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Gutknecht

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[54] **TRACK BRAKE APPARATUS WITH SLIDING SHOES AND WEAR PLATES FOR PREVENTING EXCESSIVE MOVEMENT OF THE SHOES IN THE DIRECTION OF VEHICLE MOVEMENT**

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Related U.S. Patent Documents

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Filed: **Apr. 10, 1996**

[51] **Int. Cl.**[6] **B61K 7/00**

[52] **U.S. Cl.** **104/249**; 188/62

[58] **Field of Search** 104/60, 26.2, 249, 104/250, 252; 188/38, 38.5, 40, 43, 62, 63

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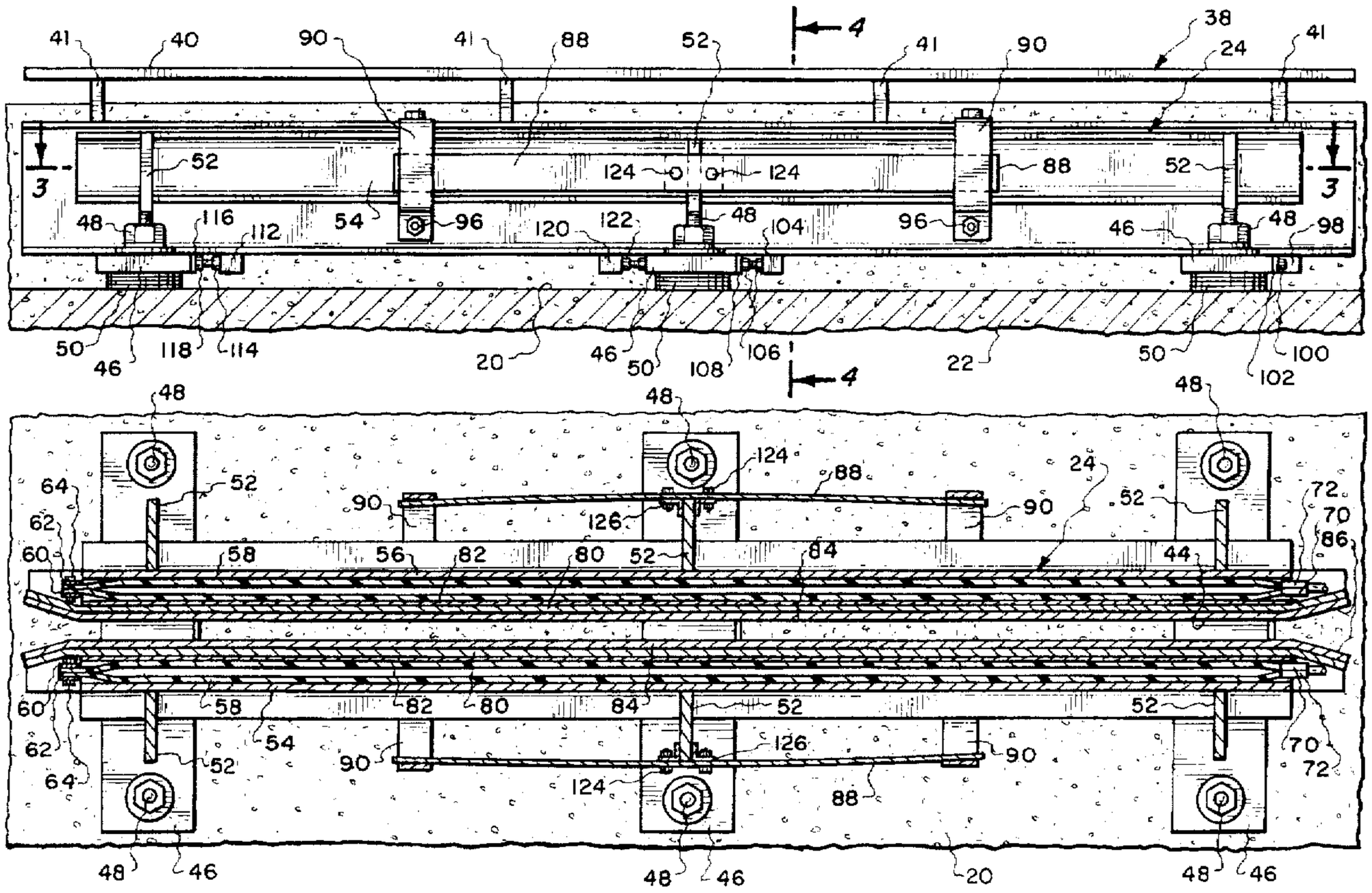
Attorney, Agent, or Firm—Jack C. Munro

[57] **ABSTRACT**

A brake apparatus that is designed to brake a drag race vehicle that is movable within a track of an amusement ride. The braking apparatus includes a pair of braking units that each include movable portions that are movable toward each other so as to clamp onto a guide plate that is being carried by the vehicle as it moves along the track. This clamping onto the guide plate results in slowing and eventual slopping of the vehicle. The braking units are movable by means of inflatable bladders into the braking position. The braking units are mounted on metallic cross beams which are fixedly mounted to the track The movable portions of the braking units are slidably mounted on the metallic cross beams. Longitudinal movement of the movable portions, which occurs during the braking position, is to evenly apply pressure against each of the metallic cross beams. Each of the bring units are continuously spring biased toward the non-braking position.

