2021105724 17 Aug 2021

SCRAP CRUSHING APPARATUS WITH DUAL-SIDED CRUSHING MECHANISM

FIELD OF THE INVENTION

The present invention relates to a scrap crushing apparatus with dual-sided crushing mechanism.

BACKGROUND OF THE INVENTION

In scrap recycling industries, various shapes & configurations of scrap crushing machines are presently used. However, it is challenging task to get continuous scrap crushing flow from these machines, resulting in increased over all crushing time. Moreover, life of these large machines is short, due to excessive wear of parts owing to continuous movement of the hammer, linings, rotors, and discs etc. Therefore, for effective management of daily scrap generation, a scrap crushing device for small shape scraps such as beverage cans, domestic bins is the need of the hour. This will be specifically beneficial for micro, small and medium Enterprise (MSME) industries which incur large handling costs for scrap generation during production.

In the view of the forgoing discussion, it is clearly portrayed that there is a need to have a portable scrap crushing apparatus for light materials with dual-sided crushing mechanism. The crushing rate of the present invention is more than conventional machines owing to the dual-sided crushing i.e., in forward as well as backward direction, utilizing the piston motion effectively.

SUMMARY OF THE INVENTION

The present disclosure seeks to provide a scrap crushing apparatus that presses the regular or irregular shape hollow scrap parts from both the backward and forward sides. The device can press the hollow object of various shapes such as cylindrical, rectangular or square cube shapes etc. The apparatus condenses the scrap to save room for disposal and to make it recyclable. It is specifically beneficial for the MSMEs. The apparatus utilizes slider crank mechanism. It is highly economical with minimal maintenance cost. Its small size makes its portable and easy to handle. Its dual-sided pressing mechanism, make it more versatile.

In an embodiment,the scrap crushing apparatus with dual-sided crushing mechanism comprises a slider crank assembly comprising of a crank wheel, a plurality of connecting shafts and a slider block. The slider crank assembly transmits a rotary motion of the crank wheel to a reciprocating motion of the slider block and due to the reciprocating motion of the slider block, the slider block moves back and forth along a path length inside a bed block. The scrap crushing apparatus further comprises a rotation means attached to the crank wheel for rotating the crank wheel. The scrap crushing apparatus further comprises a ball bearing assembly comprising a ball bearing and a bearing housing. The ball bearing assembly is connected to the crank wheel by one of the plurality of connecting shafts, to allow smooth rotation of the crank wheel. The scrap crushing apparatus further comprises two crushing plates attached to the two open sides of the slider block. The back-and-forth motion of the slider block causes the two crushing plates to crush a scrap placed inside the bed block from two sides. The bed block comprises of one or more openings of predefined size. A collecting frame is attached beneath the bed block for collecting the scrap after a crushing operation. Here,the

scrap comprises a hollow space that is reduced during the crushing operation.

In another embodiment, the crushing operation of the scrap crushing apparatus is configured by placing the scrap inside the bed block. Then, rotating the crank wheel through the rotation means until the hollow space of the scrap is reduced enough to make the scrap fit the one or more openings of the bed block. Here, the hollow space of the scrap is reduced by smashing of the scrap against the bed block. Lastly, collecting the scrap from the collecting frame for disposal. Here, an operator operates the scrap crushing apparatus on a smooth and rigid surface like table or ground.

In another embodiment, the two crushing plates and the bed block of the scrap crushing apparatus is made up of 20MnCr5 carbon steel.

In another embodiment, the scrap crushing apparatus further comprises a base frame and a plurality of legs to make the scrap crushing apparatus rigid and easy to handle.

In another embodiment, the rotation means of the scrap crushing apparatus comprise of a lever handle for manual rotation of the crank wheel.

In another embodiment, the scrap is either irregular shaped or regular shaped such as cylindrical, rectangular, squarish and cubical.

In another embodiment, the scrap is made up of aluminium, composite fibre and magnesium.

In another embodiment, the breadth of the scrap is less than 60 mm and the height of the scrap is less than 125 mm.

Another object of the invention is to provide a scrap reduction device for small and medium scale industries that reduces scrap components to effectively utilize inventory stock space for other purposes.

To further clarify advantages and features of the present disclosure, a more particular description of the invention will be rendered by reference to specific embodiments thereof, which is illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail with the accompanying drawings.

BRIEF DESCRIPTION OF FIGURES

These and other features, aspects, and advantages of the present disclosure will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

Figure 1 illustrates a block diagram of a scrap crushing apparatus with dual-sided crushing mechanism in accordance with an embodiment of the present disclosure.

Figure 2 illustrates 3-Dimensional top view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 3 illustrates 2-Dimensional front view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 4 illustrates2-Dimensional Left-Hand side (LHS) view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 5 illustrates 2-Dimensional Right-Hand side (RHS) view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 6 illustrates2-Dimensional top view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Further, skilled artisans will appreciate that elements in the drawings are illustrated for simplicity and may not have necessarily been drawn to scale. For example, the flow charts illustrate the method in terms of the most prominent steps involved to help to improve understanding of aspects of the present disclosure. Furthermore, in terms of the construction of the device, one or more components of the device may have been represented in the drawings by conventional symbols, and the drawings may show only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the drawings with details that will be readily apparent to those of ordinary skill in the art having benefit of the description herein.

DETAILED DESCRIPTION

For the purpose of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated

system, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

It will be understood by those skilled in the art that the foregoing general description and the following detailed description are exemplary and explanatory of the invention and are not intended to be restrictive thereof.

