Nov. 10, 1959 C. W. KANDLE 2,912,228

DRILL HEAD FOR WING CUTTERS

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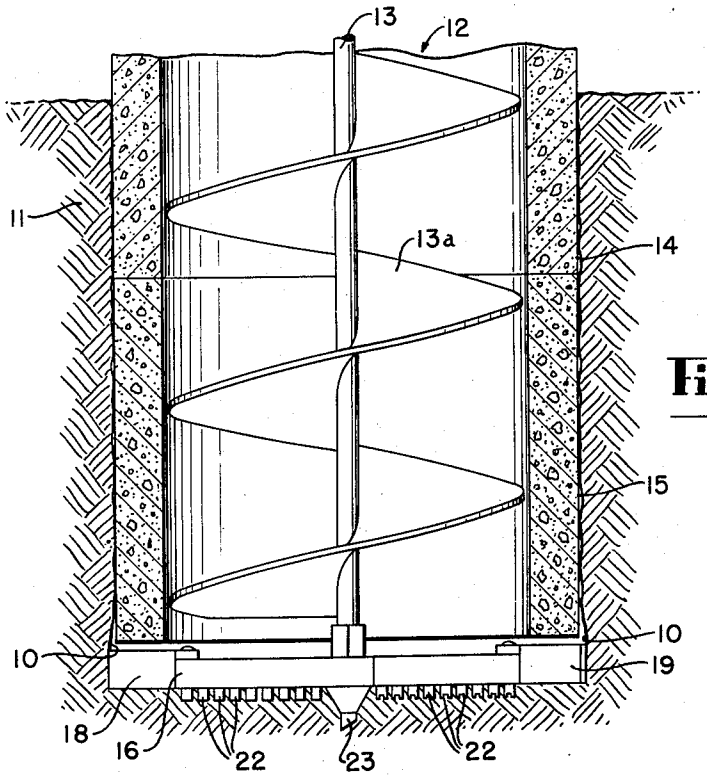


Fig. 1

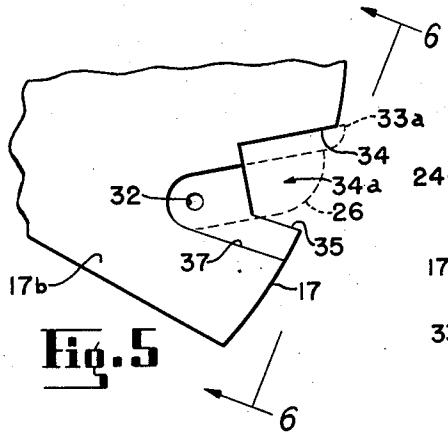
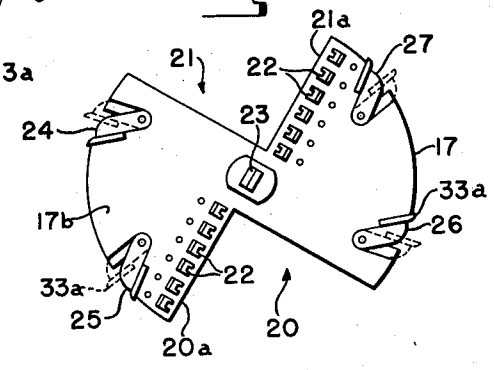


Fig. 5

Fig. 3



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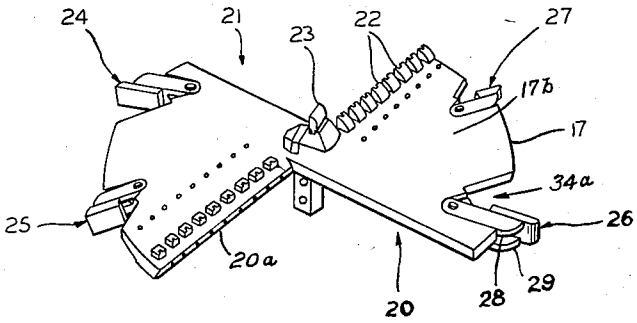


