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(12) # EUROPEAN PATENT APPLICATION

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(54) **Hammers.**

(57) An all polypropylene hammer with a hollow moulded handle (2) and head (1), the head filled with lead shot (7) and closed with a plug (1,6). The striking faces of the head are removable cup shaped components (3,4) which may be selected for the work in hand. The head has vent holes to accommodate heating and cooling of the lead shot, a guide slot to facilitate cutting an old striking face off and a steel washer (5,6) can reinforce the cup. Additional lead shot can be contained in the head end of the handle. The hammer is made in an automated injection die casting cycle and the shot, plug and striking face cups added afterwards.

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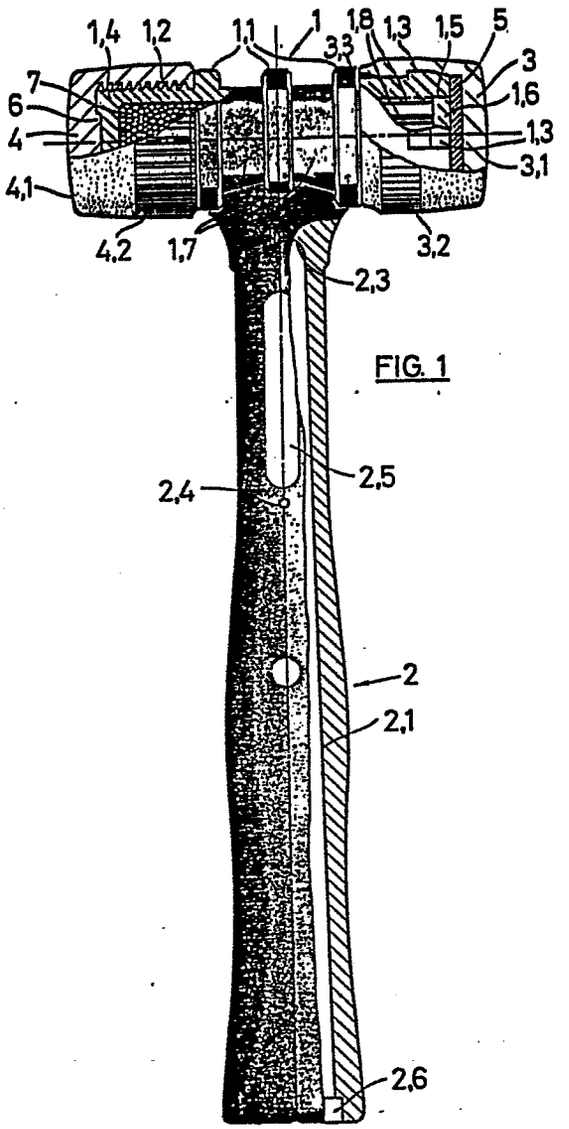

FIG. 1

FIELD OF THE INVENTION

This invention concerns improvements in and relating to hammers. The invention is applicable to all kinds of hammers, mallets and similar implements.

BACKGROUND OF THE INVENTION

Traditional hammers comprising a wooden handle and metal head, or all metal hammers have been replaced but only to a limited extent by certain composite hammer designs of metal and polymeric material.

Around 1972 Australian patent 43 797 was published describing a polymeric moulded hammer having entirely embedded inside the polymer a steel handle and a hollow steel tubular head containing lead shot. The metal inserts therefore had to be supported within the mould prior to closure of the mould for injection of the polymer into which the metal became embedded.

Also in 1972 French patent 2 088 164 described a polymeric hammer containing a solid metallic mass entirely embedded within the head of the hammer. Special retaining pins which held the mass in position in the mould when it was closed also had to be cast in with the polymer. End caps were clipped onto each end of the head to provide striking faces which covered the pins referred to, but the end caps were not exchangeable.

In 1977 United States patent 4 039 012 described a design similar to that of the Australian patent, namely a steel reinforcement of the handle and head with lead shot in the head but in this case a steel ball and peen protruded from the surrounding polymer so that the handle and only part of the head were embedded in the polymer, the striking faces then being the protruding steel ball and peen.

In 1976 South African patent 76/1035 described a hammer essentially comprising a metallic handle and hollow head containing lead shot, the hand grip portion of the hammer having a polymeric grip cast around it and the striking faces of the head being formed by screw-on caps made of polymeric material.

These hammer designs were interesting but experience showed that they did not provide a sufficient advantage over the traditional hammer construction methods as to surplant them. They did not achieve a conclusive reduction in the cost of production of a hammer nor did they totally satisfy, in all cases, the technical requirements of strength and durability required.

