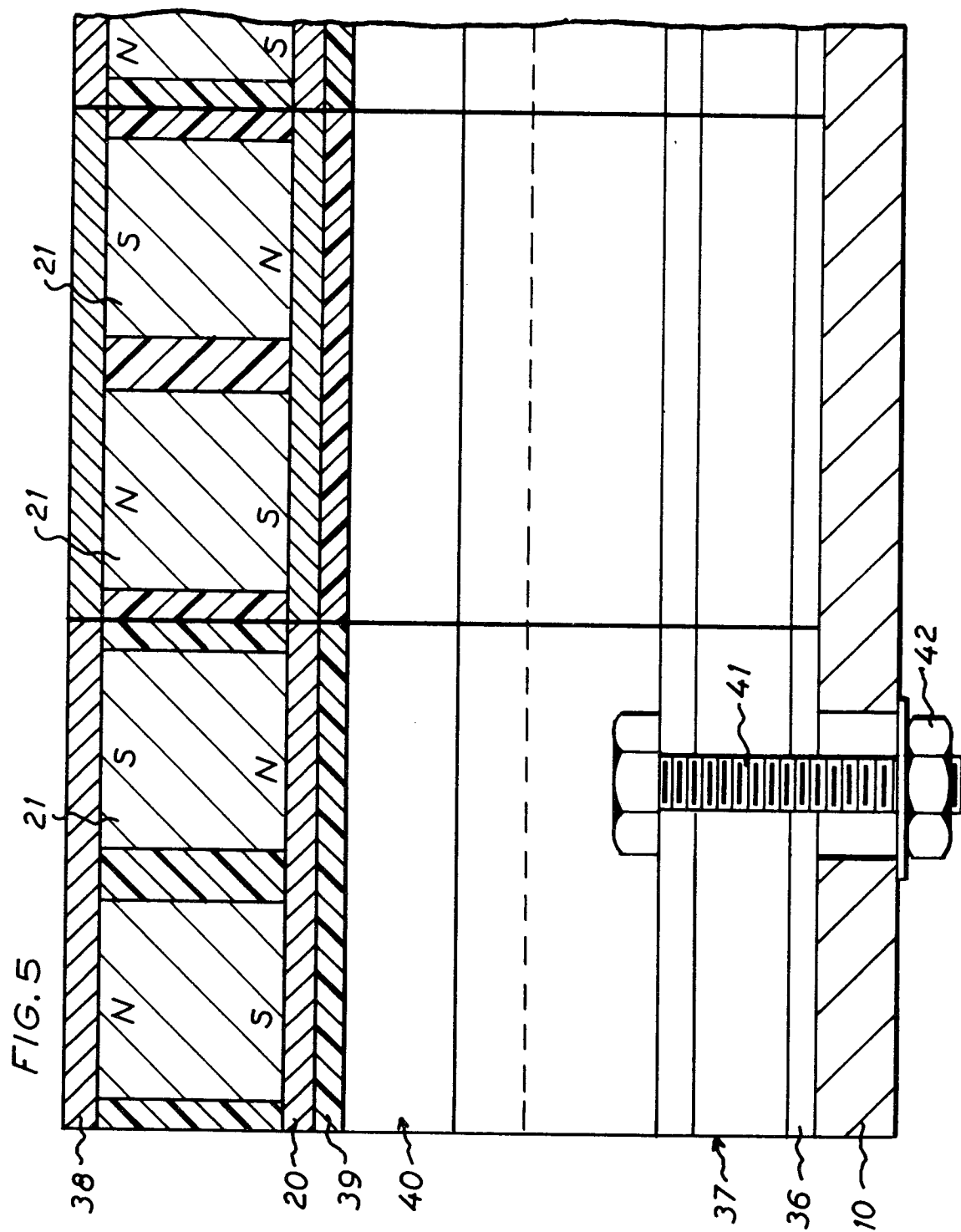


FIG. 3







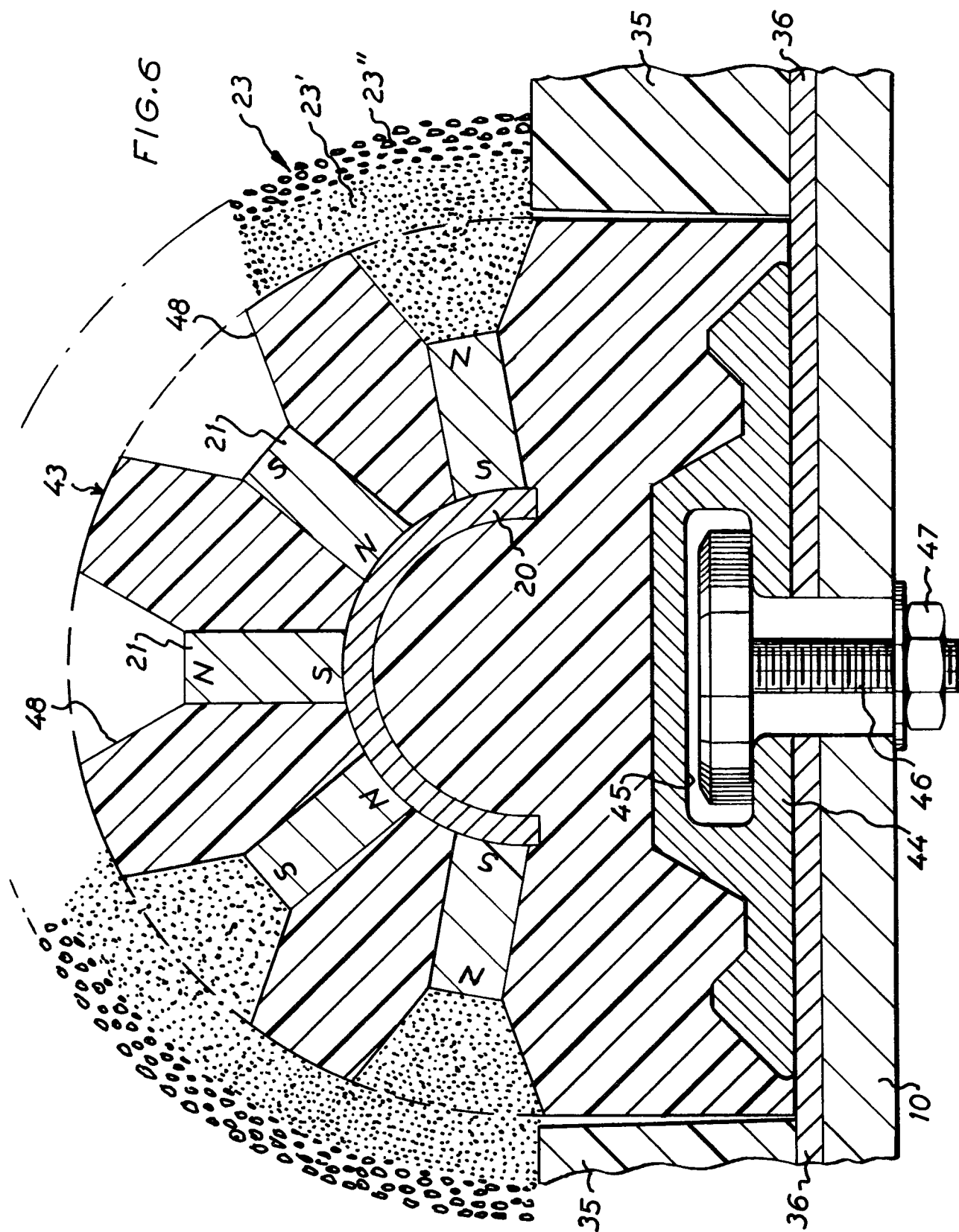
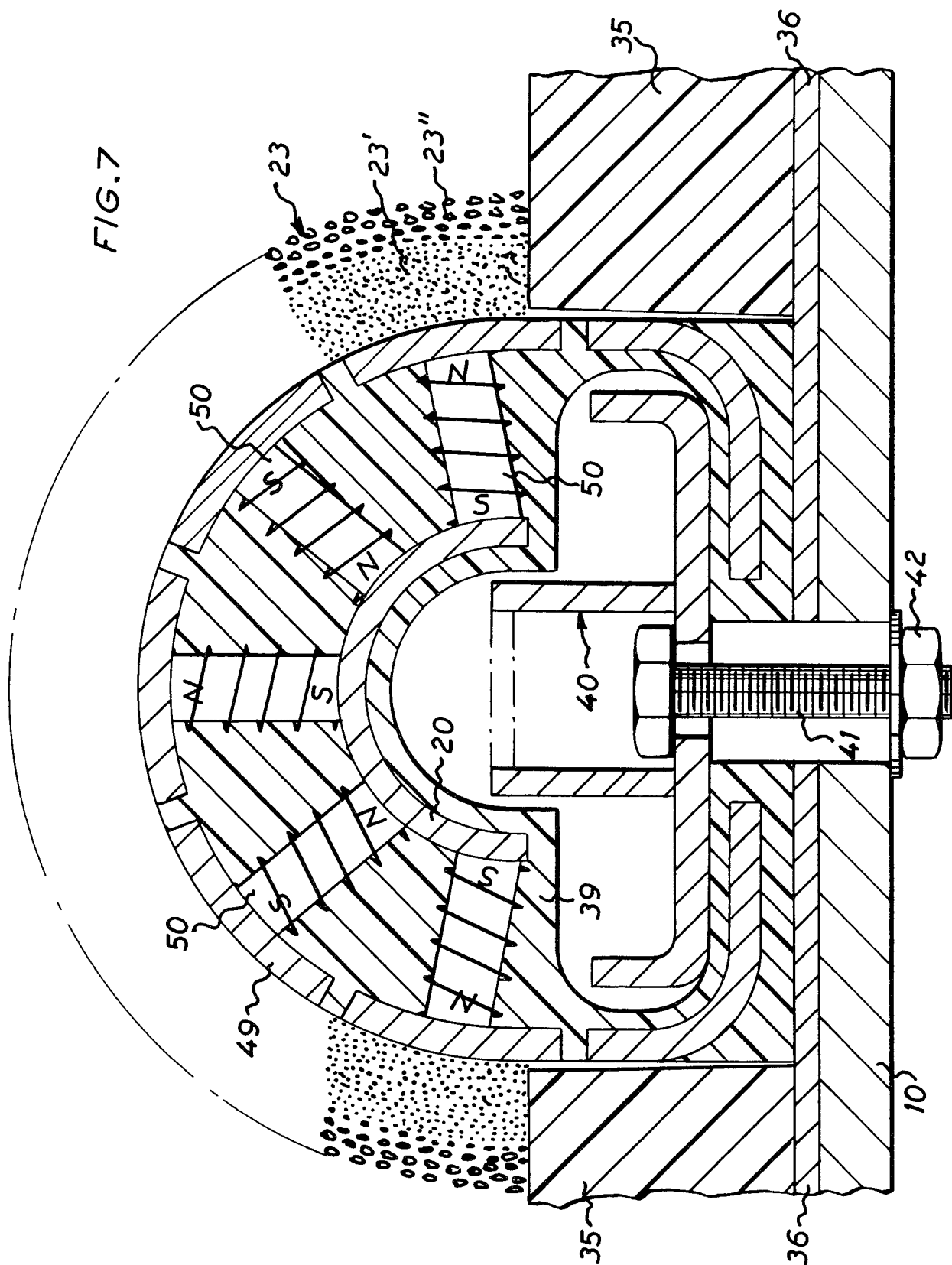
