May 2, 1961 L. G. EHMANN 2,982,486

HAMMER FOR IMPACT CRUSHERS

Filed April 20, 1959

Fig. 1

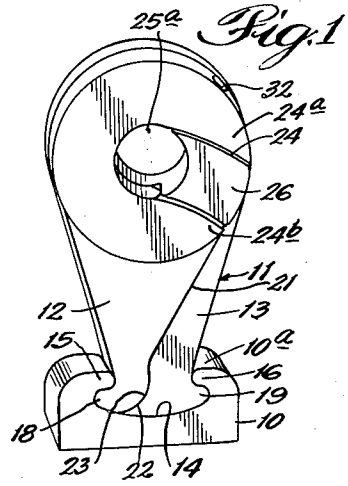


Fig. 2

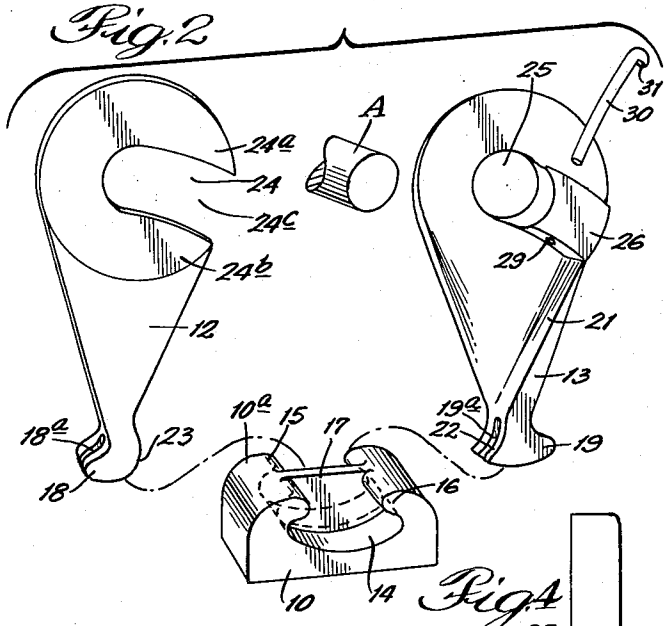


Fig. 3

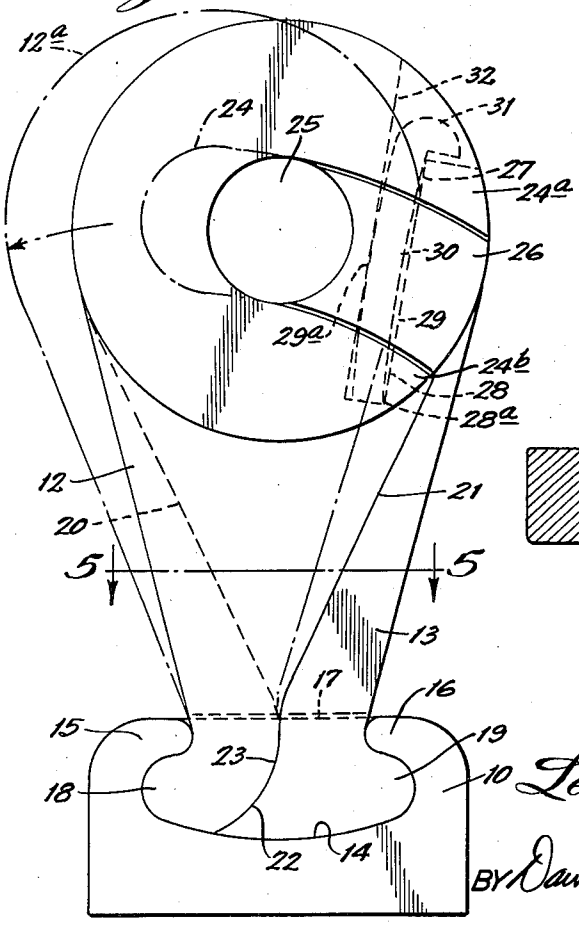


Fig. 4

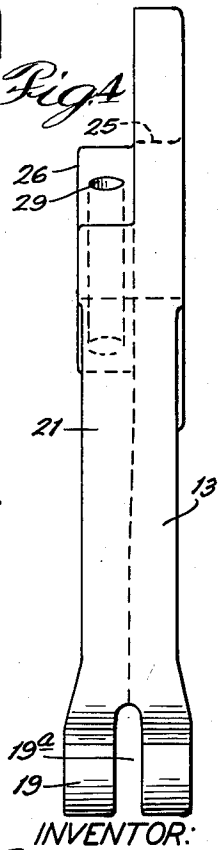
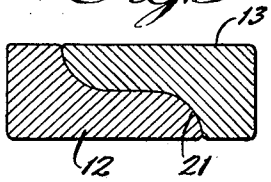