It is an object of this invention to provide a hammer which can be injection die cast exclusively of polymeric material without the requirement for any reinforcing metallic inserts in the mould to be moulded in. This facilitates fully automated moulding which realises the cost reducing

potential of this method of manufacture.

It is a further object of the invention to provide a hammer exclusively of polymeric material having a metallic mass enclosed in the head and removably attached striking faces which can be replaced by the user as required.

SUMMARY OF THE INVENTION

A hammer in accordance with this invention comprises an injection die cast exclusively polymeric integral handle and head, the handle hollow moulded by virtue of a blind hole terminating short of the head, the head hollow moulded, by virtue of a blind hole open at least at one end, the hollow in the head containing a metallic mass and closed by at least one plug, the head having a removably attached striking face component at least at one end of the head.

A process of manufacturing a hammer in accordance with this invention comprises the steps of injection die casting an exclusively polymeric integral handle and head by closing a mould into which a core to form a hollow moulded handle having a blind hole terminating short of the head is inserted and into which a core for hollow moulding the head by a blind hole open at at least one end of the head is inserted, followed by the steps of ejecting the integrally moulded hammer from the mould and thereafter inserting a metallic mass in the hollow in the head and closing it with

a plug and then attaching a striking face component to at least one end of the head.

The metallic mass to be inserted in the head is preferably lead shot (or steel shot) and it is pointed out that the product then comprises a hammer made only of plastic and the lead shot contained in its head.

In accordance with the invention the head may be provided with vent holes to allow for alternate escape and ingress of air which accommodates the effect of heating of the lead shot which occurs when the hammer is used.

Preferably a guide slot running axially in the head is provided for purposes of facilitating cutting the striking face component(s) for purposes of removal of the striking face component and its replacement. Striking faces may preferably be provided in the form of a cup which is to be secured to an end of the head.

It may be preferred to include a steel washer interposed between an end of the head and the polymeric striking face to increase the mass of the head and reinforce the striking face.

As an optional feature in accordance with the invention provision can be made for a metallic mass to be inserted into the hollow at the head end of the handle for the

purpose of enhancing the striking mass of the hammer as a whole, especially for small hammers.

Preferably the striking face component is provided with an inwardly directed projecting part which keys into a matching recess in an end of the head. This is designed to increase the security of attachment of the striking face component to the head, in particular to prevent it from twisting off the head during use.

Preferably means is provided for securing the plug which encloses the space inside the head with the lead shot contained. The securing means preferably comprises an interiorly located lock groove in the periphery of the plug and a matching lock groove in a corresponding position in the interior surfaces of the hollow in the head. This lock groove is filled with part of the lead shot or other fill in the head during use so as to aid in locking the plug in position. Although generally polymeric the plug may also be made of steel, for example. The interior of the head may be provided with a plurality of longitudinally extending ribs which stop short of the position to be occupied by a plug.

For the mass production of hammers on a large scale and at low unit price in accordance with this invention such hammers can be injection die cast of suitable polymeric materials, especially high quality and high mechanical

property polymeric materials such as polypropylene, polyurethanes and polymethylmethacrylate materials.

Thus the present invention provides a process of injection die casting hammers of the kind described above which is characterised by the absence of any inserts located in the mould to be cast permanently in the hammer and which employs mould parts and core parts which are automatically closed. Preferably the mould comprises support pins which provide support for the positioning of the distal end of a core insert for the handle, in view of the length of that core. The avoidance, in accordance with this invention, of any reinforcing insert to be cast into the product brings significant advantages. One avoids the costs of manufacture of the insert, of manual or automated insertion in the mould in every moulding cycle, the risk of misalignment in the mould which can lead to rejects or even mould damage and one has the advantage that if there is a reject it can be reground and recycled without any need to first remove a metal insert.

It is a feature of the present invention to provide what may be described as a universal hammer, that is suitable for many applications such as a meat mallet, for tool making, engineering, carpentry, aeronautical, automotive and other purposes, the removable cap being chosen according to the work. For this purpose the caps are preferably moulded in a variety of materials both metallic and

polymeric offering varying properties and they may be colour coded to assit in clear selection.

Preferably the neck of the handle, that is where the handle extends into the head is deeply filletted and webbed to provide adequate strength (and resilience for shock resistance) for example particularly against damage resulting from "miss hits".

