

[54] PIPE TARGET ASSEMBLY

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[22] Filed: Nov. 1, 1973

[21] Appl. No.: 412,006

[52] **U.S. Cl.** **33/293; 33/295; 40/11 A**

[51] **Int. Cl.**..... **G01c 15/06**

[58] **Field of Search** 33/286, 293, 294, 295;
248/14, 16; 40/310, 11 A, 10

[56] **References Cited**

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[57]

ABSTRACT

A target assembly for placement in a pipe to establish the center thereof. The target assembly includes a resilient frame formed from a single wire into a symmetrical planer structure. The frame is capable of manual compression for insertion into a pipe of an inside diameter for which the target assembly was selected. The resiliency of the frame then forces the assembly outwardly against the inside of the pipe in a symmetrical fashion such that the assembly will be centrally located within the pipe. A target is attached to the frame in such a way that the target defines the center of the pipe with the assembly in place. Two fixed points are established where the target is mounted to the frame. The target and frame are attached in such a way that the flexure of the frame about the two fixed attachment points is not restrained by the target in order that the symmetrical placement of the assembly will not be impaired.

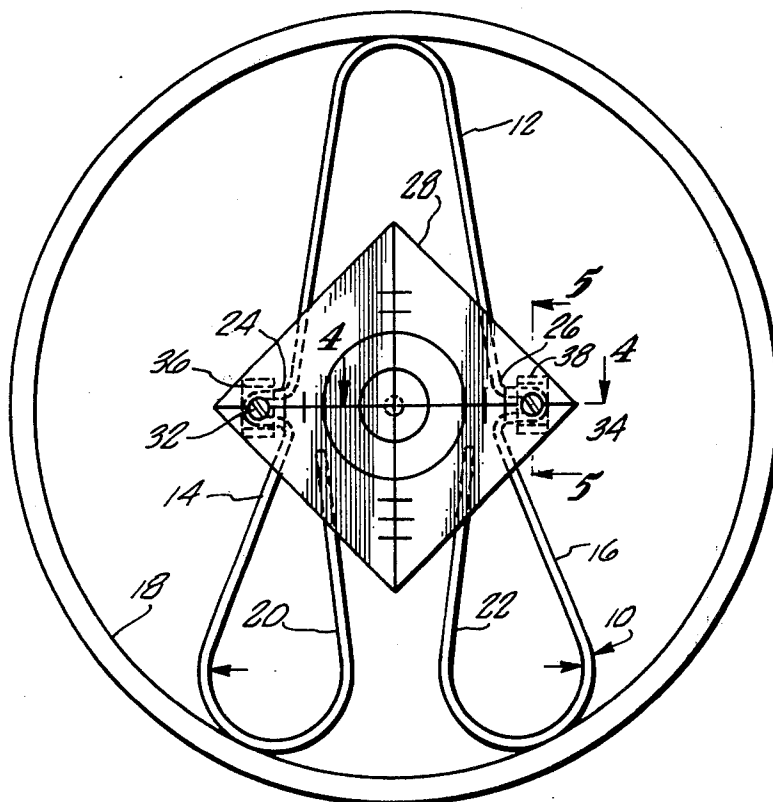


FIG. 1

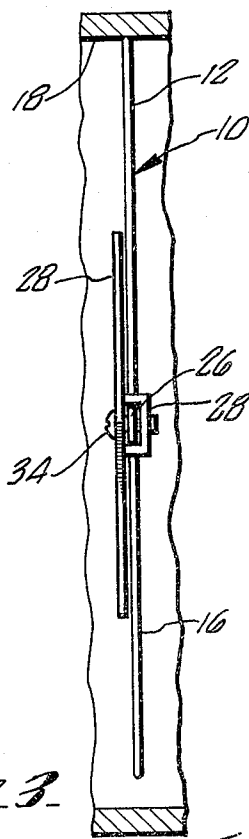
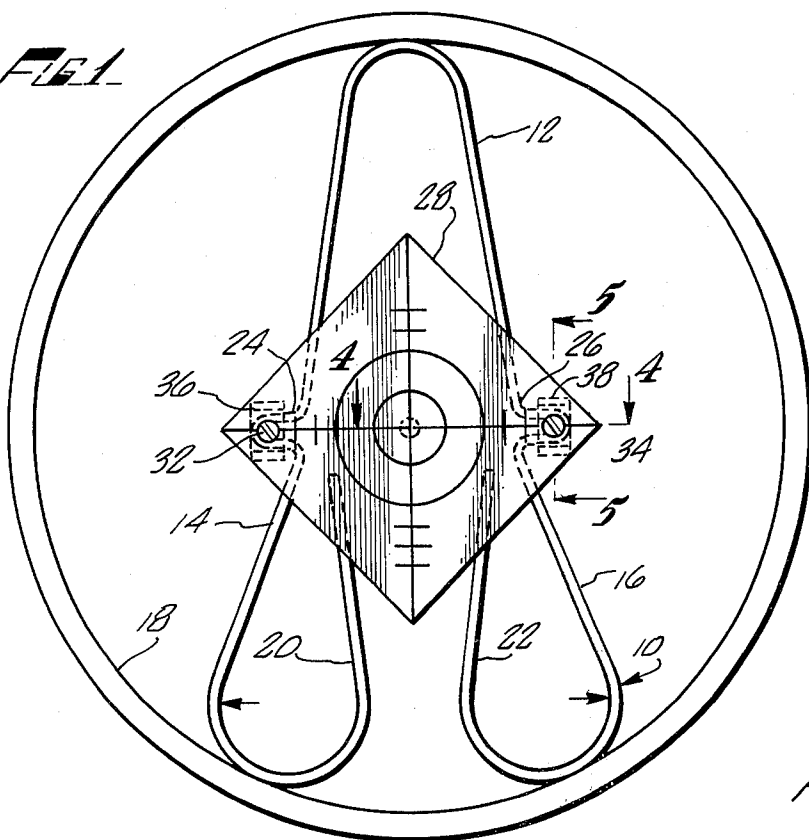


FIG. 3

FIG. 2

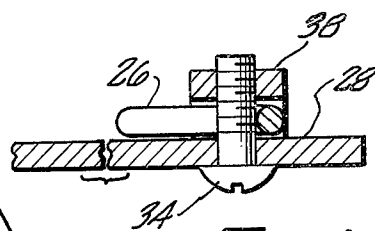
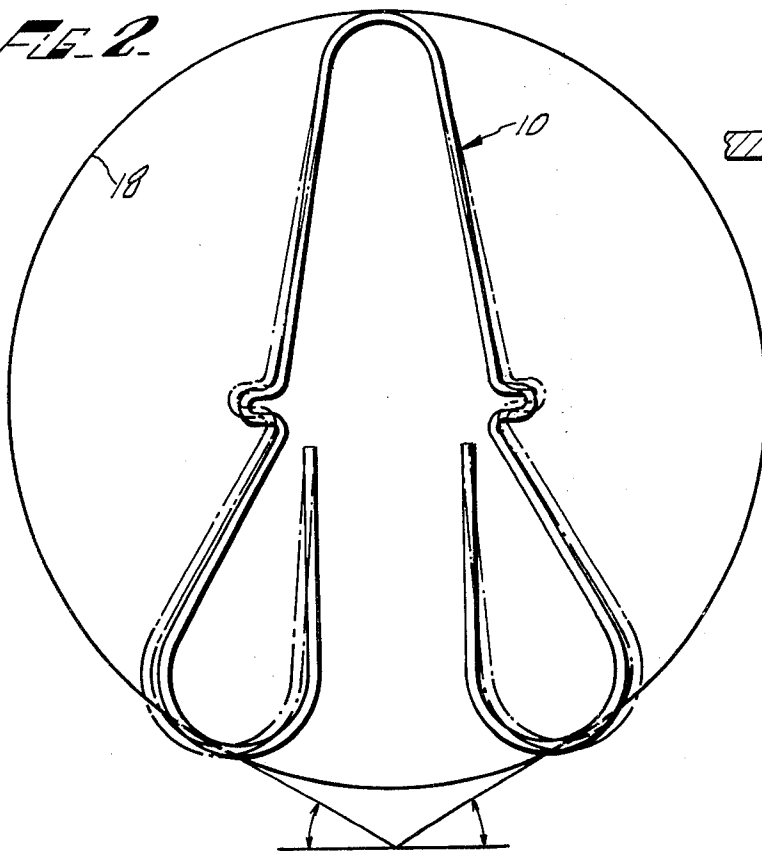