14 Claims, 4 Drawing Sheets



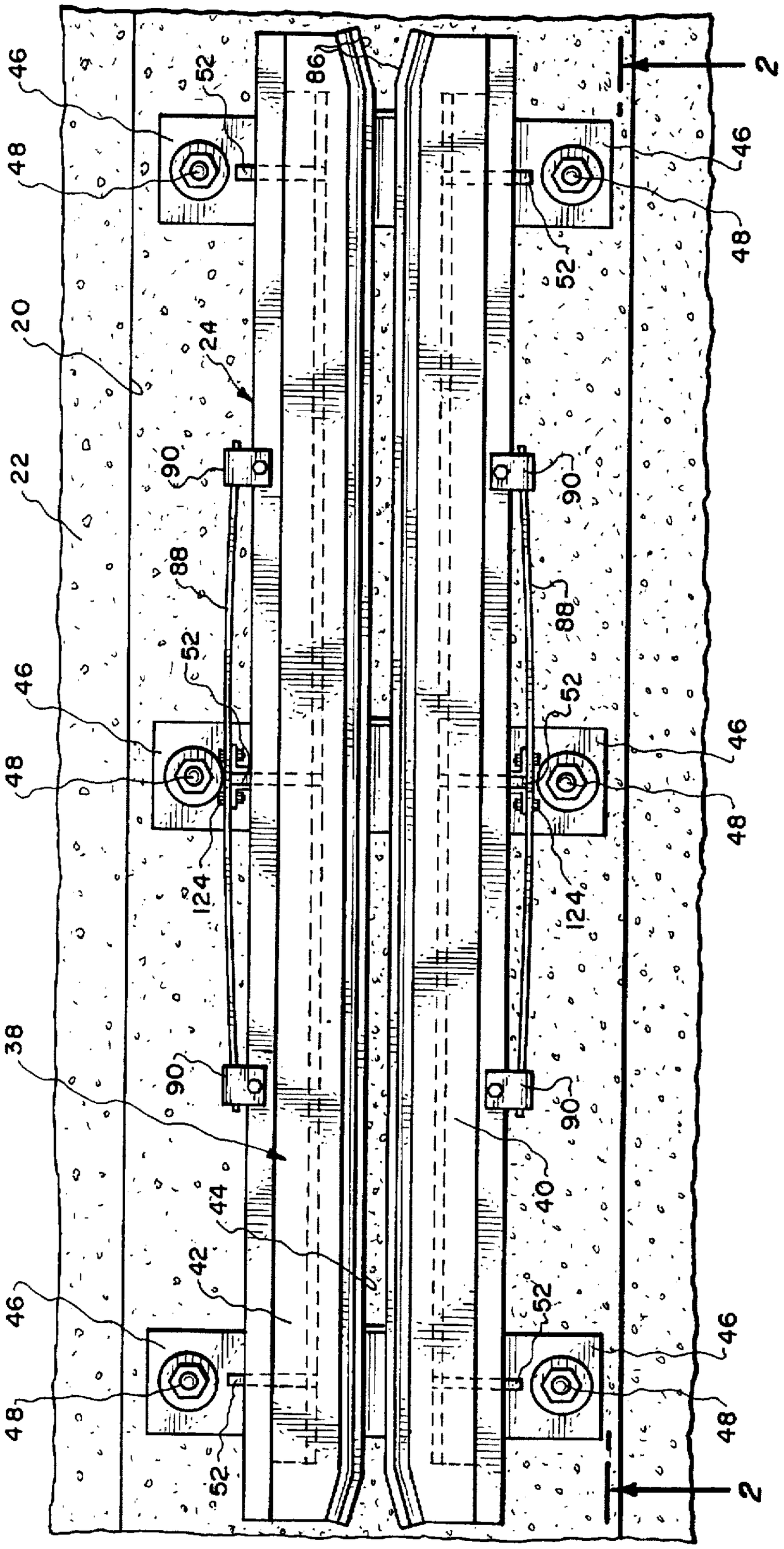

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Fig. 1.

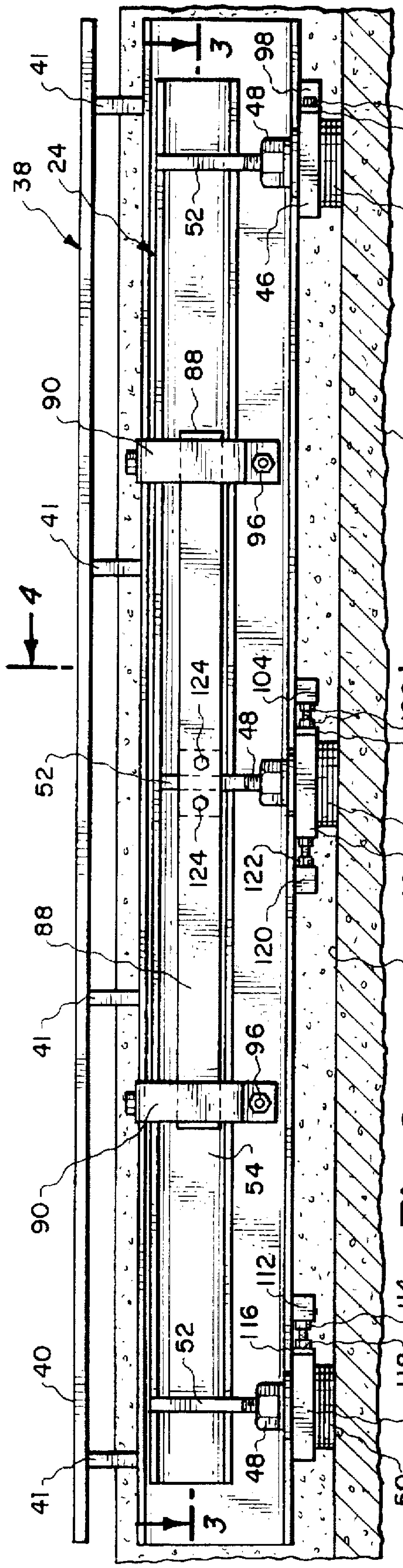
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Fig. 2.

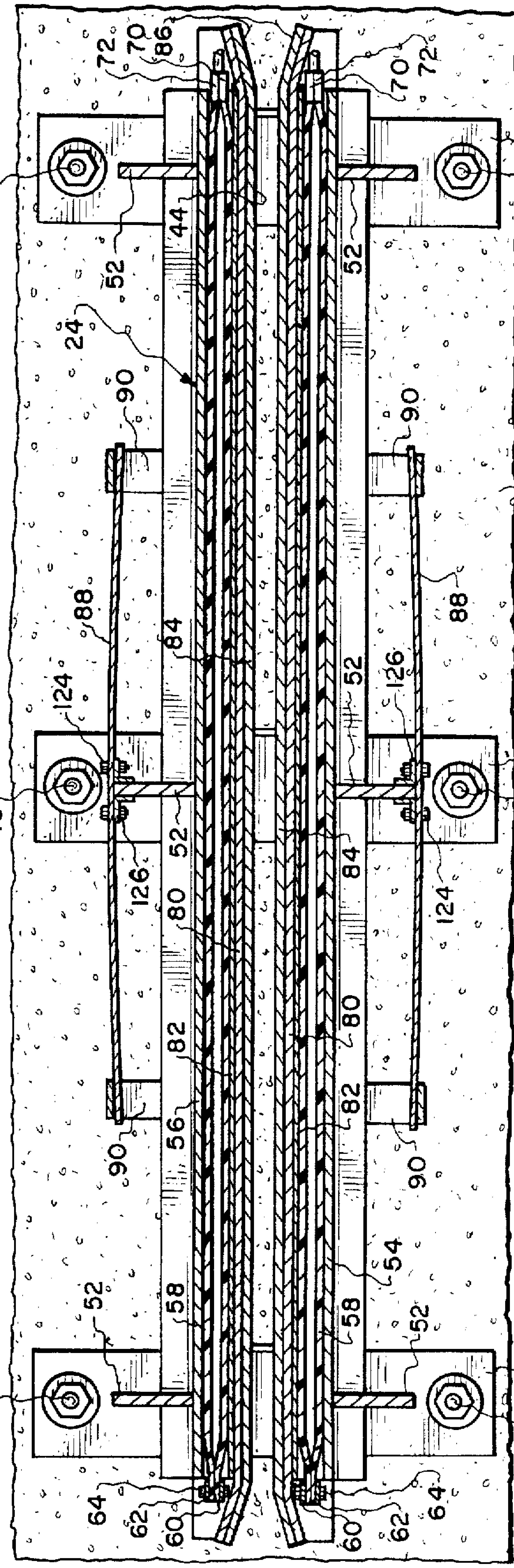
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Fig. 3.