Fig. 5



INVENTOR:
Leslie G. Ehmann,
BY Dawson, Tilton, Fallon & Lungmus,
ATTORNEYS.

United States Patent Office 2,982,486
Patented May 2, 1961

2,982,486

HAMMER FOR IMPACT CRUSHERS

Leslie G. Ehmann, Portland, Oreg., assignor to Esco Corporation, a corporation of Oregon

Filed Apr. 20, 1959, Ser. No. 807,560

12 Claims. (Cl. 241—197)

This invention relates to a hammer for impact crushers, and, more particularly, to a multipiece hammer readily assemblable for repair or replacement.

The invention here is an improvement on my Patent No. 2,404,775, issued July 30, 1946. In that patent, I provided a hammer characterized by a removable head or wearing portion for use in a rotary impact crusher or reducer. In such equipment, a driven shaft having a plurality of discs carries one or more hammers pivotally attached to the periphery of each disc. These hammers cooperate with peripherally-arranged breaker bars to provide the desired crushing action.

In the above-mentioned patent, I provided a hammer structure which made it possible to renew the wearable head portion of the hammer without the need of renewing the shank. A novel fastening arrangement was employed for connecting the hammer head to the shank, embodying a socket formed in one surface of the hammer head including integral portions forming overhanging shoulders on the hammer head. The shank included a pair of leg members having foot or arm ends extending laterally and cooperatively beneath the corresponding shoulders of the hammer head.

Although the construction of my patent provided desirable advantages in the installation, operation and replacement of hammers for impact crushers, a problem still existed in that considerable time was required for the replacement of a hammer head. Here, it is to be appreciated that the hammer head is usually the element needing replacement, since it is the head that is involved in the crushing operation. Depending upon the type of crusher, considerable time was involved in replacement, since in many instances it was necessary to provide a substantial dis-assembling of the crusher in order to remove the shanks from their pivotal mounting on the various aligned discs. Thus, although savings could be made in material, i.e., the shanks reused, this was at the expense of time. It would be desirable if the advantages of a hammer having a replaceable head could be preserved while providing means for quickly and expeditiously replacing the head.

The provision of such a hammer is an object of this invention. Another object is to provide an improved hammer for an impact crusher in which the hammer head can be readily replaced without disassembling the crusher and, more specifically, without completely removing the shank from its mounting within the crusher. Still another object is to provide a hammer for an impact crusher, or the like, in which cooperating shank elements immovably secure the hammer head in one position, yet permit replacement of the hammer head when in another position and all while the shank is retained in place in the crusher. Yet another object is to provide a novel hammer structure for an impact crusher in which the head and shank elements cooperate during operation to provide superior resistance to stress while permitting ready replacement of the wearable hammer head. Other objects and advantages of this invention can be seen as this specification proceeds.

The invention will be explained in conjunction with an illustrative embodiment in the accompanying drawing, in which—

Fig. 1 is a perspective view of a hammer embodying teachings of this invention;

Fig. 2 is a perspective view of the elements of Fig. 1 but in exploded form;

Fig. 3 is an enlarged elevational view of the structure of Fig. 1 and showing in broken line a portion of the hammer shank during disassembly;

Fig. 4 is a side elevational view of one shank element; and

Fig. 5 is a transverse sectional view of the shank portion of the hammer as would be taken along the line 5—5 of Fig. 3.

In the illustration given, the numeral **10** designates a hammer head of the type more specifically described in my Patent No. 2,404,775. Reference may be made to that patent for additional details of construction as might be desired.

The shank portion of the hammer generally designated by the numeral **11** is made up of two arms **12** and **13**, as can be best seen in Fig. 2.