The means of removable attachment of the striking faces to the hammer head may comprise a screw attachment or various clip action formations, bayonet connection formations or other suitable formations moulded in the polymer and optionally reinforced by metal inserts such, for example, as spring steel circlips, binding reinforcements, clamping arrangements and the like.

The hollow provided in the handle could have a wooden or metal insert provided to it after the moulding step has been completed.

One can put a steel sleeve closed at one end into the head or a steel tube closed at both ends containing lead shot filled into it can be inserted in the head. This could be useful especially for large hammers.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention is illustrated by

way of example, in which :

Figure 1 is an illustration of a first embodiment of the invention, and

Figure 2 is an illustration of a second embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBIDIMENT

As shown in figure 1 of the drawing the hammer comprises a head generally indicated at 1 and a handle generally indicated at 2 which are integrally moulded of a suitable polymeric material by high volume injection moulding techniques. The head comprises externally a plurality of circumferential ribs 1,1 and near opposite ends of the head suitable means of attachment of caps which form striking faces. For purposes of illustration in this drawing a screw thread 1,2 is shown at the one end and a click-action type connection 1,3 at the other end. However, a single hammer having these features can be offered. A softer polymer, for example polyurethane of selected lower hardness can be used for the clip-on component 3 while a harder polymer (which would be well suited for clip-on connection) for harder work for the screw on component 4. The clip-on component 3 has a lead-in taper 3,3 at the entrance to its bore to ease pushing onto the click action should 1.3. It must be made clear that any other kind of connection can be

employed, for example, bayonet type connections which require a rotating action over a limited angular rotation to bring the cap into a locked position or conversely into a position in which it can be removed. In the case of the projections 1,3 these could be provided on the inner faces of the cap with appropriate recesses in the hammer head, being the inverse arrangement to that illustrated, if desired. Similarly the bayonet arrangements can be inverted. A further possibility is a separate rotatable ring which provides a locking action to hold or retain a cap in position. A rotatable ring which does not provide a primary attachment to the cap but instead provides a secondary function of locking a primary attachment or ensuring security of a primary attachment could also be adopted.

Furthermore an outer spring ring of metallic material, for example, can be used, partially or wholly embedded in the polymer of the end caps to strengthen the attachment of the end cap.

It must also be made clear that the end caps can be manufactured from metallic material rather than polymeric. The choice of materials will be relevant to the purpose for the particular end cap.

Sandwiched between the end cap 3 and the end of the hammer head is a metallic disc 5. This provides reinforcement of

the end cap against very hard blows or blows onto very sharp surfaces, for example.

The end cap 4 at the opposite is shown for illustration purposes to have an inwardly directed projecting part 6 which keys into a matching recess in the head.

In this embodiment the hammer head is illustrated as being a blind hole thus moulded with the end 1,4 closed and the opposite end 1,5 open. The open end 1,5 is closed by means of a polymeric plug 1,6 which is ultrasonic welded in position after a suitable filler, for example lead shot 7, has been inserted. However, it must be made clear that the hammer could be moulded with both ends of the head open and both ends closed by means of polymeric discs such as the disc 1.6. Longitudinally extending ribs 1,7 are provided inside the bore of the head 1 terminating short of the position occupied by the plug 1,6, to locate the plug. (The lead shot fill is not drawn so as to reveal these ribs).

The end caps 3 and 4 are moulded with convex spherical striking surfaces 3,1 and 4,1 respectively so as to reduce a tendency for the peak pressures resulting from blows being generated near the edges of the head.

It will be clear that the screw thread type attachment 1,2 will facilitate easy attachment and removal of the head and

generally speaking it will be desired that whatever attachment means is adopted that this also facilitates removal so as to interchange heads in the course of use according to the application.

Two very fine pin holes 1,7 are provided in the head as breathing holes to permit exit and ingress of air to accommodate this requirement when, for example, lead shots 7 heats up, which is a tendency if the hammer is used intensively.

It will, of course, be appreciated that the metallic disc such as steel discs 5 and 6 increase the weight of the strike provided by the hammer as well as giving the structural reinforcement mentioned. These discs also protect the hammer head should a cap break in use.

Such a hammer can be provided not only with the two end caps attached but in addition with a plurality of alternative end caps which can be used to replace those on the hammer. These end caps would be moulded possibly in different materials to provide different properties as mentioned and can be colour coded.

Preferably the end caps are provided with serrations 3,2 and 4,2 to facilitate screwing them on and off or attachment by a bayonet action or any other. The breath holes 1,7 would also be appropriate for another low melting type material

which is used as filler for the caps. If a liquid is used as filler then, of course, the holes must be omitted so as to hermetically seal the hammer head. Any material at all can be used such as sawdusst, water, stone, stacks of discs, stacked rods or any other form or quality of material.