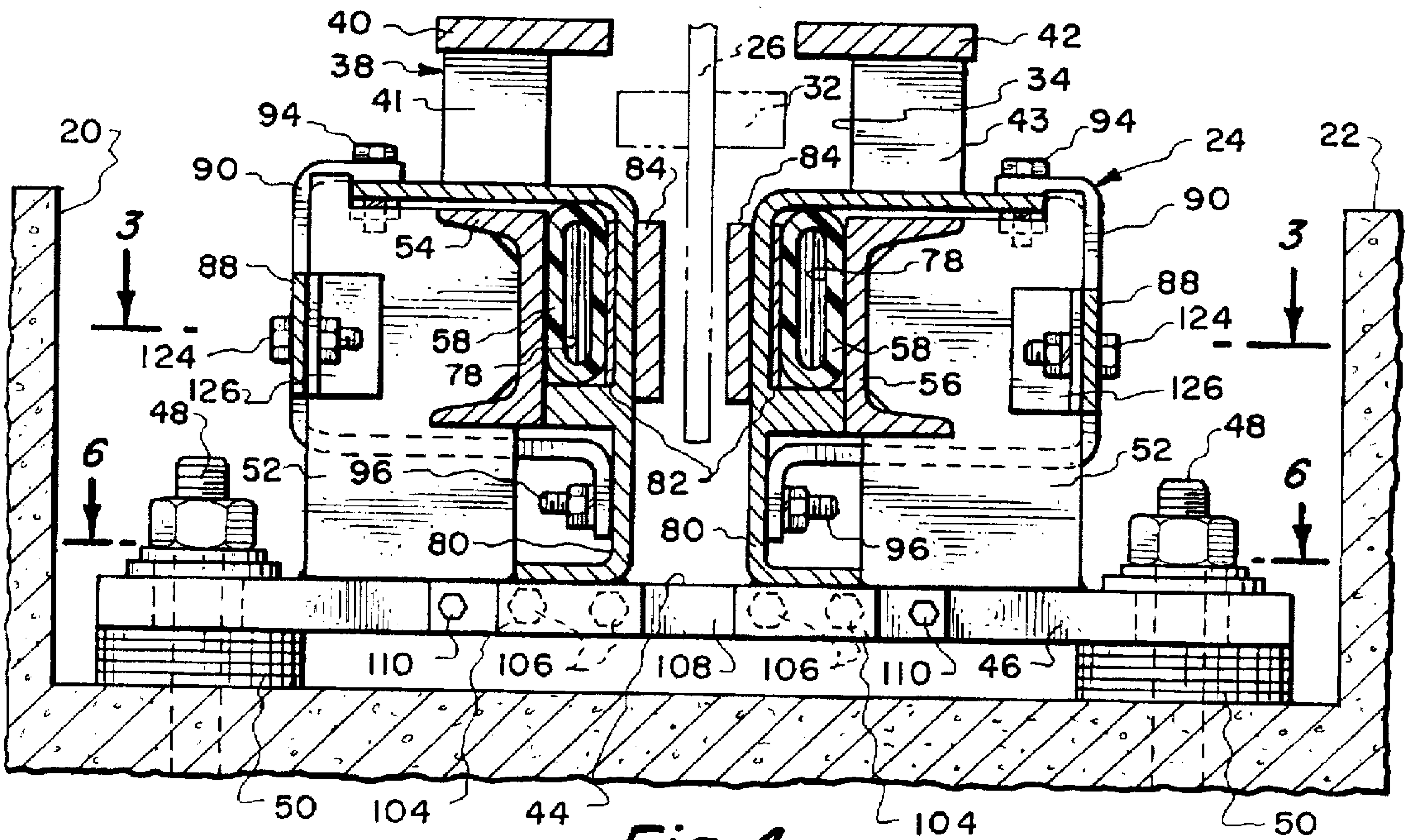
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Fig. 4.

