Nov. 12, 1957 H. WEAVER, JR 2,812,701

ROTARY HOE

Filed March 8, 1954

Fig. 1.

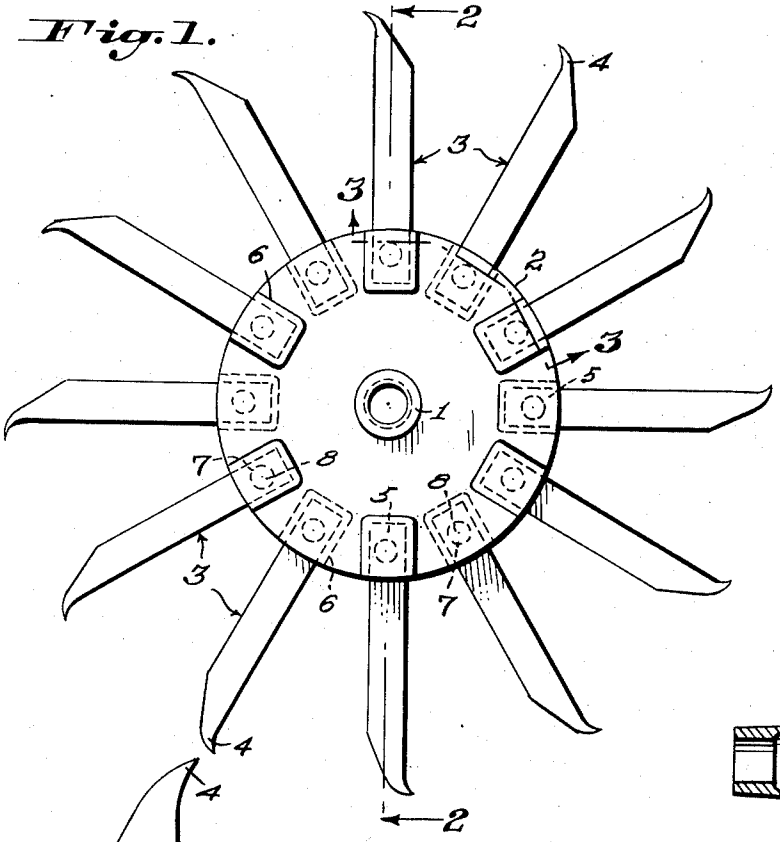


Fig. 2.

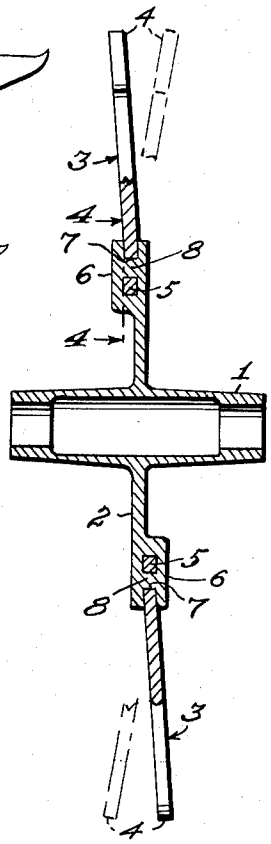


Fig. 4.

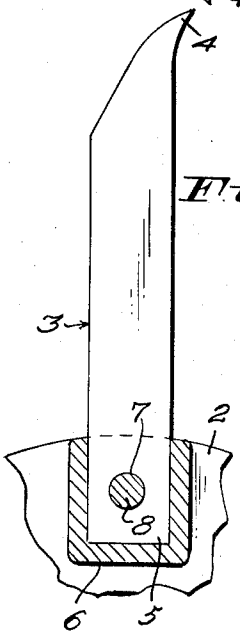
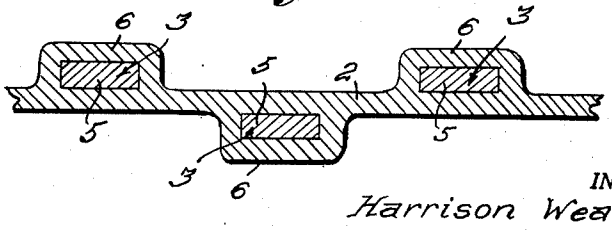


Fig. 3.



