

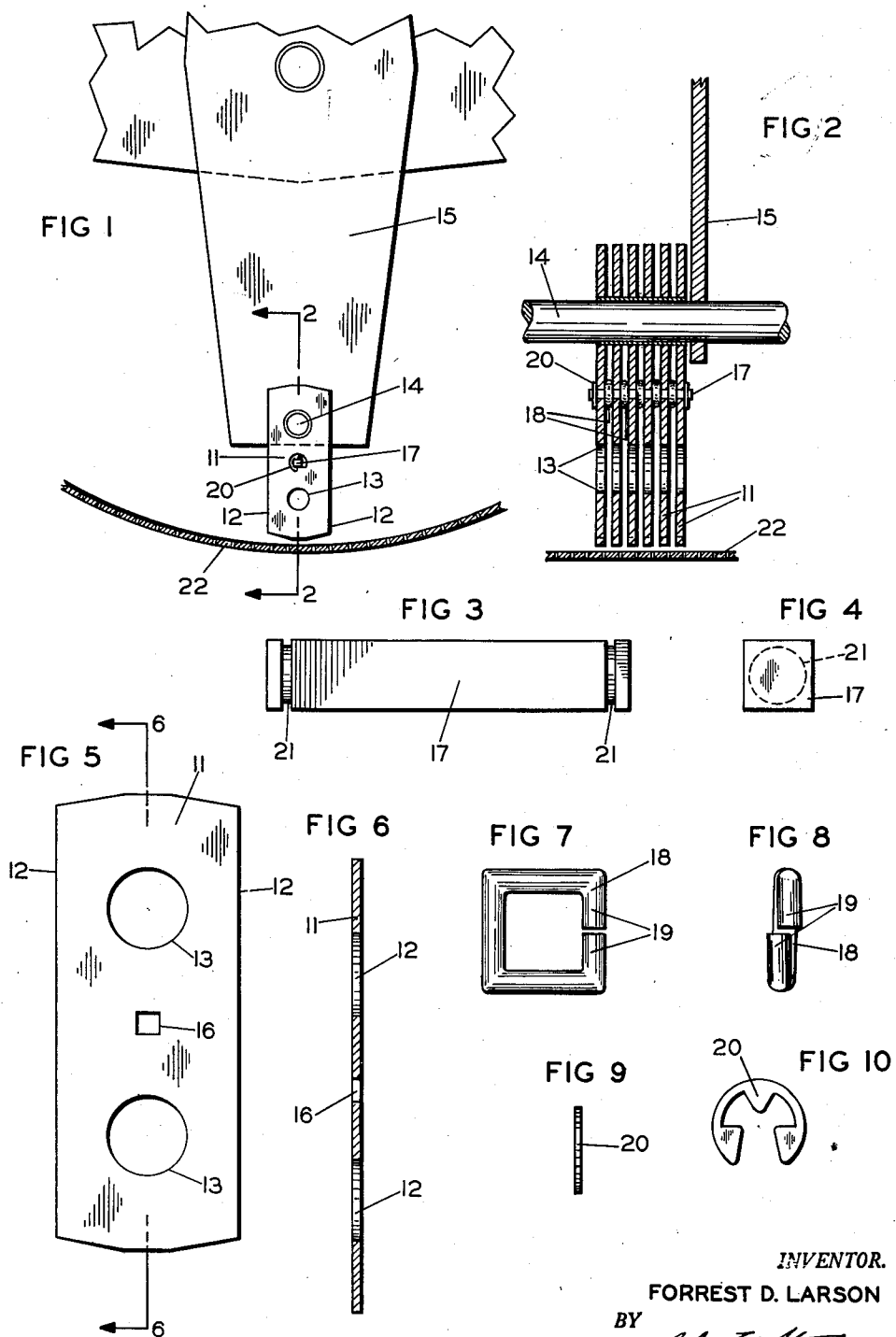
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PULVERIZING BLADE CLUSTER

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PULVERIZING BLADE CLUSTER

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This invention relates to pulverizing blades or hammers for use in hammer mills or the like, and particularly to a cluster of such blades or hammers which is adapted to be mounted in various positions in the machine in order to make all of the several working edge surfaces readily and selectively available for performing the pulverizing functions of the machine.

It is an object of my invention to provide a cluster of elongated flat blades which is readily reversible, end for end, as a unit in the pulverizing machine, without separating the individual blades one from another.

A particular object is to provide improved means for joining the several blades of a cluster together as a unit or group in which the several blades are resiliently held apart in spaced, substantially parallel relation one to another whereby limited lateral vibration of the individual blades is permitted in operation.

A further object is to provide a cluster of substantially oblong, symmetrical blades which are connected together and spaced apart one from another by centrally located spacing and fastening means so that the cluster is in balance when in any of the several positions in which it may be used in a pulverizing machine.

Another object is to provide readily detachable means for connecting the several blades of a cluster together for installation and use as a unit, the connecting means being so fastened to the blades as to permit separation of the individual blades quickly and easily when the replacement of one or more of them or rearrangement of them in the cluster becomes necessary or desirable.

The invention also includes certain other novel features of construction which will be pointed out in the following specification and claims.

In the accompanying drawing, a preferred embodiment of my invention is illustrated by way of example and not for the purpose of limitation.

Referring to the drawing:

Figure 1 is a fragmentary part side elevational and part sectional view showing one of my improved clusters mounted on the rotor of a hammer mill or like pulverizing machine;

Fig. 2 is a fragmentary section taken on the line 2-2 of Fig. 1;

Figs. 3 and 4 are side elevational and end views respectively on an enlarged scale showing the pin for connecting the blades together;

Fig. 5 is a side elevational view showing one of the blades for the cluster;

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Fig. 6 is a central longitudinal section taken on the line 6-6 of Fig. 5;

Figs. 7 and 8 are respectively enlarged side elevational and end views of one of the blade spacing members, and

Figs. 9 and 10 are end elevational and side views respectively of one of the spring clips for confining the blades and spacers on the connecting pin.

