Sept. 22, 1959 H. L. OWNBEY 2,905,249

WELL SCREEN AND DRIVE SHOE ASSEMBLY

Filed June 14, 1957

FIG. 1

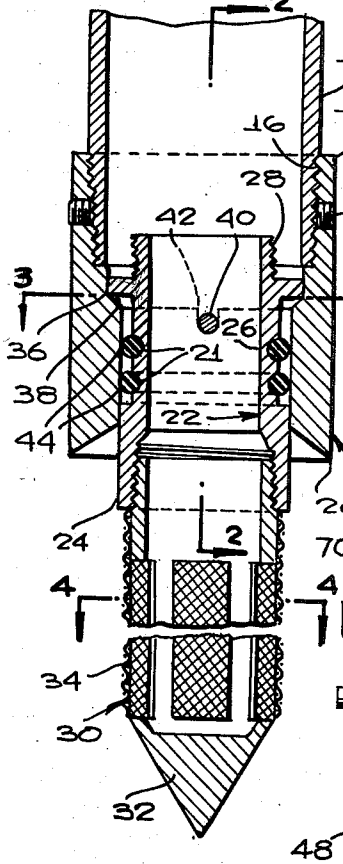


FIG. 2

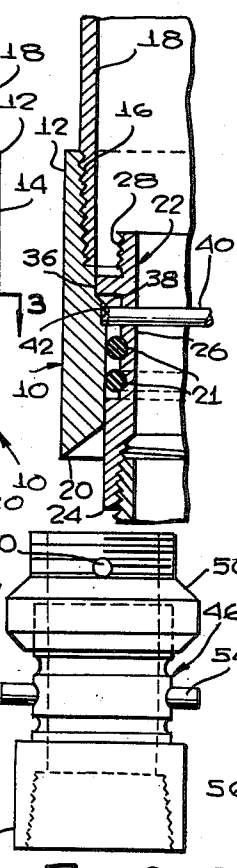


FIG. 6

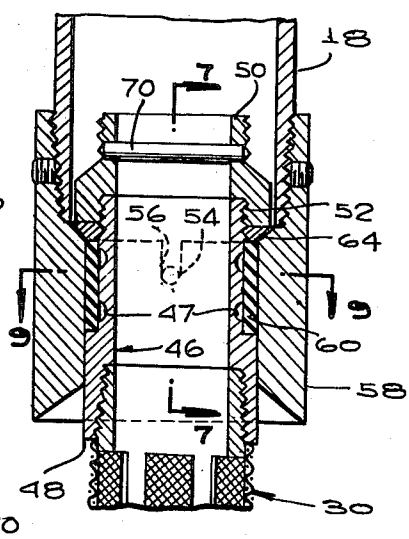


FIG. 7

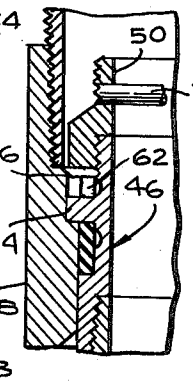
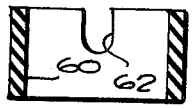


FIG. 10



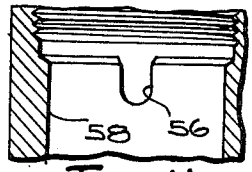


FIG. 11

FIG. 3

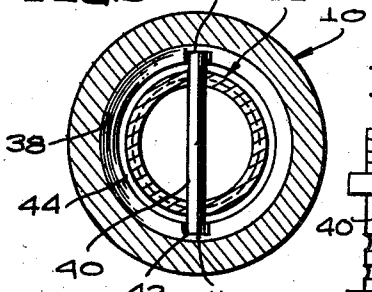


FIG. 8

FIG. 5

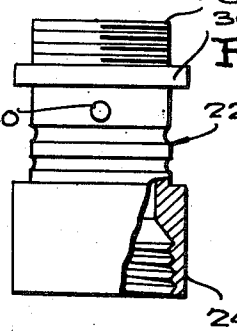


FIG. 9

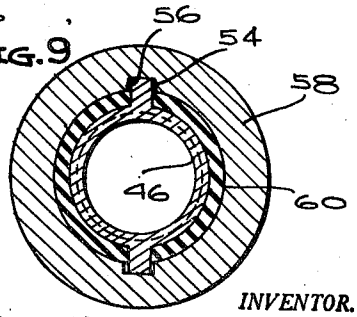
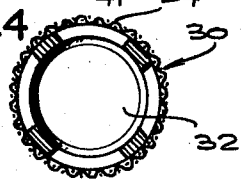


FIG. 4



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WELL SCREEN AND DRIVE SHOE ASSEMBLY

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3 Claims. (Cl. 166—157)

The present invention relates to a well screen and shoe assembly for attachment to a well casing.