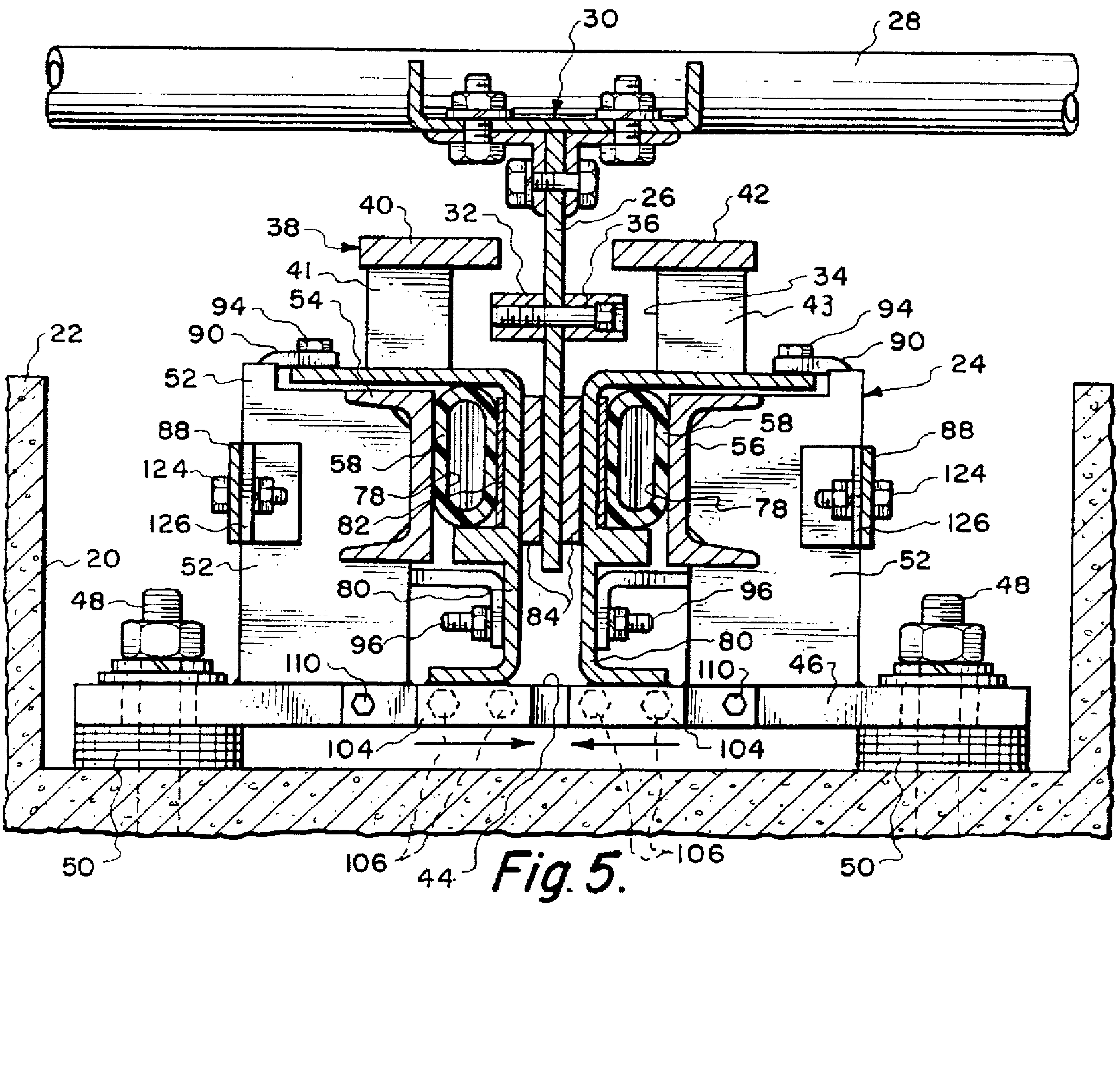
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Fig. 5.

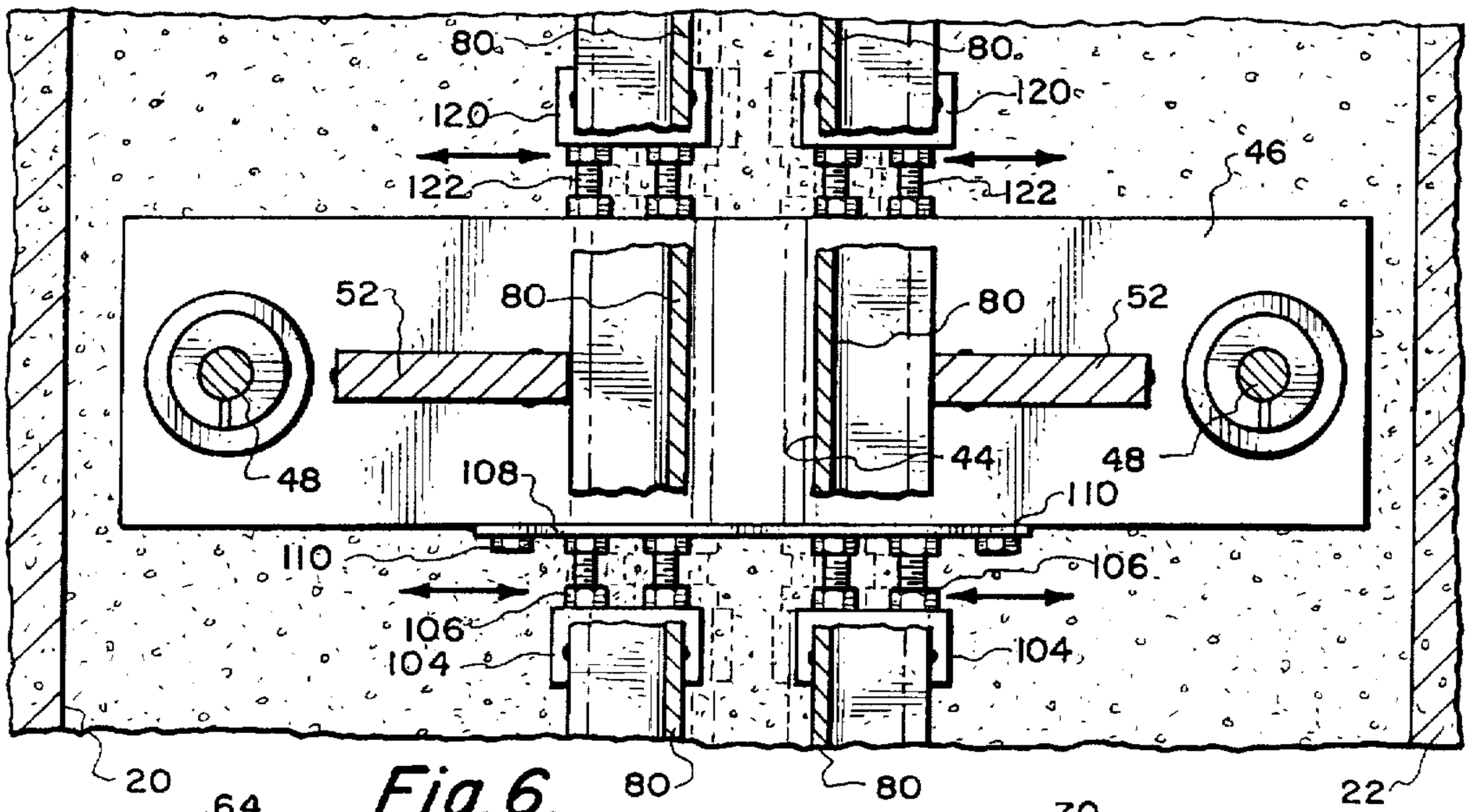

Fig. 6.