FIG. 4

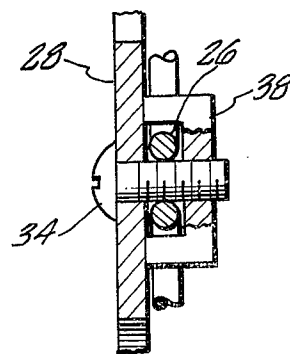


FIG. 5

PIPE TARGET ASSEMBLY

This invention is directed to a target assembly used in the construction of pipe systems. More specifically, this invention is directed to a target assembly which is capable of being easily and quickly positioned within a pipe to indicate the center thereof for alignment of the pipe during the construction of a pipe system.

Target assemblies have been employed in conjunction with light beam generator systems for the alignment of pipes during the construction of water supply systems, sewer systems, and the like. Such assemblies are positioned on or near a pipe in order that the center of the target is meaningfully related to a position on the pipe. When the light beam intercepts the target at the eye thereof, the pipe is properly positioned. Such systems are commonly used to align pipes and other structures which are not conveniently aligned by normal surveying techniques. However, such target assemblies are either relatively complicated or not capable of seeking their own alignment relative to the pipe. Consequently, such assemblies have either been relatively expensive or require careful alignment procedures.

The present invention is directed to a target assembly which is comparatively simple, and yet is easily installed in a preselected diameter pipe, tends to locate the target at the center thereof, is rigidly retained within the pipe, and can be easily removed. The assembly includes a resilient wire frame to which is mounted a target. The wire frame is symetrically shaped in a planer configuration and sized to intersect the inside surface of a pipe at three positions. The resiliency of the frame allows manual compression thereof for easy insertion into and extraction from a properly sized pipe. The target assembly will tend to position itself centrally within the pipe because the resilient frame is designed to symetrically deflect under compression. In order that symetrically deflection might occur, the frame is symetrically and the mounting brackets locating the target on the frame allow the frame to freely rotate about the mounting points.

Accordingly, an object of the present invention is to provide a simple target assembly which can be centrally positioned in a pipe of a predetermined size.

Another object of the present invention is to provide a relatively simple target assembly which may be placed within a pipe and which automatically positions the center of the target coincident with the centerline of the pipe.

A further object of the present invention is to provide a manually operative target assembly which may be compressed symetrically and positioned within a pipe of predetermined inside diameter in order that the center of the target will be coincident with the centerline of the pipe.

Yet another object of the present invention is to provide a target assembly including a resilient frame constructed from a single wire and a target which centers itself within a circular enclosure and remains locked therein by compression.

Another object of the present invention is to provide a target assembly which includes a frame constructed from a single wire to intersect a pipe of preselected inside diameter at three positions and which will automatically position itself within the pipe to centrally position a target.

Other and further objects and advantages of the present invention will be made readily apparent from the following detailed description and accompanying drawings.

FIG. 1 is a front view of the present invention shown in place within a pipe.

FIG. 2 is a front view of the single wire frame of the present invention in its relaxed position. The wire is shown in phantom in its position assumed after assembly.

FIG. 3 is a side view of the present invention located within a pipe.

FIG. 4 is a detailed cross-sectional view taken along line 4—4 of FIG. 1.

FIG. 5 is a detailed cross-sectional view taken along line 5—5 of FIG. 1.

Turning to the views of the assembled preferred embodiment of the present invention, a target assembly is illustrated positioned in compression within a pipe. The assembly is shown to include a resilient frame, generally designated 10, which is formed from a single piece of wire. The wire is conveniently symmetrical in order that it may be assured of uniform deflection about the symmetrical centerline when the lower portion of the frame 10 is compressed. However, the wire may be formed less conveniently in an asymmetrical configuration providing that the flexure of each side of the frame 10 about the symmetrical centerline remains equal.