An object of the present invention is to provide a well screen and shoe assembly which lends itself to ready and easy attachment of the well screen to the lower end of an installed well casing and to easy detachment from such casing of such screen when it is desired to clean the screen.

Another object of the present invention is to provide a well screen and shoe assembly for a well casing which effectively seals the casing against the admission of sand or gravel, one which lends itself to manufacture in all sizes, one sturdy in construction and of simple structure, economical to manufacture and assemble, and one which is highly effective in action.

These and other objects and advantages of the present invention will be fully apparent from the following description when taken in connection with the annexed drawing, in which:

Figure 1 is a sectional view of the lower end portion of a well casing with the well screen and shoe assembly according to the present invention installed thereon;

Figure 2 is a fragmentary sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a sectional view taken on the line 4—4 of Figure 1;

Figure 5 is an elevational view of the hollow coupling tube used in Figures 1 to 4, inclusive;

Figure 6 is a sectional view of the modified form of the invention;

Figure 7 is a fragmentary sectional view, taken on the line 7—7 of Figure 6;

Figure 8 is an elevational view of the coupling tube used in the assemblies shown in Figures 6 and 7;

Figure 9 is a sectional view taken on the line 9—9 of Figure 6;

Figure 10 is a sectional view of the rubber sealing means used in the assemblies shown in Figures 6 to 9, inclusive; and

Figure 11 is a fragmentary sectional view of the drive shoe used in the assembly shown in Figures 6 to 9, inclusive.

Referring in greater detail to the drawing in which like numerals indicate like parts throughout the several views, the well screen and shoe assembly according to the present invention comprises an upstanding hollow open-ended cylindrical drive shoe 10 having the portion 12 adjacent the upper end securable by means of set-screws 14 and threads 16 to a portion adjacent the lower end of a well casing 18.

The lower end of the drive shoe 10 may be provided with a cutting edge as at 20 in Figures 1 and 2, although such edge is not always required.

A hollow coupling tube 22 is positioned within the shoe 10 so that a portion 24 adjacent one end projects beyond and below the lower end of the shoe 10 with a

portion adjacent the upper end inwardly of and spaced from the lower end of the shoe, the latter named portion being designated by the reference numeral 26 and including an upwardly threaded nipple 28.

The lower end portion 24 of the tube 22 is provided with internal tapering threads receiving the threaded upper end portion of a standard or conventional well screen member 30 having a pointed lower end 32 and a screen 34 extending therearound.

The upper end portion 26 of the tube 22 has an outwardly projecting shoulder 36 which engages an inwardly directed shelf 38 extending around the inner wall of the drive shoe 10 and forming a stop means preventing the movement of the tube 22 wholly out of the shoe 10.

A stainless steel pin 40 extends diametrically across the tube 22 in the portion 26 of the latter and has the projecting end portions 41 thereof slidably seated in opposed slots 42 formed in a shelf 38 projecting from the inner surface of the shoe 10. It is to be understood that the projecting end portions 41 of the pin 40 constitute opposed pin members on the exterior of the tube 22.

Compressible sealing means, embodying a pair of O-rings 44 are positioned within a pair of grooves 21 formed on the exterior surface of the tube 22, and sealingly engage the inner surface of the shoe 10. The pin 40 and the slots 42 constitute means for connecting the tube 22 to the shoe 10 against rotational and longitudinal movement of the tube 22 in a downward direction and permitting longitudinal movement of the tube 22 in an upward direction.

In use, the tube 22 is secured to one end of a pipe rod or pipe having internal threads fitting upon the threads of the nipple 28 and the assembly is lowered into the well casing 18, the shoe 10 having been previously affixed thereto and used to cut or drill the well as the casing 18 was lowered. Upon reaching the position in which the tube 22 is within the shoe 10, as shown in Figures 1 and 2, the tube 22 is rotated until the pin 40 slips into the slots 42, whereupon the tube 22 is pushed downwardly until the projecting end of the pin 40 seats in the bottom of the slots 42, resulting in locking the tube in place and compressing the O-rings 44.