The inner surface **10***a* of the hammer head **10** is equipped with a socket **14**. The socket **14** is in the form of an elongated recess having shoulders **15** and **16** which are integral with the head and overhanging the opposite ends of the recess on socket **14**. An integral web **17** extends lengthwise of the recess **14** and perpendicularly from the base thereof to divide the recess **14** substantially centrally and into two portions. As can be appreciated from Fig. 2, the web **17** is integral with the head at both the base of the recess **14** and with the shoulders **15** and **16**.

The shank arms **12** and **13** have a first pair of ends adapted to fit cooperatively in the recess **14** of the head **10**, the arms **12** and **13** being equipped with lateral projections or feet **18** and **19**, respectively. As can be appreciated from a consideration of Figs. 1 and 3, the feet **18** and **19**, which extend laterally, fit snugly under the over-hanging shoulders **15** and **16**. The ends of the shank arms, i.e., the feet **18** and **19**, are slotted as at **18***a* and **19***a*, respectively, for fitting cooperatively over the web **17**. Alternatively, the head **10** may be equipped with side walls to form a "box-type" head and thus retain the feet **18** and **19** in place without the need for a web **17** and slots **18***a* and **19***a*.

The shank arm ends fitting into the socket in the head **10** may be of substantially the same width as that of the head. The inner, widened end portions of the shank arms are of a reduced thickness and are so shaped that in the assembled relation they fit cooperatively together in an overlapping relation, as can be seen in Figs. 1 and 3. The opposed edges of the arms or members **12** and **13** are provided with tapered, laterally-extending flange portions as indicated at **20** and **21**, respectively, which strengthen the tip portions of the shank arms.

In assembling the hammer, the shank arm **13** is first inserted into the recess **14** in the head **10** and moved furthermost to the right so that the foot **19** is inserted under the overhanging shoulder **16** and with the slot **19***a* straddling the web **17**.

The surface of the shank arm end opposite the lateral projection or foot **19** is concavely curved as at **22**, while the adjacent surface **23** of the end of the shank arm **12** is convexly curved to permit a pivotal insertion of the foot **18** under the shoulder **16**. The pivotal movement just referred to can be appreciated from a consideration of Fig. 3, where the position of arm **12** during either insertion or removal of foot **18** from under shoulder **15** is designated in broken line and has the numeral **12***a* applied thereto.

When the arm 12 is rotated clockwise in the presentation seen in Fig. 3, the arm 12 comes into parallel, overlapping relation with respect to arm 13, and the projection 18 will move under the overhanging shoulder 15 while the adjacent curved surfaces 22 and 23 of the shank arm ends fit snugly against each other.

The widened upper ends of the shank arms 12 and 13 are provided with openings 24 and 25, respectively. When the arms 12 and 13 are in assembled overlapping relation, as seen in Fig. 1, the openings are available for receiving a shaft or rod for supporting the hammer from the rotating disc of a crusher.

As is best seen in Fig. 2, the opening 24 in arm 12 extends sidewardly and arcuately downwardly so that a shaft or a rod can be positioned inwardly of the opening from the side. In contrast to this, the opening 25 in arm 13 is a circular bore and requires that for a rod or shaft to be inserted the arm be moved axially rather than transversely along the rod or shaft. In the illustration given, the slot-providing side walls are arcuate so as to readily pass the mounting shaft A (see Fig. 2) when the foot 18 is pivoted out from under shoulder 15. The radius of curvature of the slot portion 24c (see Fig. 2) is substantially greater than the convex surface 23, being more remote from the pivot center on shoulder 15. The curvature of the slot aids in resisting any tendency of the parts to become disassembled due to laterally applied stresses.

The arm 13 is equipped with a boss-like protuberance 26 (again best seen in Fig. 2), which is arcuately contoured and which mates with and is received within the opening 24. Each arm 12 and 13 can be considered to have a circular opening extending transversely therethrough and perpendicular to the direction at which feet 18 and 19 extend, with the opening in arm 12 additionally being provided with a laterally and downwardly arcuate slot portion accommodating the passage of the mounting rod A and in which the protuberance 26 is received. As can be best seen in Fig. 3, the slot-providing walls 24*a* and 24*b* are equipped with aligned openings 27 and 28. These openings extend generally in a downward or longitudinal direction, and when the arms 12 and 13 are assembled in overlapping relation, are further in alignment with an opening 29 in arm 13, specifically in the boss-like protuberance 26. Mounted in the aligned openings 27—29 is an arcuate retaining pin 30 which is equipped at the upper end thereof with a laterally-extending, integral lug or head portion 31. The upper slot-providing portion 24*a* is relieved in the area of the upper end of opening 27 as at 32 to accommodate the positioning of pin 30 and its integral head portion 31 within the upper surface of the assembled shank 11.

