Oct. 31, 1950 D. BUCCICONE 2,527,911

MAGNETIC SHEET PILING

Filed March 19, 1946 5 Sheets-Sheet 1

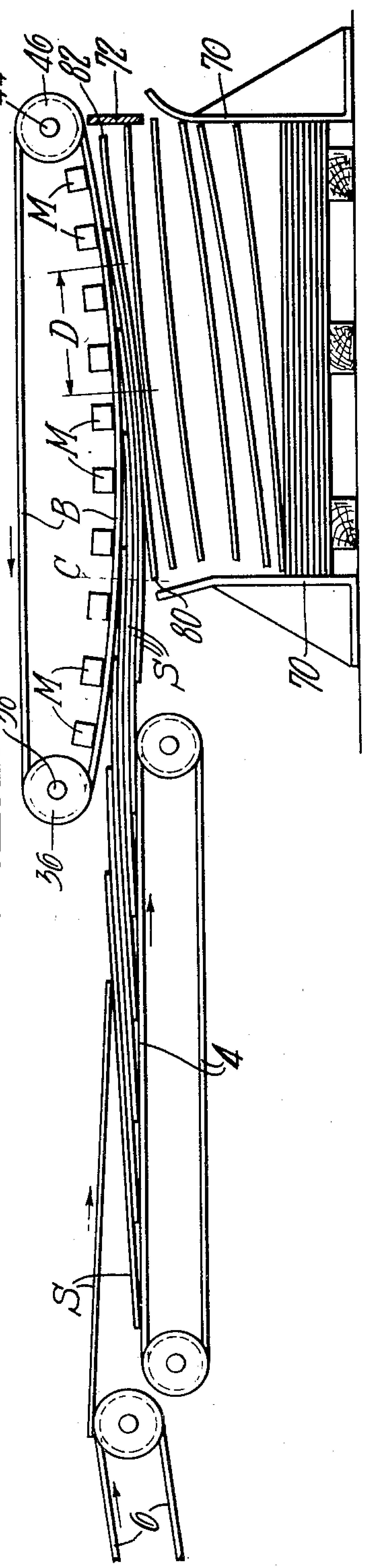

FIG. 1.

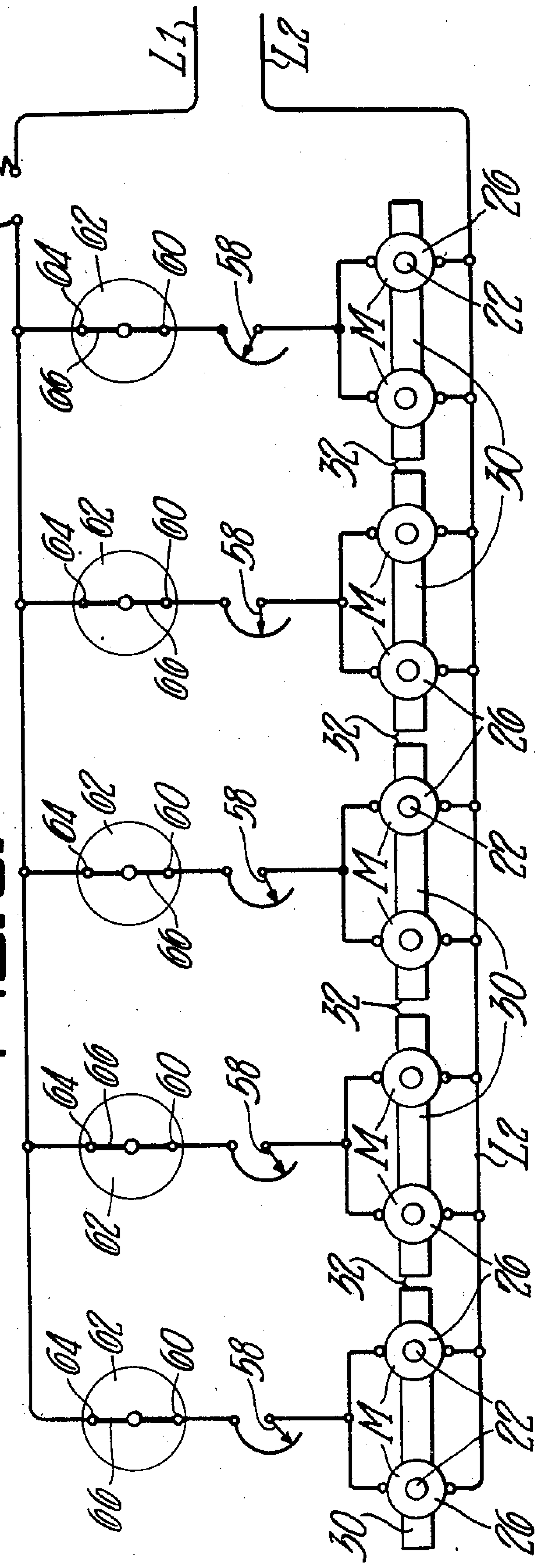

FIG. 9.