The frame 10 is divided into an upper loop 12 having two leg portions which extend upwardly from the center of the target assembly to meet at the symmetrical centerline of the frame 10. The lower loops 14 and 16 extend below the center of the target assembly to meet the inner wall of the pipe 18 and then return upwardly to form handles 20 and 22. Located between the upper loop 12 and each of the lower loops 14 and 16, mounting loops 24 and 26 establish mounting points defined by the centers of curvature of each of the mounting loops 24 and 26. The several loops of the frame 10 all lie in a plane.

A target 28 is shown here to be a square sheet of rigid material of sufficient diagonal width to cover the mounting loops 24 and 26. The target 28 may be of any convenient shape. However, it is preferred that the center of the target be solid in order that the light beam will be displayed at the point of intersection of the light beam with the target. Further, the target should extend to the mounting loops 24 and 26 in order that the target and frame may be conveniently joined. A pattern 30 is displayed on the target 28 in order that the center is defined and the surrounding area may be easily identified.

Means for mounting the target 28 to the resilient frame 10 are provided in association with the mounting loops 24 and 26. Pin means are associated with the target 28 to position the target 28 relative to the mounting loops 24 and 26. These pins means comprise screws 32 and 34 in the present embodiment which are positioned through the target 28 along a centerline of the target and equidistant from the center thereof. The positioning of the screws 32 and 34 is such that the distance between their centerlines is slightly larger than the distance between the mounting points defined by the centers of curvature of the mounting loops 24 and 26 determined when the frame 10 is relaxed. The screws 32 and 34 extend through the target 28 to receive the mounting loops 24 and 26 when the frame 10 is expanded as shown by the phantom lines in FIG. 2. By

making this distance between the screws 32 and 34 large enough to require the frame 10 to be expanded to fit over the screws, it is assured that the target 28 will not be loose in the frame 10.

To retain the screws 32 and 34 within the mounting loops 24 and 26, channel nuts 36 and 38 are employed. The channel nuts 36 and 38 allow tightening of the screws 32 and 34 without drawing the nuts 36 and 38 against the mounting loops 24 and 26. In this way, the frame 10 is prevented from sliding away from the target 28. By retaining the target 28 on the frame 10 without creating a compressive hold on the mounting loops 24 and 26, the frame 10 is allowed to freely flex about the pin means when a symmetrical load is placed thereon.

The complete target assembly when not subjected to any outside compressive load is designed to be somewhat larger than the inside diameter of the pipe for which the target is designed. This relationship can best be seen in FIG. 2 where the lower portion of the frame 10 is shown to extend outwardly of the inside surface of the pipe 18. By having the assembled device of a slightly greater dimension than the pipe in which it is to be placed, the target assembly will remain compressed when positioned within the pipe and will be held against the inner wall thereof.

To position the target assembly within the pipe, the assembly may be grasped by the handles 20 and 22. The handles 20 and 22 should be positioned so that an individual may grasp both handles in one hand and compress the two together. The handles are in such a position that when compressed manually the compression loading is symmetrical. When the handles 20 and 22 are compressed together, the lower loops 14 and 16 are drawn inwardly. Naturally, they flex under the load and respond equally to the symmetrical compression loading. The mounting loops 24 and 26 are constrained to remain at a fixed distance from one another by the target 28 and screws 32 and 34. However, because the target 28 is mounted to the frame 10 in such a way as not to compress the mounting loops 24 and 26, the mounting loops 24 and 26 are free to rotate about the screws 32 and 34 and the upper loop 12 will deflect. As the lower loops deflect inwardly and the mounting loops 24 and 26 remain spaced apart, the upper loop 12 will tend to bow outwardly in either direction. The result of this compression on the handles 20 and 22 is that the loops 14 and 16 move inwardly to fit within the inside surface of the pipe 18 and the entire structure also compresses in height by the flexure action of the loops 14, 16 and 12. Once the target assembly is placed within the pipe, the manual compression is released. This allows the lower loops 14 and 16 to expand outwardly to contact the inner surface of the pipe. The upper loop 12 also is forced into contact with the pipe. Once in place, the target remains under compression and provides an accurate location of the centerline of the pipe.