Fig. 2

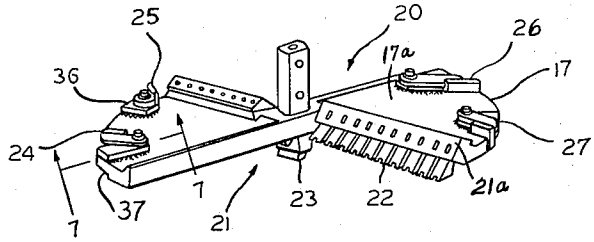


Fig. 4

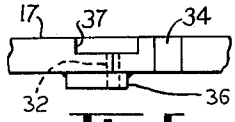


Fig. 6

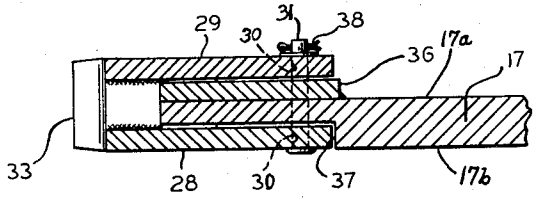


Fig. 7

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DRILL HEAD FOR WING CUTTERS

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1 Claim. (Cl. 255—76)

This invention relates to drilling apparatus and more particularly to drill heads having wing cutters thereon.

In drilling vertical holes in the earth for the installation of caissons, large diameter concrete pipes, on the order of 48 inches, for example, are inserted in the hole immediately after the drill head. The drill drive shaft extends through the concrete pipe and when the hole is completed the drill head is withdrawn back up through the pipe. The drill head, must cut a hole of larger diameter than the outside diameter of the pipe to permit the latter to be inserted after the drill head and as it progresses through the earth. Therefore, wing cutters are employed on the drill head which extend radially outwardly beyond the outer surface of the pipe, which often have a wall thickness of 6 inches. These wing cutters ream the hole clean so as to prevent binding of the pipe as it follows the drill head in the earth.

When the drilling operation is completed, the wing cutters are retracted as the drill head rotation is reversed and the drill unit can then be pulled back through the pipe.

When drilling as above described, it will be appreciated that considerable weight of the drill unit is placed on the drill head and on the wing cutters. It has been found that the resulting pressure between the bottom of the hole and the drill head has caused the wing cutters to bind and prevent their swinging to a fully extended cutting position.

In accordance with this invention there has been provided a drill head including wing cutters which eliminates any binding of the cutters and thereby insures proper operation thereof.

Other advantages of the invention will appear hereinafter as this disclosure progresses, reference being had to the accompanying drawings in which:

Figure 1 is a vertical sectional view through a hole being dug by a drill head embodying the invention;

Figure 2 is a perspective view of a drill head made in accordance with the invention, taken generally from the bottom of the head, and showing the wing cutters in the cutting position;

Fig. 3 is a bottom view of the head with the cutters in the contracted position and shown in the cutting position in broken lines;

Fig. 4 is a perspective view of the top side of the head shown in Figure 2;

Fig. 5 is a fragmentary view of a portion of the head, taken from the bottom side thereof and on an enlarged scale to show the recess for the cutter which is shown dotted in the contracted position;

Fig. 6 is a side view of the recessed plate portion taken along line 6—6 of Figure 5; and

Fig. 7 is an elevational sectional view showing a cutter mounted on the drill head, taken generally along line 7—7 of Figure 4, but with the cutter in the extended cutting position and on an enlarged scale.

Referring more particularly to Fig. 1 of the drawings, a large hole **10** has been drilled in the ground **11** by the drill unit **12**. The drill unit is secured to a drive shaft

13 having a spoil removing auger **13***a*. Two concrete pipe sections **14**, **15** have been inserted in the hole with the lower end of pipe **15** shown following behind the drill head **16**. As the depth of the hole is increased, the earth adjacent thereto tends to cave in and bind against the pipe sections, as shown in Fig. 1. As the drill progresses downwardly additional lengths of pipe as may be needed are inserted in the hole from the top, forcing pipe **15** further into the hole.