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MAGNETIC SHEET PILING

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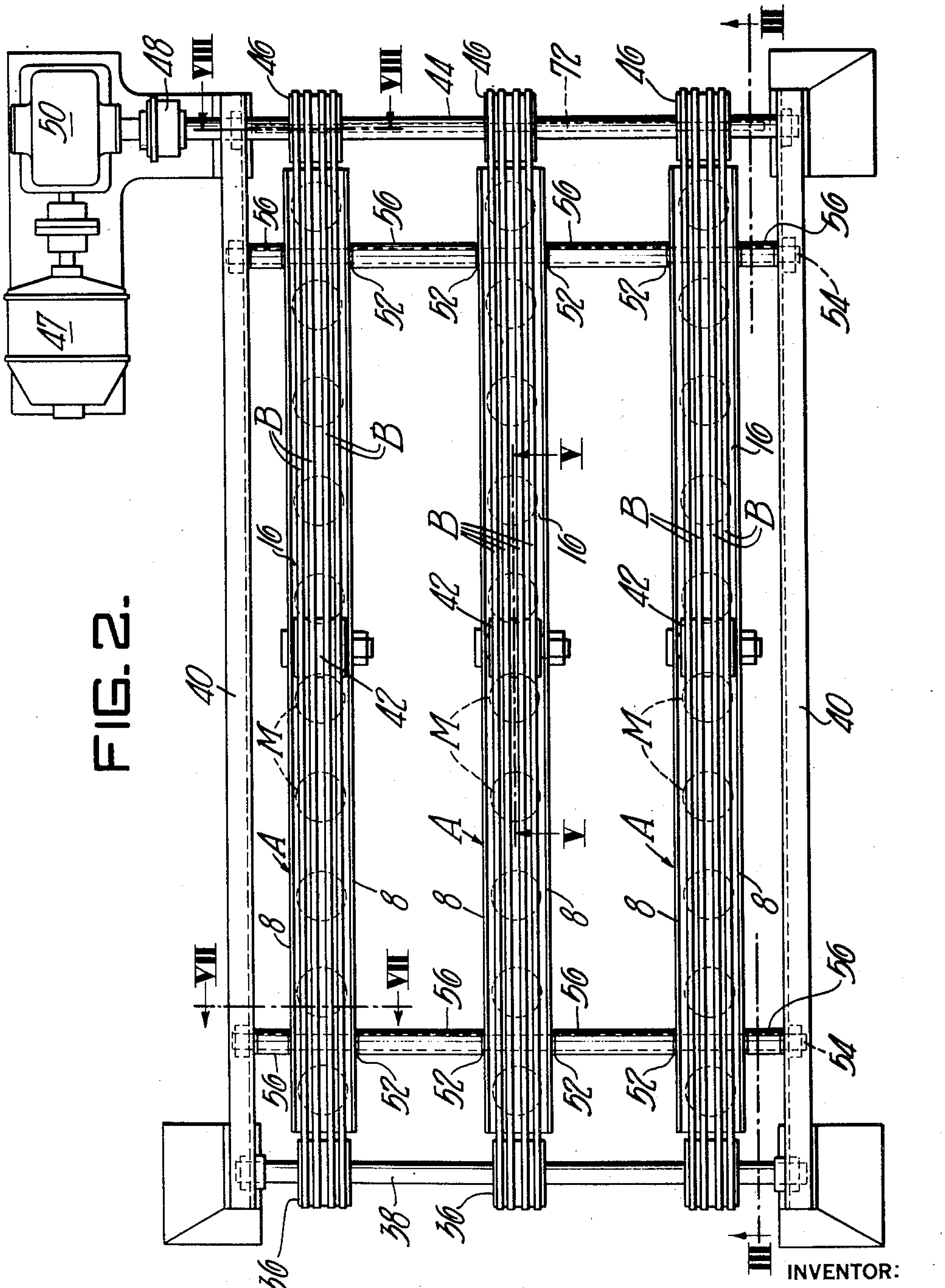

FIG. 2.

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MAGNETIC SHEET PILING

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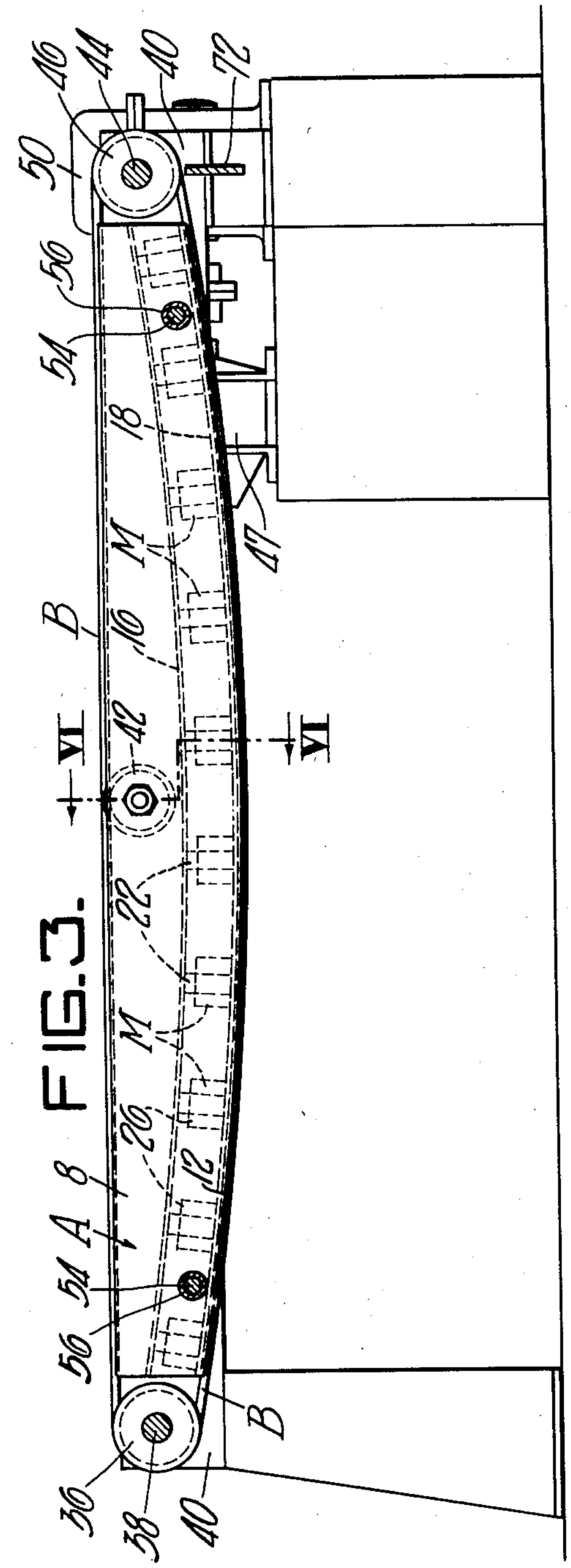

FIG. 3.