In installation, the arm 12, when rotated clockwise, as would be the case if the organization seen in the drawing is employed, brings the opening 24 into receiving relation with the rod A and also protuberance 26. When the arms 12 and 13 are completely overlapped, i.e., their upper, generally circular profiles in alignment, a central circular opening 25*a* (see Fig. 1) is provided for the receipt of the mounting rod or shaft A. The arcuate resilient metal pin 30 is then inserted through the aligned openings 27—29, and retains the shank elements and head securely united. When it is desired to either replace or reverse the head 10, it is merely necessary to insert a tool such as a screw driver beneath the head portion 31 of the pin 30 to pry it out of the aligned openings 27—29. Thereafter, the arm 12 can be pivoted counterclockwise (as seen in Fig. 3) to disengage the foot 18 from under the shoulder 15. Once the foot 18 is so removed, the head 10 can be quickly disengaged from the leg 13 and replaced or reversed. The replacement of leg 12 follows the reverse procedure, being finally completed by the reinsertion of the resilient locking pin 30.

Through the provision of an arcuate resilient metal locking pin 30, the tendency of the pin to be dislodged during operation of the hammer is effectively opposed. Further, the installed pin is effective to restrain the shank elements 12 and 13 from being disassembled. As is seen in Fig. 3, the pin 30 on one side bears against the opening 29 as at 29*a*, while the other side bears against the other side of openings 27 and 28, as at 27*a* and 28*a*.

In operation, the disc or other plate supporting the hammer would ordinarily be rotated in a counterclockwise fashion, so that the essential impact stress would be transmitted to any shaft through the shaft element 13 and the boss-like protuberance 26. Thus, the protuberance additionally reinforces the hammer at the point of heavy stress and preferentially absorbs stresses in contrast to the other shank element 12, thereby preventing the application of stress thereto which might tend to disassemble the shank elements.

While in the foregoing specification I have set forth a detailed description of an embodiment of the invention, it will be apparent to those skilled in the art that many variations in the details herein given may be made without departing from the spirit and scope of the invention.

I claim:

1. In an impact crusher hammer, a replaceable, work-performing head having opposed work faces and adapted to be carried in interlocked relation by a suspending shank composed of a pair of members having oppositely-projecting curved feet swingable into said interlocked relation with the work-performing head about axes substantially parallel to said faces, said work-performing head comprising a body having a top, end and side walls, said side walls having oppositely-facing recesses therein open at the top, said recesses being shaped to provide shoulders at opposite ends adjacent the top wall and adapted to overlie said oppositely-projecting feet on opposite sides of said partition, the opposed surfaces of said shoulders being substantially arcuate, the said recesses also being curved to conform to said feet in the assembled relation therewith and to permit swinging movement of at least one of said feet about the adjacent arcuate shoulder surface to effect the interlocked assembled relation of said head and shank, each of said members having an opening extending therethrough spaced from said head, said openings being alignable when said shank members are interlocked, a downwardly arcuate slot extending laterally from the opening in one of said members and adapted to pass a shaft received in said one member opening when said one member is pivoted out of interlocking relation with the other member, and locking means extending through said members maintaining said members in interlocked relation.

2. The structure of claim 1 in which the said other member is equipped with an arcuate protuberance positioned in said slot when said members are interlocked, said protuberance being substantially coextensive with said slot.

3. The structure of claim 2 in which said members are equipped with generally longitudinally-extending, aligned openings adapted to receive a locking pin, the opening in said other member extending through said protuberance, and an arcuate resilient metal locking pin extending through said aligned openings.