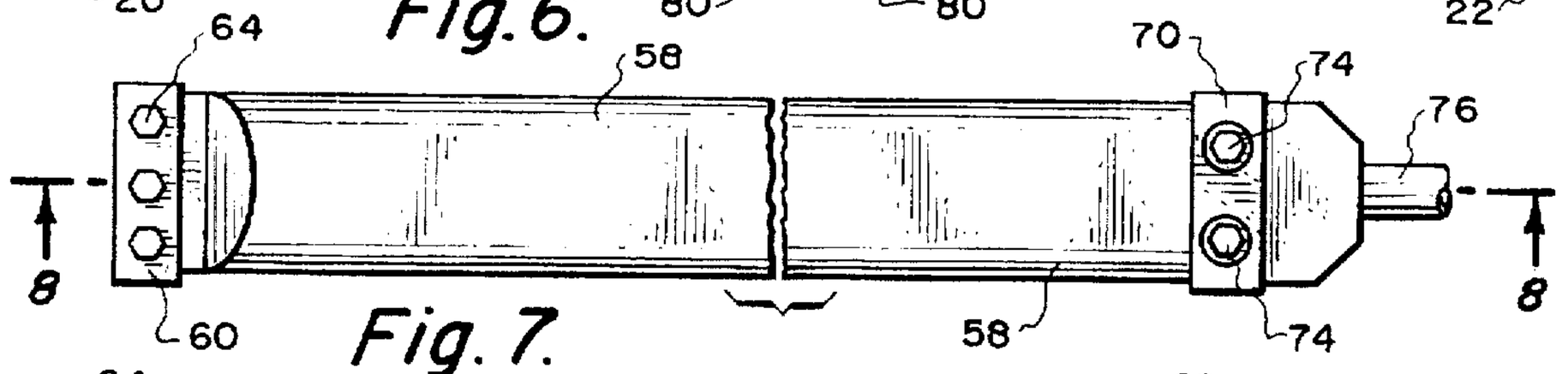

Fig. 7.

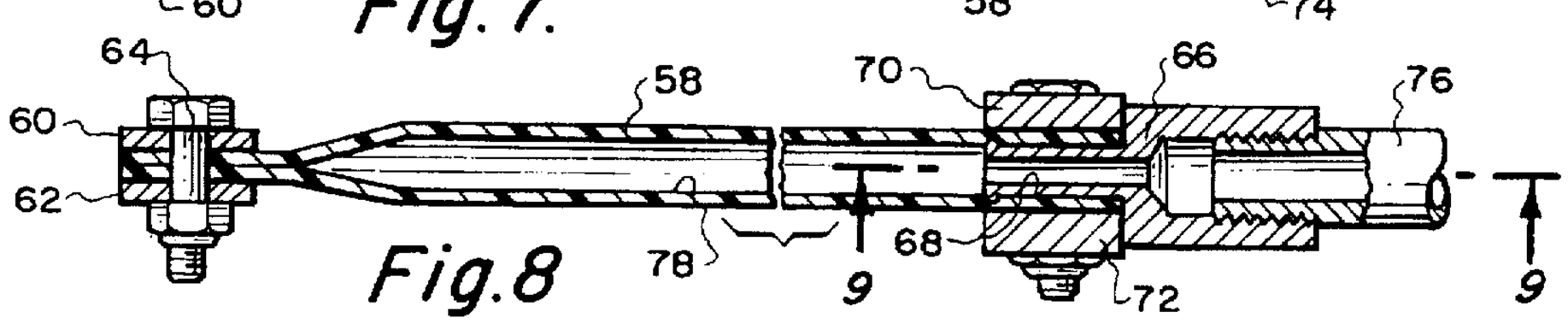

Fig. 8

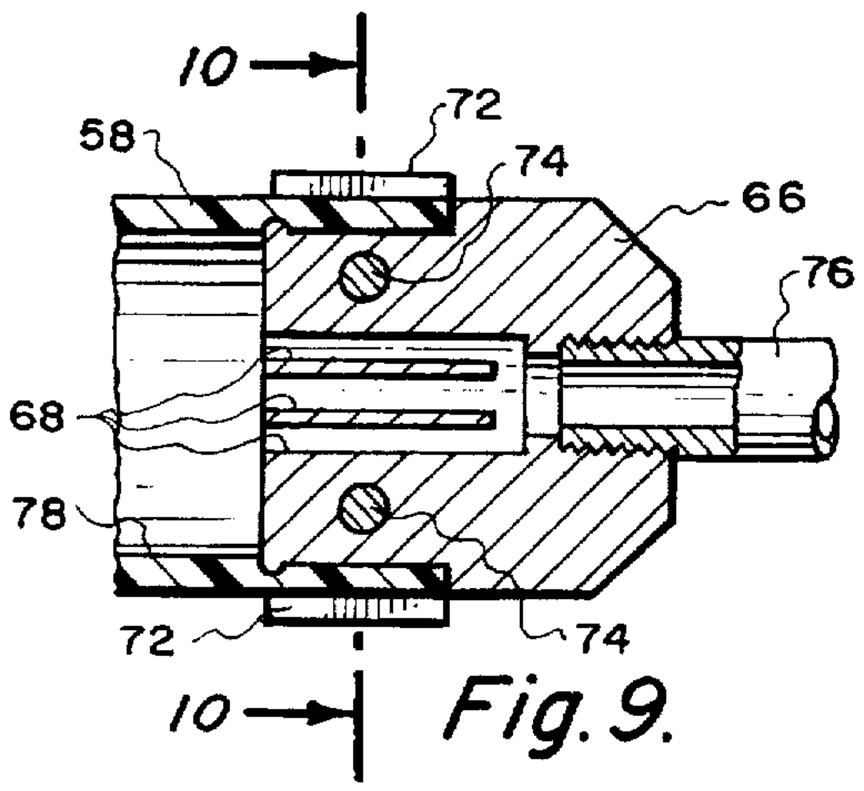

Fig. 9.

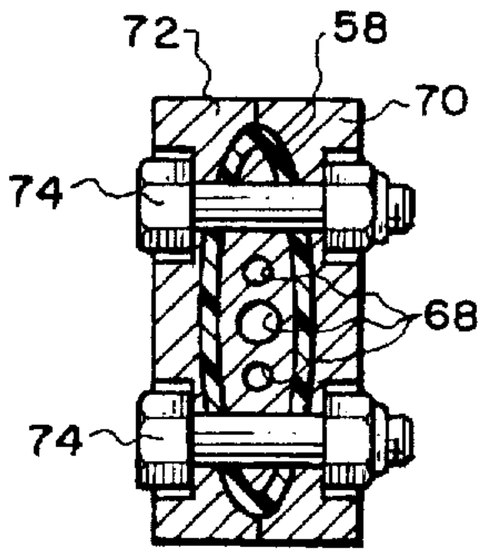

Fig. 10.

TRACK BRAKE APPARATUS WITH SLIDING SHOES AND WEAR PLATES FOR PREVENTING EXCESSIVE MOVEMENT OF THE SHOES IN THE DIRECTION OF VEHICLE MOVEMENT

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of this invention is directed to a brake apparatus which is designed to be mounted in conjunction with a fixed structure where the brake apparatus, when activated, functions to slow and stop a movable structure that is moving relative to the fixed structure.