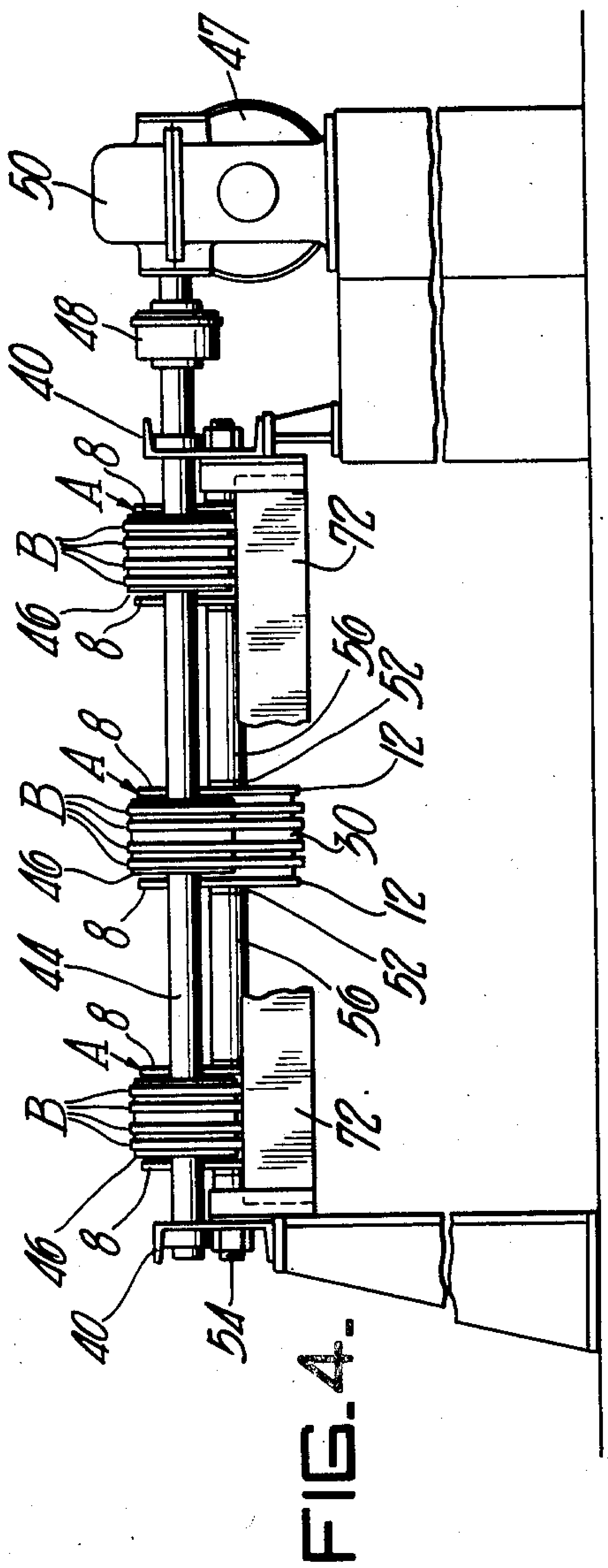

FIG. 4.

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MAGNETIC SHEET PILING

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FIG. 5.