4. In an impact hammer for rotary crushers, and the like, a hammer head, an elongated recess in the upper surface of said head, a pair of shoulders overhanging the opposite ends of said recess, a pair of arms each having an end extending into corresponding ends of said recess, said arm ends having lateral projections extending cooperatively under corresponding of said overhanging shoulders, said arms being insertable separately into said recess, the first of said pair of arms having a concave curved surface opposite the lateral projection thereof, the second of said arms having a convex curved surface opposite the lateral projection thereof for abutting cooperatively against the curved surface of said first arm when said two arms are assembled in said recess for preventing disengagement of

said projection from said shoulders, the curvatures of said convex and concave curved surfaces being such that said second of the arms is moved into assembled relation with the first arm and head from a position angularly away from said first arm, each of said arms having an opening extending therethrough spaced from the end equipped with said lateral projection, the opening in the second of said arms being laterally elongated to provide a laterally-extending slot, aligned pin-receiving openings in said arms, and a locking pin extending through said aligned openings, said pin being equipped with a laterally-extending portion and said second arm being equipped with a recess in the wall thereof in which said laterally-extending portion is received.

5. In an impact crusher hammer, a suspending shank and a work-performing head replaceably mounted on said shank, said shank including a pair of members having complementary shapes including oppositely offset leg portions adapted to overlap in assembled relation, each of said members having a foot portion at one end including a heel surface and a toe part projecting outwardly in a sidewise direction with respect to said offset leg portions, each of said members having a curved surface adjoining said projecting toe part, said work-performing head comprising a body having on opposite sides thereof similar recesses of a shape closely conforming to said foot portions when said heel surfaces are in contact, said body also having integral shoulders with opposed curved surfaces adapted to overlie said toe portions, said work-performing head being placed in interlocked relation on said shank by angular swinging movement of at least one of said members about the adjacent curved shoulder surface in a direction such that said offset leg portions move across one another into overlapping relation, each of said members being equipped with a circular opening extending transversely therethrough and transverse of the length of the foot portion thereof and adjacent to but spaced from the end thereof opposite the end equipped with said foot portion, said openings being aligned for the receipt of a mounting shaft when said members are in overlapping relation, one of said members having an arcuate slot communicating with the opening therein and extending in a direction opposite to and parallel to the length of the foot portion thereof, and a retaining pin extending through said members for maintaining said members in overlapping relation, the other of said members being equipped with a slot-fitting protuberance on the face thereof adjacent said one member, said protuberance being moved into said slot during said angular swinging movement.

6. In an impact crusher hammer, a head equipped with apertures adapted to receive a pair of shank elements and retaining the same when the shank elements are pivoted together in overlapping relation, a pair of shank elements each equipped with a transverse opening, a rod member extending through said openings, a sidewardly-extending slot in one element communicating with the opening therein and sized to pass said rod member for disengaging said one element from said rod member, and retaining means for said shank elements releasably maintaining said shank elements in overlapping relation with the openings therein aligned.

7. In an impact crusher hammer, a head equipped with apertures adapted to receive a pair of shank elements and to retain the same when the shank elements are pivoted together in overlapping relation, a pair of shank elements each equipped with a transverse opening, each of said shank elements including at one end a foot part pivotally engageable with said head and an enlarged portion at the other end in which said opening is located, a rod member extending through said openings, a sidewardly-extending slot in one element communicating with the opening therein, said slot extending in a direction normal to the length of said rod member and sized to pass the same when the foot part of said one element is pivotally disengaged from said head and simultaneously disengaging said one element from said rod member and said head, shoulder means in the other element receivable in said slot, and retaining means for said shank elements releasably maintaining said shoulder means in said slot.

8. In an impact crusher, a pair of elongated shanks each equipped with a shaft-receiving opening adjacent one end thereof and an arcuate integral foot at the other end, one of said shanks being equipped with an arcuate slot extending laterally from the opening therein and adapted to pass a shaft into said opening, retaining means extending through said shanks immobilizing said shanks relative to each other with the openings therein in aligned relation, and a striking head for said shanks equipped with opposed foot-receiving openings contoured to fit the feet of said shanks and retain said feet immovably therein when said shank openings are aligned, a shaft extending through said openings, said one shank being pivotally disengageable from said shaft by movement thereof to pass said shaft through said slot, which movement simultaneously disengages the foot of said one shank from said head.