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United States Patent Office 2,812,701
Patented Nov. 12, 1957

2,812,701

ROTARY HOE

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Application March 8, 1954, Serial No. 414,677

4 Claims. (Cl. 97—212)

This invention relates to rotary hoe of the type used in rotary gang tillers, cultivators and the like, said hoe comprising a single metal casting in the form of a hub, adapted to be mounted on the horizontal shaft of a cultivator, having a thin solid transverse disc-like flange extending outwardly from a central portion of the hub, a series of spaced hoe teeth extending radially from and distributed around the periphery of said disc-like flange, said hoe teeth having points at their outer operating ends and shanks at their inner ends which lie adjacent to and are staggered first on one side and then on the other side of said flange, said shanks being surrounded by and embedded in cast metal in the form of protuberances which are also staggered first on one side and then on the other side of said flange, said shanks having transverse apertures filled with plugs of cast metal which lock the shanks in the cast metal protuberances, said shanks extending from the periphery of the disc-like flange part way only towards the cast metal hub; all as more fully hereinafter set forth and as claimed.

Rotary tillers have reached the stage where they are highly developed as well as being highly efficient. One of the more common forms makes use of rotary hoes, a plurality of which are mounted on a horizontal shaft to make a "gang." Many different types of rotary hoes have been proposed. One difficulty involved in the making of these hoes is in the method of securing the teeth to the hubs. The teeth should be made of steel in order to retain their cutting edges and reduce wear while, for economy reasons, the hubs are preferably made of cheaper metal. In the past the teeth have usually been welded or riveted to discs which are integral with the hubs. It has also been proposed to employ steel teeth secured to cast iron hubs. All of these prior methods involve difficulties since, after long periods of use and exposure to weather, the various joints between the teeth and the hubs have tended to loosen. The methods used for securing the teeth in the hubs have also been expensive.

I have discovered a very simple and practical method of making a secure joint between the teeth and the hub of a rotary hoe which eliminates welding, riveting and the like but which produces a joint which cannot become loose through wear or corrosion. Moreover it enables the use of forged steel teeth or tines which are of very inexpensive construction, being merely straight metal bars tapered to a point at one end while the other or base end is provided with a bore or aperture. These teeth are used as inserts in the mold in which the iron hub is cast. The mold cavity extends around the base of the individual teeth and thus cast protuberances having internal sockets are formed integrally with the bases of the teeth. The cast metal fills the apertures provided in the bases of the teeth and thus forms permanent keys serving to lock the teeth into the sockets of the hub.

The grey cast iron hub is advantageously provided with a thin cast disc-like flange extending peripherally from a central portion of the hub and the sockets which hold the

teeth are spaced around the periphery of this flange. The central part of the flange is relatively thin to save weight and the cast metal while the sockets form protuberances and are spaced first on one side and then on the other side of the central plane of symmetry of the flange. Owing to the method of construction no additional expense is involved in staggering the teeth in this fashion. Moreover owing to the secure joint between the teeth and the hub it is possible to incline the teeth slightly to the vertical.

I have found that if the teeth are inclined to the vertical in such fashion that the operating ends of adjacent staggered teeth are spaced apart a distance slightly greater than that of their bases, a self-cleaning effect is produced. There is less tendency for the teeth to pick up clods of earth and the like.

Teeth which are inclined to the vertical do not penetrate the soil as deeply as teeth which are vertical; hence there is a practical upper limit to the extent of the inclination. But in the case of relatively short hubs it is possible to space the teeth at their ends a distance apart which is substantially equal to half the length of the hubs. When this is done all the cutting points of the teeth of a gang of rotary hoes are equally spaced. This, of course, produces a very uniform working of the soil. But the practical upper limit of inclination is about 12° from the vertical, while I prefer much smaller inclinations of from about 3° to 7°.

My invention can be explained in greater detail by reference to the accompanying drawing which shows, more or less diagrammatically, a practical operating embodiment of my rotary hoe. In this showing

Fig. 1 is a side elevation of my hoe,

Fig. 2 is a vertical axial cross section of the hoe, taken along the line **2—2** of Fig. 1,

Fig. 3 is a partial cross section through the hoe taken along the broken line **3—3** of Fig. 1, while

Fig. 4 is a partial section showing a side view of one of the hoe teeth cast integrally with a socket, the section being taken through the socket, along the line **4—4** of Fig. 2.

In the various views like parts are designated by like reference numerals. Referring first to Figs. 1 and 2, the cast iron hub of my rotary hoe is shown at **1** while the integral flange or disc is shown at **2**. The tines or teeth shown generally at **3** can be merely straight steel bars tapered to points **4** at their outer ends while their shanks **5** are cast into protuberances **6** formed in the disc during the casting operation. The bases are provided with apertures or bores **7** and these are filled with a plug **8** of cast metal during the casting. In order to be certain that the cast metal fills these bores they should have a diameter of at least about ¼ inch. But in the case of tines which are ⅞ inch wide and 5/16 inch thick, I employ ⅜ inch bores.