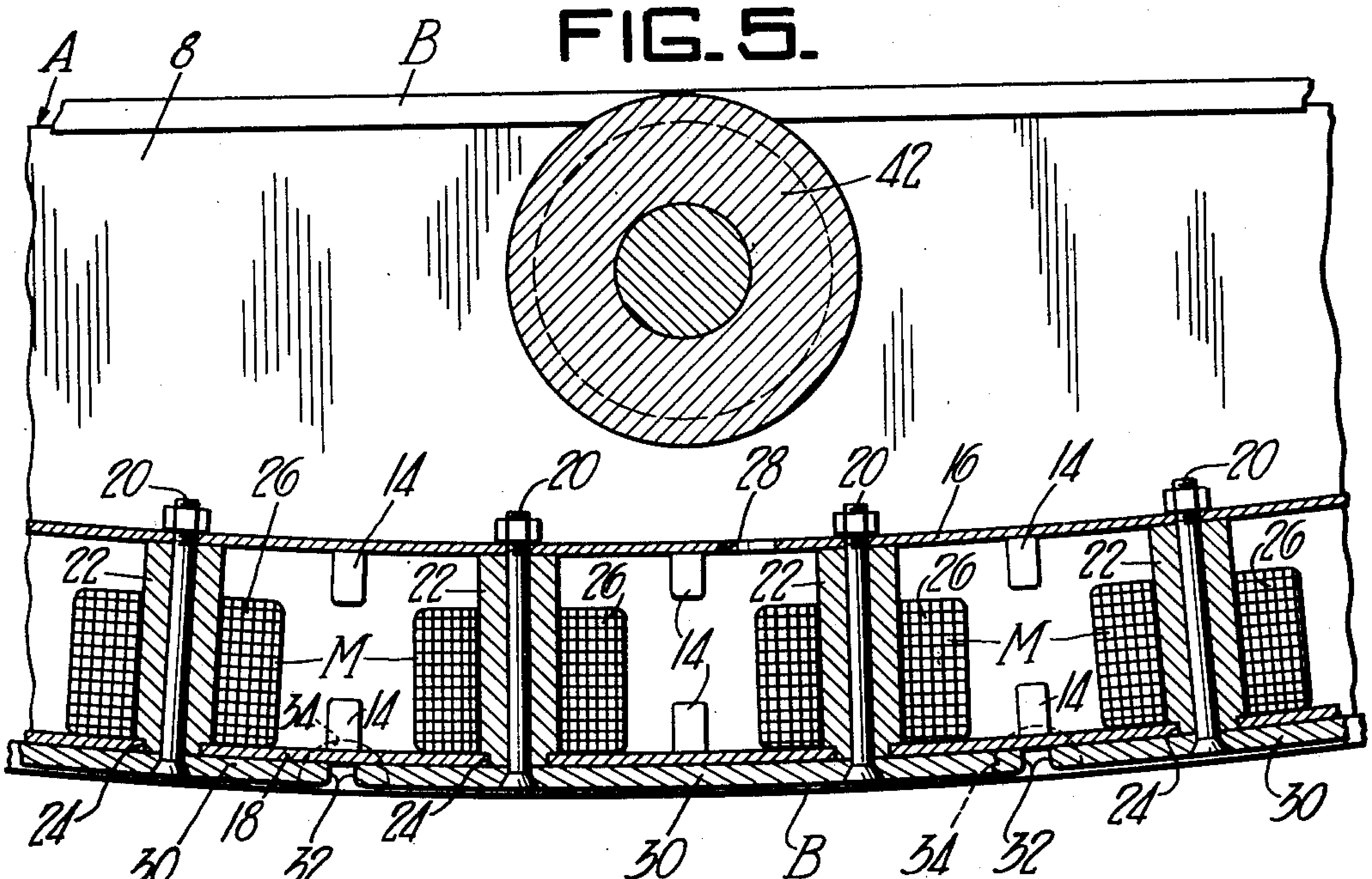


FIG. 6.