9. In an impact hammer for rotary crushers, and the like, a hammer head, an elongated recess in the upper surface of said head, a pair of shoulders overhanging the opposite ends of said recess, a pair of arms each having an end extending into corresponding ends of said recess, said arm ends having lateral projections extending cooperatively under corresponding of said overhanging shoulders, said arms being insertable separately into said recess, the first of said pair of arms having a concave curved surface opposite the lateral projection thereof, the second of said arms having a convex curved surface opposite the lateral projection thereof for abutting cooperatively against the curved surface of said first arm when said two arms are assembled in said recess for preventing disengagement of said projection from said shoulders, the curvatures of said convex and concave curved surfaces being such that said second of the arms is moved into assembled relation with the first arm and head from a position angularly away from said first arm, each of said arms having an opening extending therethrough spaced from the end equipped with said lateral projection, a rod member extending through said openings, the opening in the second of said arms being laterally elongated to provide a laterally-extending slot, said slot being sized to pass said rod member for completely disengaging said second arm from said rod member when the second arm lateral projection is moved angularly for disengagement from its associated shoulder, aligned pin-receiving openings in said arms, and a locking pin extending through said aligned pin-receiving openings.

10. An impact crusher hammer, a suspending shank and a work-performing head replaceably mounted on said shank, said shank including a pair of generally elongated members having complementary shapes including oppositely offset leg portions adapted to overlap in assembled relation, each of said members having side walls providing a foot portion at one end thereof, said foot portions including a heel surface and a toe part projecting outwardly in a sidewise direction with respect to said offset leg portions so as to provide protuberances in said side walls, each of said members having a curved surface adjoining said projecting toe part, said work-performing head comprising a body having on opposite sides thereof similar recesses of a shape closely conforming to said foot portions when said heel surfaces are in contact, said body also having integral shoulders with opposed curved surfaces adapted to overlie said toe portions, said work-performing head being placed in interlocked relation on said shank by angular swinging movement of at least one of said members about the adjacent curved shoulder surface in a direction such that said offset leg portions move across one another into overlapping relation, each of said members being equipped with a circular opening extending transversely there-

through and transverse of the length of the foot portion thereof and adjacent to but spaced from the end thereof opposite the end equipped with said foot portion, said openings being aligned for the receipt of a mounting shaft when said members are in overlapping relation, one of said members having an arcuate slot communicating with the opening therein and extending in a direction parallel to the length of the foot portion thereof, said slot providing an opening in the side wall of said one member equipped with said heel surface, and a retaining pin extending through said members for maintaining said members in overlapping relation.

11. An impact crusher hammer, comprising a pair of shanks each equipped with a mounting opening adjacent one end thereof, a mounting shaft extending through said openings, each shank having two sets of side walls with the opening therein extending between one set of side walls, foot portions on each shank at the other end thereof and projecting outwardly from the other set of side walls, a head equipped with apertures in which said foot portions are received when said shanks are arranged in overlapping relation, one of said shanks being equipped with an arcuate slot extending from the opening therein to one of the other set of side walls to interrupt the same, whereby movement of said one shank to disengage the foot portion thereof from its associated head aperture causes said shaft to pass through said slot to simultaneously disengage said one shank from said shaft, said other shank being equipped with shoulder means positioned in said slot when said shanks are in overlapping relation, and removable retaining means for maintaining said shank elements in overlapping relation.

12. An impact crusher hammer, comprising a pair of shanks each equipped with a mounting opening adjacent one end thereof, a mounting shaft extending through said openings, each shank having two sets of side walls with the opening therein extending between one set of side walls, foot portions on each shank at the other end thereof and projecting outwardly from the other set of side walls, a head equipped with apertures in which said foot portions are received when said shanks are arranged in overlapping relation, one of said shanks being equipped with an arcuate slot extending from the opening therein to one of said other set of side walls to interrupt the same, whereby movement of said one shank to disengage the foot portion thereof from its associated head aperture causes said shaft to pass through said slot to simultaneously disengage one shank from said shaft, cooperating pin-receiving openings in said shanks, and a resilient, arcuately-shaped pin removably mounted in said cooperating openings for maintaining said shanks in overlapping relation.

References Cited in the file of this patent

UNITED STATES PATENTS

1,940,116	Brooks	Dec. 19, 1933
2,183,880	Brooks	Dec. 19, 1939
2,397,776	Clark	Apr. 2, 1946
2,404,775	Ehmann	July 30, 1946

FOREIGN PATENTS

546,541	Germany	Mar. 15, 1932