The illustrated cluster comprises a series of similar, flat, oblong blades 11 of case hardened steel, each having substantially parallel, longitudinally extending working edge surfaces 12. A pair of circular openings 13 is formed in each blade and either of these openings is adapted to receive a supporting shaft 14 carried by the rotor of the pulverizing machine indicated generally by the numeral 15. The blades, as thus far described, are of the common type adapted to be mounted in the pulverizing machine in various positions in order to utilize either end portion of either of the working edge surfaces 12 as the leading impact edge portion of the blade.

Formed centrally in each of the blades 11 is an aperture 16 adapted to receive a pin or like member for connecting the blades together. The aperture 16 is centrally disposed with reference to opposite ends and opposite sides of the blade and is preferably non-circular in shape corresponding to that of the pin for connecting the blades together. A pin 17 is formed to fit in the several apertures 16 of the blades for connecting them together and the blades are spaced apart one from another along the pin by spacing members 18 which are confined on the pin. These spacing members are preferably constructed from spring wire and, like spring lock washers, have end portions 19 which are normally offset laterally one from the other as best shown in Fig. 8. Near each end, the pin 17 has an annular groove adapted to receive a spring clip 20. The clips 20 are forcibly sprung into the grooves 21 to confine the several blades on the pin by engagement with the outer surfaces of the end blades of the cluster. By reason of the resiliency of the several spacing members 18 which are compressed when the several blades are assembled on the pin, the blades, spacing members and locking clips 20 are held under lateral compression in the finished assembly. Further, by reason of the resiliency of the spacing members 18, the several blades of the cluster may be sprung to or from one another to a limited degree or vibrated laterally in operation.

The several openings 13 near the respective

ends of the blades are held in alignment one with the others and the several blades are prevented from rotating one relative to another on the pin 17 by reason of the interlocking of the pin 17 in the blade apertures 16. It will thus be apparent that the hammer cluster assembly shown in Figs. 1 and 2 may be handled, installed and adjusted in the machine as a unit and it operates as such in the machine. The cluster is free to oscillate about the axis of the supporting shaft 14 and the lower or outer end of the cluster extends closely adjacent to the foraminous plate or screen 22 through which the pulverized material is passed in the operation of the pulverizing machine.

After a period of operation the leading edges 12 of the several blades of the cluster become worn as a result of abrasion and impact with the material being treated and when the wear has progressed to a detrimental degree it is desirable to change the position of the cluster by reversing it either edgewise or end for end. Such changes in position may be made with a minimum of effort and loss of time by reason of my construction. In most instances it is unnecessary to separate the individual blades of a cluster. The supporting shaft 14 is merely withdrawn from the several openings 13 to permit an end for end reversal of the position of the several clusters supported on the shaft. Occasionally, however, it is desirable to remove and replace one or more of the individual blades of a cluster, without replacing the entire cluster, and when this is to be done the cluster, after removal from the machine, may be disassembled or taken apart merely by the removal of one of the spring clips 20.

For some types of machines where short blades are required, the pin connecting the several blades together may be located nearer one end of the blade than the other. Where the need for separation of the individual blades of a cluster is not likely to develop, the spring clips 20 may be omitted and the ends of the pin 17 may be merely peened over the adjacent surface of the outer blades of the cluster.

Since in many hammer mills a large number of clusters or groups of blades are used and readjustment of blades is required frequently, if the machine is in continuous use, it will be evident that losses in operating time and the cost of the readjustment or service work on the machine are important items in the economics of operation. Important savings in maintenance costs and in the time lost in interrupted operation are obtained by the use of my clusters which are removable and reversible as units quickly and easily. An important factor in such savings is the time saved in balancing the readjusted blades. My cluster is always in balance due to the central location of the blade connecting means. The efficiency of the pulverizing operation is also improved and lodging of the pulverized or unpulverized material between the blades is minimized by providing for limited lateral vibration of the individual blades.

The number, thickness and spacing of the blades which are held together as a clustered unit may be varied between wide limits to suit the particular machine with which it is to be used, the character of the material to be pulverized and the sizes to which the materials are to be reduced.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. For a pulverizing machine, the combination of a series of similar flat elongated blades each having a plurality of working edge surfaces symmetrically disposed in relation to a longitudinal axis of the blade and each formed with a centrally located, non-circular aperture, a pin fitting in the several apertures for connecting said blades together and for retaining them against relative rotation on said pin, a spring washer confined on said pin between adjacent blades to resiliently space said blades one from another and means engaging the outer blades of said series for confining the blades and washers on said pin.

2. The combination as defined in claim 1 in which said pin is formed near at least one of its ends with a recess adapted to receive a spring clip and in which said means for engaging the outer blades of said series include a spring clip removably engaging said pin in said recess and held under lateral compression by said spring washers.

3. For a pulverizing machine, a series of similar elongated blades each having a plurality of working edge surfaces symmetrically disposed in relation to a longitudinal axis of the blade and each formed with a centrally located aperture and a pair of openings spaced along said axis at opposite sides of said aperture, a pin fitting in said apertures in the several blades for connecting them together, spacing washers interposed between the several blades and confined on said pin and means engaging the outer blades of said series for confining the blades and washers on said pin, said blades being fixed against rotation one relative to another on said pin to substantially align the pair of openings in each blade with the corresponding openings in the other blades and the aligned openings being adapted to receive a shaft for suspending the blades as a cluster unit in a pulverizing machine.

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