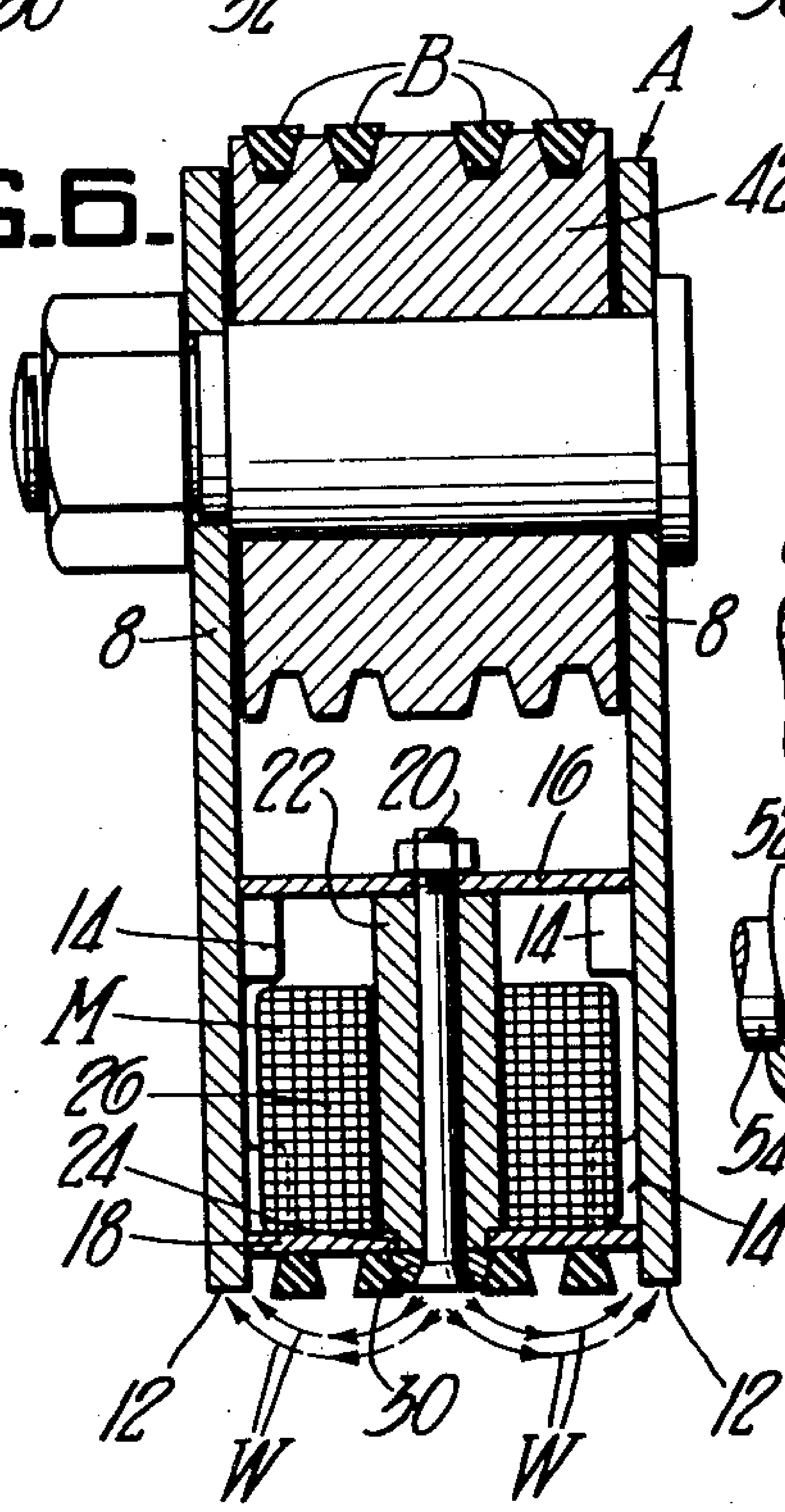
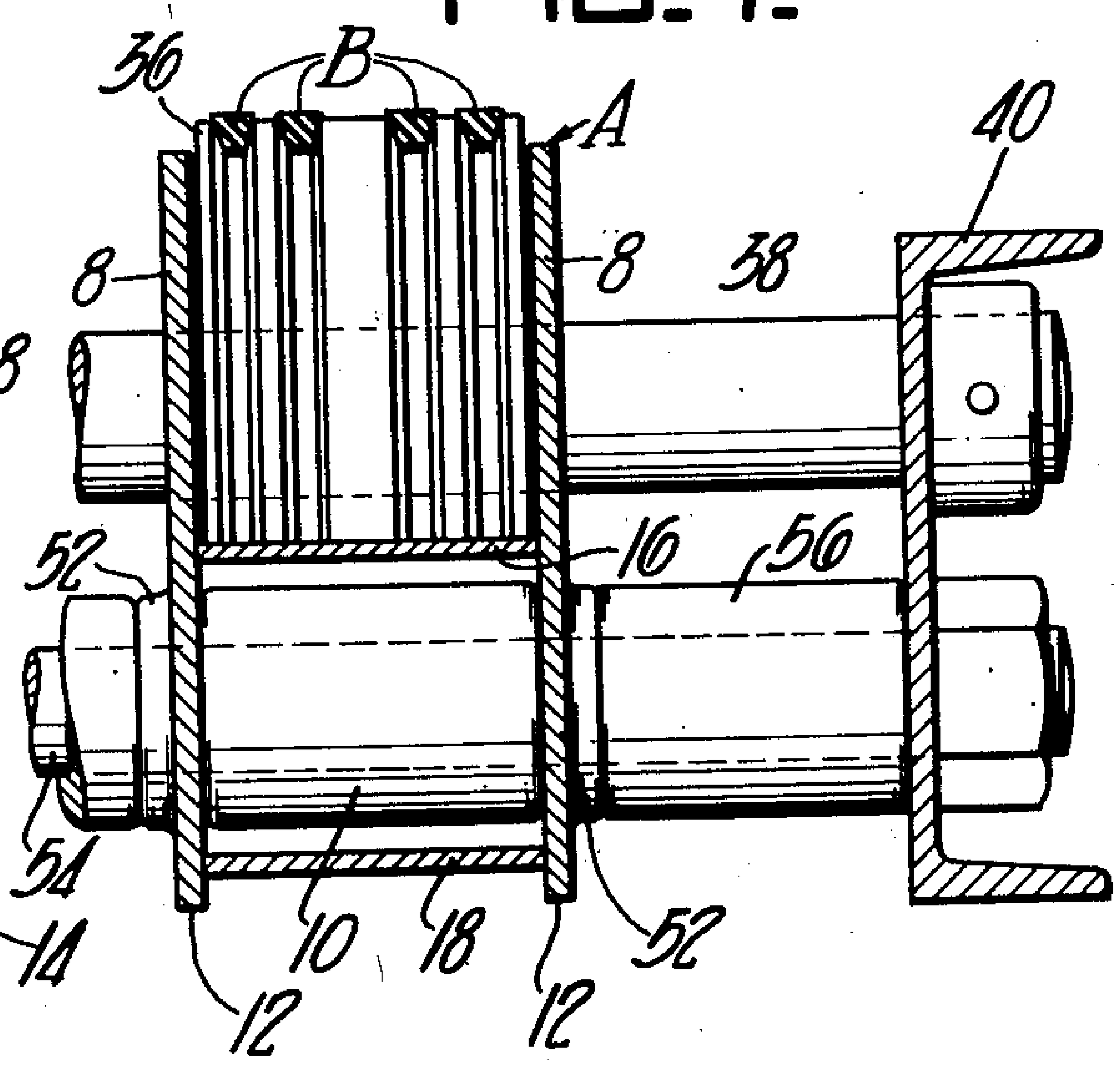


FIG. 7.