As shown best in Figs. 2 and 3 the teeth and the protuberances holding them are staggered, being first on one side and then on the other side of the center plane or plane of symmetry of the disc. The thickness of the protuberances and of the disc can be varied to some extent but I have found that a thickness of about ¼ inch for both the discs and metal surrounding the sockets provides sufficient strength for all purposes.

As shown in Fig. 2 the teeth are inclined to the vertical at a slight angle, the angle shown in this figure being about 3°. The inclination is such that the tips of the teeth are spread apart further than their bases. As stated previously the angle of inclination can be increased to a maximum of about 12° in which case when short hubs are employed the tips of the teeth can be spaced apart a distance equal to about one-half the length of the hub, this spacing having the advantage that all the teeth in a gang are spaced equally at their tips.

The hubs of my rotary hoes can, of course, be made relatively shorter than that shown in the drawing. In this case my rotary hoes can be used as inserts between the spades of standard cultivators. It is also possible to employ teeth of various lengths but 6 inch teeth are suitable for general purposes. Preferably they are made of drop-forged steel with points curving towards the front as shown. While the blades are less expensive when made in the form of straight bars, as shown, it is equally possible, of course, to make them from angled stock. It is possible with my construction to have the teeth set vertically in their sockets in line with the center of the disc but, if desired, they can be set at an angle. My casting method of securing the teeth to the hubs is flexible in that any spacing of the teeth and any inclination of the teeth can be employed as desired, a change in structure requiring only the use of a different pattern in making the molds used in casting. Hand labor in making the rotary hoes is reduced to a minimum.

While I have described what I consider to be the most advantageous embodiments of my rotary hoe, it is possible, of course, to vary the details of construction considerably from those have been described without departing from the purview of this invention. For example, while I have described the hub and disc as being made of grey cast iron, any other cast metal can be employed, such as aluminum or magnesium, if a reduction in weight is desired. The rotary hoes can be made of any convenient size and they can be mounted on the cultivator in any way desired. They are specially designed, of course, for the tractor-drawn gang type cultivators wherein a plurality of rotary hoes are mounted on a common horizontal shaft as a unit to be drawn by the tractor. The rotary hoes can either be keyed to the shaft or they may turn freely on the shaft. Any desired number of teeth can be used in the hoe. For deep penetration a small number of teeth, such as 6, can be used whereas 10 to 12 teeth are suitable for general use. The discs can likewise be made of any suitable diameter but a diameter of about 8 inches is generally suitable.

One factor which reduces the cost of my rotary hoe is that the cast sockets used for securing the teeth to the disc form such a strong mounting for the teeth that the overall length of the teeth can be reduced. Thus the bases of the teeth need to be embedded in the cast metal of their sockets to a depth of only from about 1 to 1¼ inches in order to provide a permanent and secure mounting whereas in the case of welded or riveted joints a considerable greater length of joint would be required. A substantial saving is thus effected in the most expensive elements of the hoe. It is possible, of course, to construct the hubs and discs of cast steel but this would substantially increase the cost without affording any particular advantages. Further modifications of my rotary hoe which fall within the scope of the following claims will be immediately evident to those skilled in this art.

What I claim is:

1. A rotary hoe of the type used in gang cultivators, which comprises a single metal casting in the form of a hub, adapted to be mounted on the horizontal shaft of a cultivator, having a thin solid transverse disc-like flange extending outwardly from a central portion of the hub, a series of spaced hoe teeth extending radially from and distributed around the periphery of said disc-like flange, said hoe teeth having points at their outer operating ends and shanks at their inner ends which lie adjacent to and are staggered first on one side and then on the other side of said flange, said shanks being surrounded by and embedded in cast metal in the form of protuberances which are also staggered first on one side and then on the other side of said flange, said shanks having transverse apertures filled with plugs of cast metal which lock the shanks in the cast metal protuberances, said shanks extending from the periphery of the disc-like flange part way only towards the cast metal hub.

2. The rotary hoe of claim 1 wherein the hoe teeth are inclined to the vertical at a small angle in such manner that adjacent teeth are spaced further apart at their points than at their bases.

3. The rotary hoe of claim 1 wherein the angle of inclination of said teeth to the vertical is from about 3° to 12°.

4. The rotary hoe of claim 1 wherein the hoe teeth are inclined to the vertical at an angle not exceeding about 12° in such manner that the operating ends of adjacent teeth are spaced apart a distance approximately equal to half the length of the hub.

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