One example of the present invention when used when a 10 inch inside diameter pipe employs a 9½ gage 0.141 wire as the frame 10. The defined mounting points constituting the centerlines of screws 32 and 34 are placed 3¾ inches apart. Further, the angle defined by the tangent at the intersection of the inside surface of the pipe and either of the loops 14 or 16 and a line perpendicular to the symmetrical centerline of the target is approximately 30° as illustrated in FIG. 2. Such a system requires approximately 6 to 8 pounds of force to

sufficiently compress the frame in order that the target assembly may be placed within the pipe.

Once placed, the target assembly will remain in the pipe because of the compression of the frame in the pipe. The pipe may then be positioned in the construction site and aligned by aligning the target with a light beam which may be generated by laser equipment or a line of sight established by common surveying equipment. The target can be easily removed once the pipe is in position.

Thus, a simple, inexpensive and easily manipulated target assembly is provided which may be conveniently used to establish a target at the centerline of the pipe. While embodiments and applications of this invention have been shown and described, it would be apparent to those skilled in the art that many more modifications are possible without departing from the inventive concepts herein described. The invention, therefore, is not to be restricted except by the spirit of the appended claims.

What is claimed is:

1. A target assembly for defining a point on the centerline of a pipe, comprising:

a resilient frame formed from a wire defining three points of contact for engaging the inner wall of a pipe said three points lying in a plane which is generally perpendicular to the axis of the pipe, said resilient frame being capable of deflecting symmetrically when subject to symmetrical compression loading;

a target; and

means for mounting said target centrally on said resilient frame, said means allowing symmetrical deflection of said frame when said frame is subjected to symmetrical compression loading.

2. The target assembly of claim 1 wherein said frame is larger than the inside diameter of the pipe in order that the target assembly will remain fixed within the pipe by compression.

3. The target assembly of claim 2 wherein said resilient frame is capable of being manually compressed for insertion into the pipe and then allowed to expand to become fixed in the pipe.

4. The target assembly of claim 1 wherein said resilient frame includes two handles positioned to allow manual compression of said frame with resulting symmetrical compression loading thereon.

5. The target assembly of claim 1 wherein said mounting means includes pin means extending through said target, mounting loops formed in said frame to receive said pin means and channel nuts for retaining said mounting loops about said pin means.

6. The target assembly of claim 5 wherein said pin means are positioned in said target so that said frame must be resiliently expanded to position said mounting loops about said pin means.

7. A target assembly for defining a point on the centerline of a pipe, comprising:

a resilient frame, said resilient frame being formed from a continuous length of wire into two lower loops, an upper loop and two mounting loops, said plurality of loops defining a single plane and said upper loop and said lower loops defining three points of contact for engaging the inner wall of a pipe said three points lying in a plane which is generally perpendicular to the axis of the pipe, said upper loop being attached at either end to said

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mounting loops and said mounting loops in turn being attached to said bottom loops;
a target; and
means for mounting said target centrally to said resilient frame.

8. The target assembly of claim 7 wherein said frame is larger than the inside diameter of the pipe in order that the target assembly will remain fixed within the pipe by compression.

9. The target assembly of claim 8 wherein said resilient frame is capable of being manually comprssed for insertion into the pipe and then allowed to expand to become fixed in the pipe.

10. The target assembly of claim 7 wherein said resilient frame includes two handles positioned to allow manual compression of said frame with resulting symetrical compression loading thereon.

11. A target assembly for defining a point on the centerline of a pipe, comprising:

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a resilient frame formed from a continuous length of wire into two lower loops, and an upper loop, and two mounting sections, said frame being planar and symmetrical and said frame being capable of deflection symmetrically when subjected to compression loading against said lower two loops, said two lower loops and said upper loop forming three points of contact for engaging the inner wall of a pipe said three points lying in a plane which is generally perpendicular to the axis of the pipe;
a rigid target; and

means for mounting said target centrally on said resilient frame at said two mounting sections, said mounting means including pin means and channel nut for cooperating with said mounting sections to retain said target on said frame and for allowing symmetrical deflection of said frame about said pin means.

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