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MAGNETIC SHEET PILING

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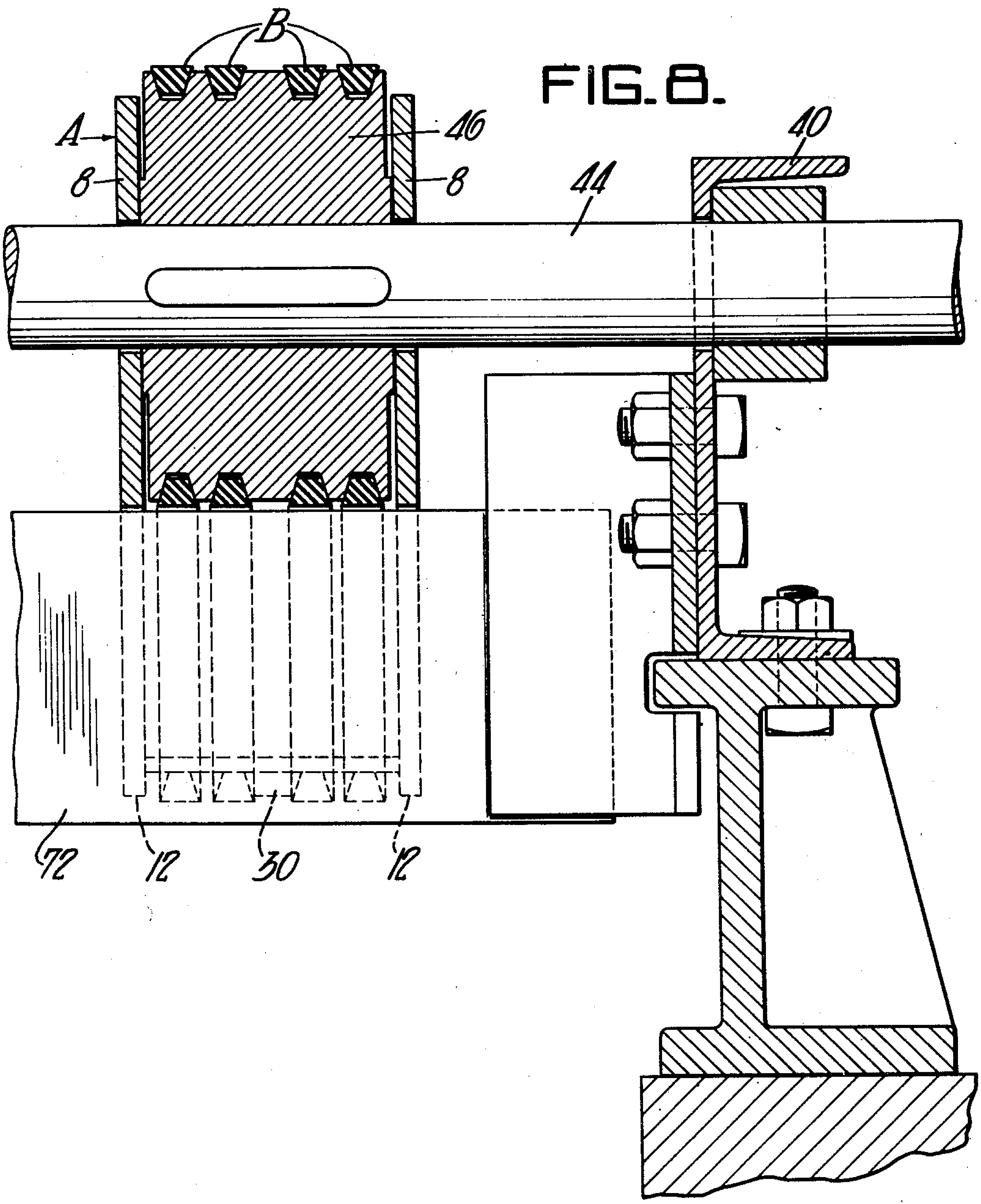
FIG. 8.



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Patented Oct. 31, 1950 2,527,911

UNITED STATES PATENT OFFICE

2,527,911

MAGNETIC SHEET PILING

Dario Buccicone, Gary, Ind.

Application March 19, 1946, Serial No. 655,620

9 Claims. (Cl. 271—68)

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This invention relates to improvements in methods and apparatus for piling magnetic sheets.

Present day continuous shears are capable of delivering cut sheets at the rate of 500 per minute or more. However, this potential capacity has frequently not been realized heretofore because of the inability of piling apparatus to efficiently pile sheets at such high speeds. At such speeds, the sheets are projected against the back stop with such force that the forward edge thereof is bent by the impact. If this impact is reduced by permitting one sheet to slide on the next lower sheet as they are being piled, the upper sheet tends to scratch or mar the lower sheet. Magnetic sheet pilers which drop the sheets on the pile tend to overcome the foregoing troubles to some degree and permit increased speed of operation but the speeds at which they can be operated are likewise limited.

It is accordingly an object of the present invention to provide an improved method and apparatus for piling magnetic sheets.

It is another object to provide a method and apparatus for high speed piling of magnetic sheets.

It is a still further object to provide a magnetic piler which is automatic in operation and does not depend on the actuation of switches to release the sheets.

It is still another object to provide a magnetic piler having a curved carrying surface to permit more efficient operation.

The foregoing and further objects will become apparent from reading the following specification in conjunction with the attached drawings, wherein:

Figure 1 is a side elevation diagrammatically showing my improved method of piling;

Figure 2 is a plan;

Figure 3 is an elevation of lines III—III of Figure 2;

Figure 4 is an end view;

Figure 5 is an enlarged partial longitudinal section on line V—V of Figure 2;

Figure 6 is a vertical section on line VI—VI of Figure 3;

Figure 7 is a vertical section on line VII—VII of Figure 2;

Figure 8 is an enlarged view, partly in section, on line VIII—VIII of Figure 2; and

Figure 9 is a wiring diagram.

Referring more particularly to the drawings, the numeral A designates a plurality of curved longitudinally extending rails, each of which has a plurality of electromagnets M mounted therein for attracting and holding magnetic sheets S against narrow conveyor belts B. The sheets S are delivered to the piler in lapped relationship by a conveyor 4 consisting of a conventional endless belt arrangement. Sheets from a continuous shear are disposed on a fast moving conveyor 6 from which the sheets are delivered to the slower moving conveyor 4 to lap them. Such lapping of sheets on a slow moving conveyor by delivery from faster moving conveyor is conventional and need not be further described.

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Each of the rails has two vertically disposed side plates 8 which extend throughout the length of the belt and are spaced apart the desired distance by spacers 10 as shown in Figure 7. The lower edges 12 of plates 8 are curved as shown in Figures 1, 3 and 5, and the inner faces are provided with a series of lugs 14 for positioning curved bridge plates 16 and core plates 18. Bridge plates 16 are adapted to retain the assembled parts of the magnets M in position as described in detail hereinafter.