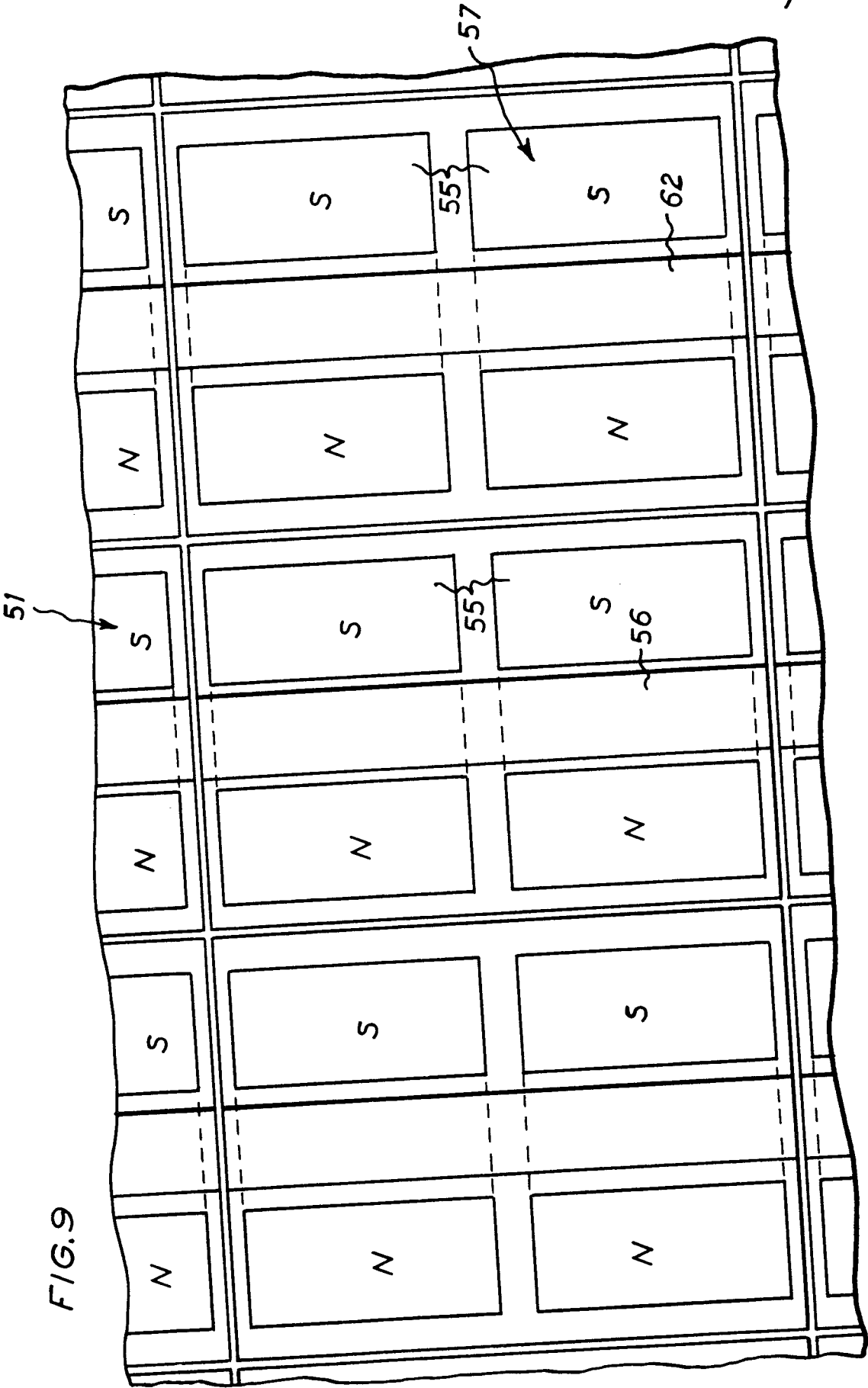


FIG. 7





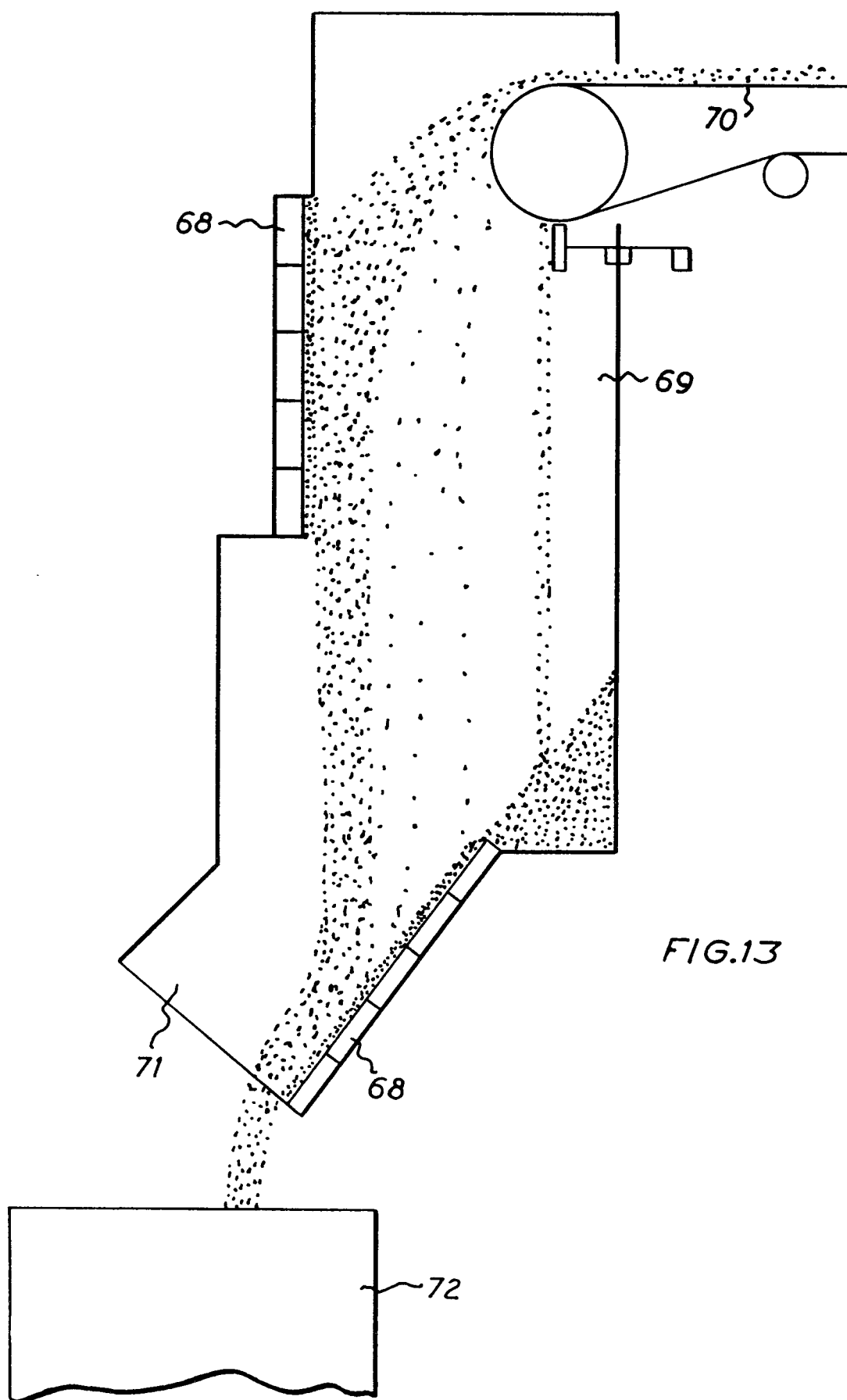


FIG.13



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
P	<u>DD - A - 137 065</u> (AKADEMIE DER WISSENSCHAFTEN DER DDR) * claim 1 * --	1	B 02 C 17/22
	<u>DE - C - 235 851</u> (OSTWALD) * page 2, line 17 * --	1	
	<u>DE - C - 548 853</u> (BÜTTNER) * claim 1 * --	1	
A	<u>DE - A1 - 2 604 173</u> (AIDA ENGINEERING) --		TECHNICAL FIELDS SEARCHED (Int. Cl.)
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☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search Berlin		Date of completion of the search 09-10-1980	Examiner ZAPP