2. Description of the Prior Art

Wherever there is a movable structure that is to be moved in conjunction with a fixed structure, there must be employed some type of a braking apparatus to stop the movable structure. An example of such a structure would be within an amusement ride such as a drag race type of amusement ride. In this type of amusement ride, a vehicle within which is to be located a human, is accelerated rapidly a certain distance down a track. The vehicle is tied to the track so that it cannot leave the track. At the end of the acceleration distance, it is then desired to slow and eventually stop the vehicle. In such a ride, it is desirable to not leave the braking to the occupant of the vehicle with instead the braking occurring automatically. The brake apparatus is mounted in conjunction with the track.

In the past, it has been common to utilize track mounted braking units in conjunction with an amusement ride. One such amusement ride has been a roller coaster. However, roller coasters do not only go in a straight line direction but also go around curves. Therefore the problem encountered by roller coaster type brakes is different than brake apparatuses which are designed to be used in conjunction with a straight line type of amusement ride.

SUMMARY OF THE INVENTION

A primary objective of the present invention is to construct a brake apparatus that is intended to be used in conjunction with a straight line amusement ride where a vehicle moves in a straight line from a start position to a finish position.

Another objective or the present invention is to construct a brake apparatus that is to operate in a fail safe manner to slow and eventually stop a movable vehicle within an amusement ride where the vehicle moves in a straight line from a start position to a finish position.

The structure of the present invention is directed to a brake apparatus that is to be mounted in conjunction with a track with the vehicle being movable on that track from a start position to a finish position. The vehicle includes a guide blade that is movable within the track. A series of brake apparatuses are to be mounted in conjunction with this track in a spaced apart relationship from each other. These brake apparatuses are mounted within the deceleration portion of the track. Each brake apparatus is to be basically identical with each brake apparatus including a pair of brake units. Included within each brake unit is a pair of inflatable bladders. Inflating of each bladder by air will result in

movable portions of each braker unit being moved toward each other. On the outer face of each movable portion is a brake shoe with the brake shoes of the opposing brake units pressing against the guide blade. This pressure will result in slowing and eventual stopping of the vehicle. Upon release of the air pressure from the bladders a leaf spring assembly will cause the movable portion of each brake unit to move to a non-braking position. Each brake apparatus is mounted on a plurality of metallic cross beams mounted within the track. During braking, the movable portion of the brake apparatus will have a tendency to move longitudinally in the same direction the guide blade is moving. The movable portions of the braking unit apply pressure to a wear plate mounted on each metallic cross beam. The structure that contacts each wear plate of each braking unit is adjustable so as to evenly divide the pressure of this force between the metallic cross beams.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of a brake apparatus constructed in accordance with this invention showing the brake apparatus in the non-braking position;

FIG. **2** is a side view of the brake apparatus of the present invention taken along line **2—2** of FIG. **1**;

FIG. **3** is a cross-sectional view taken in the direction from the top of the brake apparatus of the present invention taken along line **3—3** of FIG. **2** and also along line **3—3** of FIG. **4**;

FIG. **4** is a transverse cross-sectional view through the brake apparatus of the present invention taken along line **4—4** of FIG. **2** showing the brake apparatus in the non-braking position;

FIG. **5** is a cross-sectional view similar to FIG. **4** but showing the brake apparatus in the braking position;

FIG. **6** is a cross-sectional view taken along line **6—6** of FIG. **4** showing in more detail the brake apparatus of the present invention;

FIG. **7** is an exterior longitudinal view of an inflatable bladder assembly that is utilized in conjunction with the brake apparatus of the present invention;

FIG. **8** is a longitudinal cross-sectional view of the inflatable bladder assembly utilized in conjunction with the brake apparatus of the present invention taken along line **8—8** of FIG. **7**;

FIG. **9** is a longitudinal cross-sectional view through the fitting that is mounted in conjunction with one end of the inflatable bladder assembly taken along line **9—9** of FIG. **8**; and

FIG. **10** is a transverse cross-sectional view through the air supply fitting utilized in conjunction with the inflatable bladder assembly taken along line **10—10** of FIG. **9**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

There is formed a channel **20** within a cement base **22**. This cement base **22** is to be of an extended lineal length. Typical length would be 370 feet. An amusement ride vehicle, with a human occupant, is to be accelerated along the channel **20** for about 175 feet. This leaves about 195 feet to slow the vehicle until it actually comes to a stop. In order to slow the vehicle there is utilized the brake apparatus **24** of this invention.

The vehicle (not shown) is to have mounted on its under-side a guide blade **26**. The guide blade **26** is fixedly

mounted to the tubular frame **28** of the vehicle. Attachment to the tubular frame **28** of the guide blade **26** is accomplished by means of a mounting bracket assembly **30**. Mounted on the guide blade **26** is a retainer bar **32**. The retainer bar **32** is fixedly mounted to the guide blade **26** by means of a threaded bolt **36**. The threaded bolt **36** passes through a hole formed within the guide blade **26**. The retainer bar **32** is located within a retaining channel **34** formed within a track **38**. The upper end of the retaining channel **34** is partially closed by a pair of top plates **40** and **42**. The function or the retainer bar **32** is to keep the guide blade **26** engaged at all times within the track slot **44**. If there is any attempt by the vehicle and the frame **28** to rise in an upward direction away from the cement base **22**, the retainer bar **32** will come in contact with the undersurface of the top plates **40** and **42** which will keep the guide blade **26** captured within the track slot **44**.

Each brake apparatus **24** will generally be about five feet in length. Each brake apparatus **24** is mounted on a plurality of metallic cross beams **46** with three in number of the metallic cross beams **46** being shown. The metallic cross beams **46** are securely mounted into the cement base **22** by means of threaded bolts **48**. The metallic cross beams **46** are intended to be evenly spaced apart. In between the underside of each metallic cross beam **46** and the cement base **22** there may be incorporated a series of washers forming a spacer **50**. It is the function of the spacers **50** to locate the metallic cross beams **46** precisely level and slightly off the surface of the cement base **22**.

Secured as by welding to each metallic cross beam **46** is a pair of plates **52**. Each pair of plates **52** for each metallic cross beam **46** is located in an aligned manner forming a space there between. It is within that space that the guide blade **26** is conducted and is actually to be centrally conducted. Since there are three in number of the metallic cross beams **46**, it is to be understood that there will actually be three in number of the plates **52** located on each side of the track slot **44**.