The core plates 18 are formed of brass so as to be non-magnetic and are suspended from bridge plates 16 by bolts 20 so as to be disposed between the lower curved edges 12 of plates 8. Mounted around bolts 20 are circular cores 22, the lower ends of which are turned down to provide a close fit with holes 24 in core plate 18. The cores 22 are shown as being solid, but it is of course understood that they may be laminated if so desired. Magnet windings surround cores 22 within the rail assembly and rest on the upper surface of plate 18. Thus, the cores 22 and bolts 12 maintain the windings 26 loosely but concentrically between side plates 8. Suitably spaced apertures 28 are provided in bridge plate 16 to provide space for connecting required wiring to windings 26.

Inverted truncated retainer guides 30 are carried by the bolts 20 below the brass core plate 18. The bore of these guides is machined to fit fairly closely the heads and shanks of bolts 20. The truncated or conical exterior provides a guiding surface for the adjacent belts B. The length of each guide 30 is such that each guide retains or supports only two magnets M in position as is shown in Figure 5. Since guides 30 and bolts 20 are composed of steel or other magnetic material they form a continuation of the cores 22. A space 32 is provided between the ends of adjacent guides 30 to provide a definite and positive air gap therebetween. This is done to establish well defined transverse zones of magnetic force progressively along the length of the rails 2. To enhance this zoning effect, notches 34 may be placed in plates 8 in transverse alignment with spaces 32.

At one end of each rail 2, there are grooved idler sheaves or pulleys 36 journalled on a shaft 38 carried by side frame members 40. There is also provided in each rail an individually mounted tightening pulley 42, as shown in Figures 2, 5 and 6, which is capable of being vertically adjusted in order to maintain belts B at the proper tension.

At the other end of the rails 2, there is arranged a shaft 44 extending across the rail assembly which has suitably spaced grooved sheaves 46 keyed thereto. Shaft 44 may be connected to a suitable variable speed motor 47 through a coupling 48 and gear reduction unit 50.

Side plates 8 of the rails 2 are provided with lugs 52 adjacent the ends thereof which are bored transversely of the rails to permit tie-rods 54 to be passed therethrough and hold the desired number of rails with respect to each other and side frames 40. Sleeves or spacers 56 maintain the correct spacing and parallel relationship between adjacent rail sections.

In assembling a rail section, a curved core plate 18, into which cores 22 have been inserted, is placed against the bottom series of lugs 14 between side plates 8. Guides 30, which are also curved, are then placed against the bottom of plate 18, bolts 20 inserted, magnet windings 26 placed over cores 14, and the corresponding segment of curved bridge plate 16 dropped into place over bolts 20 and against lugs 14, after which bolts 20 are tightened. Plates 16 are made in segments to facilitate assembly and provide access to the pairs of magnets for maintenance and service.

Figure 9, in the interest of simplicity, is a wiring diagram for one rail only. As is shown in this figure, one terminal of all the magnet windings 26 is connected to line L2 of a suitable power source. The opposite terminals are connected through variable resistors or rheostats 58 to contacts 60 of switches 62. Contacts 60 are connected to contacts 64 by switch arm 66 and contacts 64 to line L1 of the power source through a master rheostat 68. By turning switches 62 to a neutral or off position, certain of the magnets may be kept deenergized if so desired.

As indicated in Figure 6 by lines W, three separate magnetic poles are established by the two side plates 8 and the retainer guide 30, each of which extends downwardly below the core plate 18 a distance slightly less than the thickness of belts B. All of the magnets M in a rail are energized with the same polarity so that flux flows from each magnet and retainer guide 30 to the side plates. This flux flow is present in successive transverse zones established by the spaced pairs of magnets throughout the length of the rail to establish the distinct magnetic zones hereinbefore referred to.

Suitable guides or racks 70 are provided beneath the piler for the sheets discharged therefrom and a stop member 72 at the discharge end of the piler.

In operation, the lapped sheets are continuously delivered to the curved under surface of the piler by the conveyor 4. Due to the transverse magnetic flux zones, the sheets are attracted toward the curved surfaces and assume a bowed or curved shape by being held against the conveyor belts B which move them toward the opposite end of the piler. The inherent stiffness of the sheets causes resistance to such flexing or curving and as a result there is a force therein urging them to spring back to a straight condition. This of course tends to remove the sheets from the piler. By properly regulating the strength of the magnets with rheostats 58 at selected locations this tendency of the sheets is utilized to cause them to automatically drop therefrom at the proper points.

Ordinarily the rearward end 80 of the bottom sheet will first separate from the lapped sheet immediately above because magnetic attraction is weakest at this point. This is due to the multiple thicknesses of sheets at C and the air gap between the magnets immediately above this rear end. In order to insure that such separation takes place proper rheostats 58 may be adjusted to weaken the magnets in closest proximity to the rear end of the sheet.

At the discharge end of the rail the forward end 82 of the bottom sheets extends beyond the sheet next above so that only a single thickness of sheet is exposed to the magnets directly above. In order therefore to cause the forward end 82 to lose contact with belts B, it is necessary to adjust the rheostat to weaken the magnets nearest the end 82 of the sheet. In case of light sheets, it may be necessary to completely deenergize such magnets by opening switches 62.

By referring to Figure 1, it will be seen that only a portion of the bottom sheet in zone D is in contact with the sheet next above due to its having assumed a straightened position. By reason of this action, the sheets may be said to "peel off," so that the portion remaining in contact with the sheet above is rapidly decreased in area whereby proper adjustment of the magnets directly above such contact will cause the contact to be broken at the same instant that the forward end 82 strikes the stop 72. It should be noted that such detachment of the sheets involves no frictional or sliding action therebetween and consequently the surfaces of the sheets are not scratched or marred.