Reference throughout this specification to "an aspect", "another aspect" or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. Thus, appearances of the phrase "in an embodiment", "in another embodiment" and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

The terms "comprises", "comprising", or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a process or method that comprises a list of steps does not include only those steps but may include other steps not expressly listed or inherent to such process or method. Similarly, one or more devices or sub-systems or elements or structures or components proceeded by "comprises...a" does not, without more constraints, preclude the existence of other devices or other sub-systems or other elements or other structures or other components or additional devices or additional sub-systems or additional elements or additional structures or additional components.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in

the art to which this invention belongs. The system, methods, and examples provided herein are illustrative only and not intended to be limiting.

Embodiments of the present disclosure will be described below in detail with reference to the accompanying drawings.

Figure 1 illustrates a block diagram of a scrap crushing apparatus with dual-sided crushing mechanism in accordance with an embodiment of the present disclosure.

The scrap crushing apparatus 100 with dual-sided crushing mechanism comprises a slider crank assembly 102 comprising of a crank wheel 104, a plurality of connecting shafts 106 and a slider block 108. The slider crank assembly 102 transmits a rotary motion of the crank wheel 104to a reciprocating motion of the slider block 108 and due to the reciprocating motion of the slider block 108, the slider block 108 moves back and forth along a path length inside a bed block 110. The scrap crushing apparatus 100 further comprises a rotation means 112 attached to the crank wheel 104 for rotating the crank wheel 104. The scrap crushing apparatus 100 further comprises a ball bearing assembly 114 comprising a ball bearing 116 and a bearing housing 118. The ball bearing assembly 114 is connected to the crank wheel 104 by one of the plurality of connecting shafts 106, to allow smooth rotation of the crank wheel 104. The scrap crushing apparatus 100 further comprises two crushing plates 120 attached to the two open sides of the slider block 108. The back-and-forth motion of the slider block 108 causes the two crushing plates 120 to crush a scrap placed inside the bed block 110 from two sides. The bed block 100 comprises of one or more openings of predefined size. A collecting frame 122 is attached beneath the bed block 108 for collecting the scrap after a crushing operation. Here, the

scrap comprises a hollow space that is reduced during the crushing operation.

In another embodiment, the crushing operation of the scrap crushing apparatus is configured by placing the scrap inside the bed block. Then, rotating the crank wheel through the rotation means until the hollow space of the scrap is reduced enough to make the scrap fit the one or more openings of the bed block. Here, the hollow space of the scrap is reduced by smashing of the scrap against the bed block. Lastly, collecting the scrap from the collecting frame for disposal. Here, an operator operates the scrap crushing apparatus on a smooth and rigid surface like table or ground.

In another embodiment, the two crushing plates and the bed block of the scrap crushing apparatus is made up of 20MnCr5 carbon steel.

In another embodiment, the scrap crushing apparatus further comprises a base frame and a plurality of legs to make the scrap crushing apparatus rigid and easy to handle.

In another embodiment, the rotation means of the scrap crushing apparatus comprise of a lever handle for manual rotation of the crank wheel.

In another embodiment, the scrap is either irregular shaped or regular shaped such as cylindrical, rectangular, squarish and cubical.

In another embodiment, the scrap is made up of aluminium, composite fibre and magnesium.

In another embodiment, the breadth of the scrap is less than 60 mm and the height of the scrap is less than 125 mm.

An embodiment of the scrap crushing apparatus is manufactured through Metal Inert Gas (MIG) welding process. The MIG welding process provides flexibility in joining materials with varying range of thickness. MIG welding

can weld materials like mild steel, 20MnCr5 Carbon steel and EN-8 grade steel materials with ease.

Figure 2 illustrates 3-Dimensional top view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Here, the embodiment consists of linkage shaft (2) and crank wheel (3) which aids to transmit the rotary motion into reciprocating motion. Shaft (4), Ball bearing (5) and Bearing housing (6) makes the device function of conversion of motions more full proof and durable. Moreover, base frame (10) and legs (11) makes the device more rigid, portable and user friendly. So that user could use it on table or floor. Additionally, holding handle (9) is attached to bed block (8) for the smooth operation.It is a manually operated apparatus.

Figure 3 illustrates 2-Dimensional front view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 4 illustrates 2-Dimensional Left-Hand side (LHS) view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 5 illustrates 2-Dimensional Right-Hand side (RHS) view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Figure 6 illustrates 2-Dimensional top view of the scrap crushing apparatus in accordance with an embodiment of the present disclosure.

Here, the portable scrap crushing apparatus crushes the scrap in two reciprocating positions with continuous run. The stepwise working of the scrap crushing apparatus is as follows. Firstly, the scrap is placed between the crusher plate and bed block. Then, the lever handle is manually rotated

to provide a reciprocating motion to the crusher plate. This makes the scrap to be condensed into a compact size through repeated motion of the lever handle. The reduced scrap can then be collected from bottom portion of the apparatus for disposal or further recycling.

The drawings and the forgoing description give examples of embodiments. Those skilled in the art will appreciate that one or more of the described elements may well be combined into a single functional element. Alternatively, certain elements may be split into multiple functional elements. Elements from one embodiment may be added to another embodiment. For example, orders of processes described herein may be changed and are not limited to the manner described herein. Moreover, the actions of any flow diagram need not be implemented in the order shown; nor do all of the acts necessarily need to be performed. Also, those acts that are not dependent on other acts may be performed in parallel with the other acts. The scope of embodiments is by no means limited by these specific examples. Numerous variations, whether explicitly given in the specification or not, such as differences in structure, dimension, and use of material, are possible. The scope of embodiments is at least as broad as given by the following claims.

Benefits, other advantages, and solutions to problems have been described above with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any component(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential feature or component of any or all the claims.