Fixedly mounted to the plates **52** and located on one side of the track slot **44** is the channel **54**. On the remaining three in number of the plates **52** located on the opposite side of the track slot **44** there is fixedly mounted a similarly shaped channel **56**. The outer surface of the channels **54** and **56** each define a flat surface. Abutting against the flat surface of the channels **54** and **56** is an inflatable bladder **58** with it being understood that there is a separate bladder for each channel **54** and **56**. One end of the inflatable bladder **58** is completely closed by means of plates **60** and **62** which are tightly bolted together by threaded bolts **64**. The opposite end of the inflatable bladder **58** is mounted on a fitting **66**. The fitting **66** internally includes a series of through holes **68**. The sidewall of the inflatable bladder **58** is tightly clamped onto the fitting **66** by clamp plates **70** and **72**. The clamp plates **70** and **72** are secured together by means of threaded bolts **74**. The threaded bolts **74** function to tightly mount the wall of the inflatable bladder **58** onto the fitting **66**.

Pressurized air is to be supplied from tube **76** and through holes **68** of fitting **66** into the interior chamber **78** of the inflatable bladder **58**. This will cause the inflatable bladder **58** to expand. This will also cause U-shaped plate **80** to be moved away from channel **54** or channel **56**. The U-shaped plates **80** actually move toward each other. Fixedly mounted to the inside surface of each of the U-shaped plates **80** is a wear plate **82** which is intended to diminish the wear on the wall of the inflatable bladder **58**. The wear plate **82** is to abut directly against the inflatable bladder **58**. The top plate **40** is fixedly mounted by supports **41** onto one U-shaped plate **80** with top plate **42** being fixedly mounted by supports **43** onto the other U-shaped plate **80**. Mounted on the exterior surface of U-shaped plate **80** is a brake shoe **84**. Expansion of the inflatable bladders **58** will cause the brake shoes **84** to be moved toward each other within the brake apparatus. This will result in the brake shoes **84** to be pressed on opposite sides of the guide blade **26**.

The brake shoes **84** will be located in the braking position for the guide blade **26** prior to entry of the guide blade **26** between the brake shoes **84**. The guide blade **26** will be guided into entry between the brake shoes **84** by flared ends **86**. Once the guide blade **26** is no longer located between the brake shoes **84**, the air pressure that is supplied within the interior chamber **78** is now decreased which will result in the inflatable bladders **58** being capable of being collapsed. The collapsing is caused by leaf spring **88**. There is a leaf spring **88** for each U-shaped plate **80**. The leaf spring **88** is mounted at its center to the plate **52** that is mounted on the metallic cross beam **46** that is located in the middle of the three in number of the metallic cross beams **46**. This mounting is accomplished by threaded bolts **124** and bracket **126**. The bracket **126** is welded to plate **52**. The ends of the leaf spring **88** are mounted by brackets **90** to U-shaped plate **80**.

The brackets **90** are fixedly mounted by threaded bolts **94** and **96** to the U-shaped plate **80**. It is to be understood that there is a pair of brackets **90** for each U-shaped plate **80**. It is also to be understood that each U-shaped plate **80** is capable of a limited amount of movement on the metallic cross beams **46**. It is this movement which is due to the inflation of the inflatable bladders **58** which will result in the brake shoes **84** coming into contact with the guide blade **26**. Upon deflation of the inflatable bladders **58**, the force of the leaf spring **83** will move the U-shaped plate **80** away from the guide blade **26** and move the brake shoes **84** further apart. The bias of the leaf springs **88** is continuous in the direction away from guide blade **26**. The expansion of each of the inflatable bladders **58** must overcome the force of its respective leaf spring **88** when moving of the U-shaped plates **80** outward into the braking position.

With the brake shoes **84** in contact with the guide blade **26**, there is a natural tendency for the U-shaped plates **80** and the brackets **90** to be carried along with the guide blade **26**, in other words move lineally relative to the cement base **22**. In order to prevent this movement, there is mounted a stop block **98** on the U-shaped plate **80**. The stop block **98** is mounted directly adjacent the metallic cross beam **46** that is located at the end of the brake apparatus **24** which first engages with the guide blade **26**. Looking at the drawings in FIG. **2**, the stop block **98** is mounted directly adjacent and on the right side of the metallic cross beam **46** that is at the right side of FIG. **2**. Mounted on the metallic cross beam **46** by threaded bolts **100** is a wear plate **102**. Each time the braking apparatus **24** applies a braking force against the guide blade **26**, the stop block **98** will be moved sharply against the wear plate **102**. Eventually over time, this will cause the wear plate **102** to be damaged and will require replacement. The wear plate **102** is used so as to prevent this damage from occurring to the metallic cross beam **46**. It is far more desirable to replace the wear plate **102** than replace a metallic cross beam **46**.

At the metallic cross beam **46** located at the approximate middle of the longitudinal length of the brake apparatus **24**, there is located a stop block **104**. The stop block **104** is also fixedly secured to the U-shaped plate **80**. It is to be understood that there is a stop block **104** for each U-shaped plate **80**. It should also be noted that there is a stop block **98** for each U-shaped plate **80**. However, the stop blocks **104**

include threaded bolts **106** that protrude from the stop blocks **104**. The heads of the threaded bolts **106** are designed to come into contact with a wear plate **108**. Wear plate **108** is basically identical to wear plate **102** with wear plate **108** being mounted by threaded bolts **110** to the metallic cross beam **46** that is mounted in the middle of the brake apparatus **24**. It is the function of the wear plate **108** to protect the metallic cross beam **46** from being damaged by the braking force. The threaded bolts **106** are to be adjusted in position so that these threaded bolts **106** contact the wear plate **108** at precisely the same time that the stop blocks **98** contact the wear plate **102**. This means braking force will be divided so that not all the force is being transmitted to the wear plate **102** but also part of that braking force is being transmitted to the wear plate **108**.

The metallic cross beam **46** that is located at the left side of FIG. **2** has a stop block **112** mounted to the U-shaped plate **80**. The stop block **112** has a plurality of threaded bolts **114** protruding therefrom. These threaded bolts **114** are to engage with a wear plate **116** which is fixedly mounted by threaded bolts **118** to the metallic cross beam **46** that is located at the left side of FIG. **2**. Again, the threaded bolts **114** are to be adjusted so that such contact the wear plate **116** at precisely the same time that threaded bolts **106** contact wear plate **108** and stop block **98** contacts wear plate **102**. The reason for the threaded bolts **106** and **114** is that the threaded bolts **106** and **114** are to compensate for minor variations in mounting positions of the different metallic cross beams **46** when mounted on the cement base **22**. Stop block **98** does not need threaded bolts since stop blocks **104** and **112** are adjusted relative to stop block **98**. It is to be noted that the braking force that is encountered by the brake apparatus **24** is to be divided equally between each metallic cross beam **46**. This division of force is desirable so that the wear encountered by the metallic cross beams **46** is not concentrated at a particular metallic cross beam **46**.