Only two wing cutters **18**, **19** are shown on the drill head of Fig. 1, but any number may be used and they would be spaced circumferentially around the drill head **16**. The cutters are adapted to pivot relative to head **16** to a position with the outer edge thereof extending radially beyond the outer diameter of the pipe so as to form a hole slightly larger than the pipe's outside diameter. The drill head is of lesser diameter than the internal diameter of the pipe so as to permit withdrawal of the head through the pipe when the cutters have been retracted as shown in Figures 2 and 3.

The drill head **16** shown in Figs. 2 and 4 is comprised of a circularly shaped heavy steel plate **17** having diametrically opposed segmental openings **20**, **21** therein. Along the trailing edges **20***a* and **21***a*, respectively, of these openings are a series of teeth **22** which cut the bottom of the hole and a pilot drill **23** is located at the center of the head.

Four wing cutters **24** to **27** have been shown in Figures 2, 3 and 5 and each comprise 2 spaced apart parallel arms **28**, **29** shown most clearly in Fig. 7. The arms have axially aligned apertures **30** by which they are pivoted on pin **31** extending through a mating aperture **32** in plate **17**. The arms **28**, **29** are connected together at their other end by the cutter blade **33** welded thereto.

The periphery of plate **17** is provided with angularly spaced cut away portions **34***a* as shown best in Fig. 5 to receive the individual cutters within the diameter of the plate when the cutters are in the retracted or non cutting position. The leading edge **34** formed by the cut away portion acts to limit the inward swinging of the cutter.

Adjacent the trailing edge **35** of each cut away portion **34***a* and on the trailing or top side **17***a* of the plate **17** a reinforcing plate **36** has been welded. This plate serves compensate in strength for the recess **37** which has been cut from the opposite or leading side **17***b* of plate **17** adjacent to trailing edge **35**. In addition the plate **36** permits the use of standard width cutters. That is to say, the distance between the arms **28**, **29** of the cutters is such as to permit the arms to slide over the plates **17**, and **36** to permit free swinging of the cutters. The arms are held against twisting when cutting by the plates therebetween. Thus, a rigid cutter is provided which will not twist in use.

Rearward swinging of the cutter is limited by the cutter blade striking the trailing edge **35** of plate **17** and when cutting occurs a rigid thrust absorbing support is thus provided for the blade.

The lower end of the pin **31** has a flat head and the pin has a keeper **38** through its other end to hold it captive in the aligned apertures **30**, **32**.

With this particular recessed mounting of the cutters to the head, a cutting head assembly has been provided which is substantially flush across its bottom side in regard to the wing cutters. Stated otherwise, the wing cutters do not extend beyond the lower surface of plate **17** and relative movement therebetween is assured to enable the cutters to swing freely to the extended cutting position when desired. By use of the reinforcing plates **36** standard width cutters can be used without using a head plate **17** having increased thickness over its entire area corresponding to the thickness of plates **36**.

By recessing the wing cutters into the lower surface of the head, the weight of the drill unit does not rest on the cutters and therefore the latter will not bind or be retarded in their movement. The outermost edge 33*a* of the cutter blade may extend slightly beyond plate 17 to provide a small blade area for engaging uncut spoil and thereby initially swing the cutter outwardly into cutting position.

It may be desirable to make a preliminary hole with a tapered drill before using the drill disclosed here for the reason that a tapered drill has faster cutting characteristics. The drill head of this disclosure is very efficient in reaming such a hole and for the finishing operation therefor.

Various modes of carrying out the invention are contemplated as being within the scope of the following claim particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

In a wing cutter earth drilling head having a rotary plate-like body with an open segment for the passage of spoil upwardly therethrough; a peripheral recess in the outer edge of said body for receiving a wing cutter blade; a second recess in the lower surface of said body and extending along and beneath the trailing edge of said peripheral recess and radially inwardly therefrom; a wing cutter comprising a cutting blade having its cutting edge extending radially outward of the periphery of said body, and a cutter support carrying said blade and having upper and lower arms extending radially inward therefrom, the lower arm being disposed in said recesses and the upper arm being spaced above said body; a reinforcing plate portion integral with said body and being disposed on the top of said body in the area coextensive with said second recess to prevent distortion of the body bounding said second recess; and a pivot pin passing vertically through said body and reenforcing plate portion and pivotally securing the upper and lower arms of said wing cutter thereto at the inner end of said second recess.

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