As has been previously pointed out, the ends 80 and 82 of the bottom sheet start to fall away from the rail prior to the mid-portion. This causes the sheet at this stage of the piling operation to assume the opposite or a convex curvature wherein tthe center bows upwardly with the forward ends 82 closer to the piler than the rearward end. If the forward magnets are too strong and cause the sheet to strike the stop with considerable impact, the momentum or force will be absorbed in the curvature and thus the forward end will not be damaged. As the sheet is separated and starts dropping onto the pile, its curvature will be reversed so that it becomes concave because of the concentrated weight at the center dropping faster than the ends which are cushioned or supported more by the air.

As previously pointed out, the rearward end 80 is closer to the pile at the beginning of the separation so that the sheet is inclined as it falls. This causes the rearward end to strike the pile first which is an ideal condition for rapid piling as it prevents entrapment of air between sheets and thereby contributes to successful high speed piling. Since the disengaging action is entirely automatic, there are no switches or controlling mechanism to get out of order. Moreover the curvature of the piler with the resulting spring back of the sheets overcomes any residual magnetism therein which adversely affects high speed piling.

While I have shown and described one specific embodiment of my invention, it will be understood that this embodiment is merely for the purpose of illustration and description and that various other forms may be devised within the scope of my invention, as defined in the appended claims.

I claim:

1. A method of piling magnetic sheets comprising feeding said sheets in lapped relation to the underside of a curved conveyor, holding said sheets to said conveyor by magnetic flux, and adjusting said flux to permit said sheets to automatically drop from said conveyor at the desired point.

2. A method of piling magnetic sheets comprising continuously feeding said sheets in lapped relation to the underside of a curved conveyor, holding said sheets to said conveyor by magnetic flux, adjusting said flux to permit the ends of said sheets to assume a straightened position as they approach a point of discharge and to drop from said conveyor when the point of discharge is reached.

3. A method of piling magnetic sheets comprising continuously feeding sheets in lapped relation to the underside of a curved conveyor, holding said sheets to said conveyor and causing them to assume a curved shape by magnetic flux, adjusting said flux to permit said sheets to assume a straightened position as they approach a point of discharge, the mid-portion only being held in contact with said conveyor by said flux at such zone, and permitting said sheets to drop from said conveyor when the point of discharge is reached.

4. A method of piling magnetic sheets comprising continuously feeding sheets in lapped relation to the underside of a conveyor the mid-portion of which is downwardly bowed, holding said sheets to said conveyor and causing them to assume the bowed shape of said magnetic flux, adjusting said flux to permit the rear end of said sheets to spring away from said conveyor as they approach a point of discharge and to release said sheets from said conveyor when the discharge point is reached, whereby the rear end of the sheets is in a lower position than the front end as the sheets are dropped.

5. A sheet piler of the class described comprising a plurality of spaced rails having curved lower surfaces, nonmagnetic belts adapted to travel along said lower surfaces, longitudinally spaced magnets along said rails above said belts, said magnets being arranged to provide successive transverse zones of magnetic flux for holding magnetic sheets against said belts and thereby carry the sheets along the underside of said piler by the resulting friction between the sheets and the belts, and means for individually varying the strength of the flux in the successive zones, said flux being adjusted to hold the sheets tightly against the belts in curved position for part of said travel and released therefrom adjacent the end of said travel to pile the same.

6. A sheet piler of the class described comprising a plurality of spaced rails having curved lower surfaces, nonmagnetic belts adapted to travel along said lower surfaces, longitudinally spaced magnets along said rails above said belts, said magnets being arranged to provide successive transverse zones of magnetic flux for holding magnetic sheets against said belts and thereby carry the sheets along the underside of said piler by the resulting friction between the sheets and the belts, and means for individually varying the strength of magnetic flux in the successive zones, said flux being adjusted to hold sheets tightly against the belts in a curved position for part of said travel and permit the sheets to assume a straightened position adjacent the end of the travel and then dropped from said conveyor to pile the same.

7. A magnetic piler comprising in combination, a conveyor, said conveyor comprising a plurality of spaced rails having curved lower surfaces, nonmagnetic belts adapted to travel along said lower surfaces, longitudinally spaced magnets along said rails above said belts, said magnets being arranged to provide successive transverse zones of magnetic flux for holding magnetic sheets against said belts and thereby carry the sheets along the underside of said conveyor, means for adjusting the strength of the flux in successive zones, means for lapping sheets, and means for delivering the lapped sheets to the underside of said conveyor, the flux in the successive zones of said conveyor being adjusted to attract and hold a plurality of sheets in lapped relation at the forward end of said conveyor and hold them against said belts and to permit said sheets to drop therefrom at the rearward end of said conveyor to pile the same.

8. A high speed magnetic piler comprising in combination a conveyor, said conveyor comprising a plurality of spaced longitudinally extending rails having curved lower surfaces, nonmagnetic belts adapted to travel along said lower surfaces, longitudinally spaced magnets along said rails above said belts, said magnets being arranged to provide successive transverse zones of magnetic flux for holding magnetic sheets against said belts and thereby carry the sheets along the underside of said conveyor, means for adjusting the strength of said flux in the successive zones, means for lapping and delivering the lapped sheets to the underside of said conveyor, said means comprising a high speed conveyor and a low speed conveyor, the high speed conveyor being adapted to deposit sheets in lapped relationship on top of the slow speed conveyor, the rearward end of said slow speed conveyor being underside the forward end of said magnetic conveyor, the magnetic flux in the zones at the forward end of said magnetic conveyor being adjusted to attract the lapped sheets delivered thereto by the slow speed conveyor and hold them against said belts and the magnetic flux in the zones at the rearward end of said magnetic conveyor being adjusted to permit the sheets to drop therefrom to pile the same.

9. A method of piling magnetic sheets comprising feeding said sheets in lapped relation to the underside of a conveyor, holding said sheets to said conveyor by magnetic flux, and adjusting said flux to permit said sheets to individually drop from said conveyor at the desired point.

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