After the vehicle has come to a stop, it will be necessary to move the vehicle back to the starting position. At that particular time the guide blade **26** will be moved from left to right in FIG. **2** through the brake apparatus **24**. Although the brake apparatus **24** should be in the non-braking position as shown in FIG. **4**, there is a possibility that the guide blade **26** will come into momentary contact with one of the brake shoes **84**. In that particular time, there will be a tendency for the brake apparatus **24** to be moved toward the right in FIG. **2**. It is desirable to prevent this movement and to do so there is mounted a stop block **120** on each U-shaped plate **80**. Each stop block **120** has a plurality of threaded bolts **122** extending therefrom which are to come into contact with the metallic cross beam **46** that is located in the middle of the longitudinal length of the brace apparatus **24**. In this particular situation, there is no need to be concerned with excessive wear. Therefore wear plates are not required since the brake apparatus **24** is not in the braking position. Threaded bolts **122** can be adjusted to come into contact with their respective metallic cross beam **46** only after a few thousands of an inch in movement of the U-shaped plate **80** and the lineal direction is the reverse of the accelerating lineal direction of the vehicle.

What is claimed is:

1. A brake apparatus mounted in conjunction with a track, a structure movable on said track, said brake apparatus comprising:

a pair of braking units, a first portion of said braking units being fixed to said track, a second portion of said braking units being movable from a non-braking position to a braking position, said braking position locating said second portion of said braking unit to contact said structure to result in slowing of said structure to achieve eventual stopping of said structure, said non-braking position locating said second portion of said braking units spaced from said structure, said braking units being movable toward each other during movement from said non-braking position to said braking position, a plurality of metallic cross beams fixedly mounted to said track, said second portion of said braking units being slidably mounted on said metallic cross beams, each said metallic cross beam including a removable wear plate, said second portion including contact means to push against said wear plates when said brake apparatus is in said braking position and said second portion is in contact with said structure.

2. The brake apparatus as defined in claim **1** wherein: said track being in a straight line.

3. The brake apparatus as defined in claim **1** wherein: each said braking unit being continuously spring biased by a biasing means toward said non-braking position.

4. The brake apparatus as defined in claim **3** wherein: said biasing means comprising a leaf spring assembly.

5. The brake apparatus as defined in claim **1** wherein: each said second portion of said braking unit being movable to said braking position by means of an inflatable bladder assembly.

6. The brake apparatus as defined in claim **1** wherein: said contact means being adjustable thereby dividing the force of said second portion pushing against said wear plates between said metallic cross beams.

7. A brake apparatus mounted in conjunction with a track, a structure movable in a lineal direction on said track, said brake apparatus comprising:

a pair of braking units, each said braking unit having a first portion and a second portion, each said first portion being fixed to said track, each said second portion being movable in the direction transverse to said lineal direction from a non-braking position to a braking position with said second portion of each said braking unit facing each other and being moved toward each other, said braking position locating each said second portion in a location to contact said structure to apply a braking force to result in slowing of said structure along said lineal direction to achieve eventual stopping of said structure, said non-braking position locating each said second portion spaced from said structure; and

braking force dividing means mounted on each said second portion, said braking force tending to cause each said second portion to move in said lineal direction, said braking force dividing means to substantially evenly distribute said braking force along each said braking unit to prevent localized concentration of said braking force at a particular location within each said braking unit.

8. The brake apparatus as defined in claim 7 wherein: said track being in a straight line.

9. The brake apparatus as defined in claim 7 wherein: each said braking unit being continuously spring biased by a biasing means toward said non-braking position.

10. The brake apparatus as defined in claim 9 wherein: said biasing means comprising a leaf spring assembly.

11. The brake apparatus as defined in claim 7 wherein: each said second portion of said braking unit being movable to said braking position by means of an inflatable bladder assembly.

12. A brake apparatus mounted in conjunction with a track, a structure movable in a lineal direction on said track, said brake apparatus comprising:

a pair of braking units, each said braking unit having a first portion and a second portion, said first portion of each said braking unit being fixed to said track, said second portion of each said braking unit being movable in a direction transverse to said lineal direction from a non-braking position to a braking position, said braking position locating each said second portion in a location to contact said structure to apply a braking force to result in slowing of said structure along said lineal direction to achieve eventual stopping of said structure, said non-braking position locating each said second portion of said braking unit spaced from each other, said braking units being movable toward each other during movement from said non-braking position to said braking position;

each said second portion including contact means to push against said track to prevent movement of each said second portion in said lineal direction when said brake apparatus is in said braking position and said second portion is in contact with said structure;

each said braking unit being continuously spring biased by a biasing means toward said non-braking position; and

said biasing means comprising a leaf spring assembly.

13. A brake apparatus mounted in conjunction with a track, a structure movable in a lineal direction on said track, said brake apparatus comprising:

a pair of braking units, each said braking unit having a first portion and a second portion, said first portion of each said braking unit being fixed to said track, said second portion of each said braking unit being movable in a direction transverse to said lineal direction from a non-braking position to a braking position, said braking position locating each said second portion in a location to contact said structure to apply a braking force to result in slowing of said structure along said lineal direction to achieve eventual stopping of said structure, said non-braking position locating each said second portion of said braking unit spaced from each other, said braking units being movable toward each other during movement from said non-braking position to said braking position;

each said second portion including contact means to push against said track to prevent movement of each said second portion in said lineal direction when said brake apparatus is in said braking position and said second portion is in contact with said structure; and

each said second portion of said braking unit being movable to said braking position by means of an inflatable bladder assembly.

14. A brake apparatus mounted in conjunction with a track, a structure movable in a lineal direction on said track, said brake apparatus comprising:

a pair of braking units, each said braking unit having a first portion and a second portion, said first portion of each said braking unit being fixed to said track, said second portion of each said braking unit being movable in a direction transverse to said lineal direction from a non-braking position to a braking position, said braking position locating each said second portion in a location to contact said structure to apply a braking force to result in slowing of said structure along said lineal direction to achieve eventual stopping of said structure, said non-braking position locating each said second portion of said braking unit spaced from each other, said braking units being movable toward each other during movement from said non-braking position to said braking position;

each said second portion including contact means to push against said track to prevent movement of each said second portion in said lineal direction when said brake apparatus is in said braking position and said second portion is in contact with said structure; and

said contact means being adjustable thereby dividing the force of each said second portion pushing against said track.

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