When it is desired to remove the well screen assembly 30 for cleaning or replacement, it is only necessary to either lower a well pipe or rod for reengagement with the threaded nipple 28 or to lower a hook member for engagement with the pin 40 for the complete withdrawal bodily of the tube 22 and the attached well screen member 30 from within the shoe 10 and out of the casing 18.

In Figure 6, the second embodiment of the present invention is shown in which the tube 46 has a lower end portion 48 and an upper end portion 50, constituting a nipple, threadedly connected together by left hand threads at 52. The tube 46 has an outwardly projecting boss 54 on opposed sides thereof receivable within diametrically opposed slots 56 provided on the inner wall of the shoe 58. The tube 46 is sealingly connected to the shoe 58 by means of a compressible sealing means or resilient sleeve 60 (Fig. 10) having a slot in its upper end on each side thereof as at 62 receiving the adjacent bosses 54.

A compression ring 64 extends about the upper end of the tube 46 and bears against the upper end of the rubber seal 60.

In use, this form of the invention is attached to a well pipe or rod by means of the external threads on the upper portion 50 of the tube 46 and the well screen member 30 is secured to the lower portion 48 in the conventional manner. After the well pipe or rod, with the tube 46 attached thereto, is lowered into the casing 18 to a point where the tube 46 is within the shoe 58, the tube 46 is turned until the bosses 54 fit into the slots

56 provided on the inner wall of the shoe 58. The pipe or rod may then be detached from the portion 50 and withdrawn from the casing 18. Tightening of the portion 50 upon the portion 48, by means of the well pipe or rod before it is withdrawn compresses the rubber sleeve 60 to sealingly engage the tube 46 to the shoe 58. The tube 46 is provided on the exterior surface with a pair of grooves 47 which are to accommodate O-rings when the latter are desired to be employed in place of the sleeve 60.

When it is desired to remove the well screen assembly 30, reinsertion of the well pipe or rod into the casing 18 and attachment to the portion 50 and unscrewing of the portion 50 from the portion 48 a few turns will loosen the pressure of the ring 64 and will release the compression of the rubber sleeve 60, permitting easy withdrawal of the tube 46 from within the shoe 58 and thence outwardly of the casing 18. The pin 70 extends across the upper portion 50 of the tube 46 and may be engaged by a hook member (not shown), lowered from the ground surface for removing the assembly 30.

It will be seen, therefore, that the well screen and drive shoe assembly according to the present invention provides a means for mounting a well screen assembly in the lower end of a well casing in such a manner as to make its attachment to and detachment therefrom ready and easy in a highly efficient manner. The well screen and drive shoe assembly lends itself to attachment to well casings driven into sandy soils, gravelly soils, clay soils and rock, or a combination of two or more types of soils, and effectively prevents the flow of sand, gravel, or other soil upwardly through the casing, a condition which formerly required that the casing be pulled from the well and that the well be redriven.

What is claimed is:

1. A well screen shoe assembly for attachment to an end of a well casing comprising an upstanding hollow open ended cylindrical guide shoe having the portion adjacent the upper end adapted to be fixedly connected to a portion adjacent one end of said well casing, a shelf projecting from the inner surface of said shoe intermediate the upper and lower ends thereof, a hollow coupling tube provided with an external shoulder between the ends thereof positioned within said shoe so that a portion of said tube adjacent one end projects beyond the lower end of said shoe with the portion of said tube adjacent the other end inwardly of and spaced from the lower end of said shoe and the shoulder resting upon said shelf, compressible sealing means surrounding said tube and sealingly engaging said shoe, said shelf having spaced slots extending downwardly from the upper end thereof, opposed pin members projecting from the exterior of said tube and engaged in said slots for connecting said tube to said shoe against rotational and longitudinal movement of said tube in a downward direction and permitting longitudinal movement of said tube in an upward direction, and a well screen attached to said one end portion of said coupling tube, the other end portion of said coupling tube being adapted for attachment thereto of a device for lifting said coupling tube and screen bodily out of said shoe.

2. The well screen shoe assembly according to claim 1 in which said compressible sealing means embodies spaced resilient O-rings seated in grooves surrounding and formed in said grooves and sealingly engaging said shoe.

3. The well screen shoe assembly according to claim 1 in which said compressible sealing means embodies a resilient sleeve surrounding said tube and sealingly engaging said shoe.

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