It will also be an option to provide the hammer with one end cap integrally and permanently moulded in position, for example the end cap 4, omitting the disc 6. In this embodiment only one of the end caps will then be replaceable to provide alternative types of striking faces.

The end caps can be given a coarser thread than illustrated and can be formed in a hexagonal head form so as to be attachable by means of, for example, a ring spanner.

The inner edge surfaces of the end cap can be provided with grooves, teeth or ratchet formations to provide a click action tending to hold the head in its tightened position. as a further option an interlocking system between the two caps can be provided functioning after they have been screwed into position or otherwise rotationally fixed in position to prevent them from being removable. Thus the securing of the end caps will be provided by way of interlocking between the end caps themselves rather than between each end cap an the hammer head.

The handle 2 as shown is provided hollow moulded as shown by the broken lines 2,1 forming a blind hole which terminates at 2,3 short of the hammer head. Holes 2,4 are formed in the handle by pins which operate in the mould parts and centralize the core which forms the hollow 2,1. A flattened surfae 2,5 is provided on which identification marks such as trade marks, type marks and part component marks, etc. can be placed. The strength of the handle particularly in the position where it joins with the hammer head must be sufficient for miss-hits to occur without breaking the head off the handle and this can be provided by designing for a spring action in the polymeric material of the handle by suitable choice of that material. Furthermore, preferably the handle is given an oval cross sectional shape, the large dimension being aligned in the direction of the head to provide enhanced bending strength in that direction. A cap 2,6 is inserted to close off the hollow 2,1.

As shown in figure 2 of the drawing the hammer comprises a handle 11 and head 12 which are integrally moulded, for example, from polyurethane, polymethylmethacrylate, nylon or polypropylene. The hardness grade of polymer and the type will be selected with cost in mind as well as toughness and other mechanical characteristics. The handle is hollow moulded by virtue of a blind hole 11,1 in the handle which terminates at 11,2 short of the head 12. A plug 13 at the heel of the handle closes off the hole in this example.

The neck 11,4 where the handle blends into the head is deeply filletted, e.g. by fillets as at 14,1 and ribbed, e.g. by ribs 14,2, 14,3 and 14,4. The head is also hollow moulded by virtue of a blind hole 12,1 thus open at 12,2 and closed at 12,3. However, broken lines 18 indicate an alternative head construction having a wall at 18 and open at both ends, i.e. end wall 12,3 eliminated. This can be moulded by two mould cores inserted from both ends of the head in the moulding step. The two chambers will then be filled with lead shot and plugged. A plug 12,4 is bonded in position after the insertion of lead shot 15 for a "dead blow" type hammer. The plug can alternatively be kept in place by means of co-operating lock grooves 12,6 in the bore of the head 12 and 12,7 in the plug 12,2; sufficient clearance is left at 12,8 to allow shot to enter these two circumferential grooves and lock the plug in position. A removable striking face component 16 provides a striking face at the one end and is shown with a wedge shaped clip formation 16,1 which clips with a click action into a corresponding circular groove in the end 12,3. A helically coiled spring wire 16,2 is located in a groove 16,3 which encircles the component 16 around the outer surface in the locality of the formation 16,1. At the opposite end of the hammer a similar component 17 is provided and here for illustrative purposes an alterntive clip-in formation 17,1 of rounded shape is shown, the component illustrated here removed for clarity of illustration. The formation 17,1

fits into a matching formation 12,5 in the head when the component is clicked into position. Again a circular groove 17,2 around the outer surface of the component is located in the region of the formation 17,1 to receive the helical coil of spring wire to maintain a resilient closing action to keep the component in position in use. The interior cylindrical surface of the component 17 has axially directed slots 17,3 to provide more elasticity to that portion so as to facilitate the click-on action.

Each of the striking face components have furthermore a slot to allow a screwdriver to be inserted to remove the component. This slot is provided on an inner cylindrical surface of the striking face component leading up to the edge of that surface adapted so that when the component is clicked into position the end of the slot is revealed, into which the blade of a screwdriver can be inserted to lever off the component when required. Alternatively the head can be marked with a longitudinally extending groove as a guide for cutting the striking face component to ease removal.

CLAIMS

1. A hammer which comprises an injection die cast exclusively polymeric integral handle and head, the handle hollow moulded by virtue of a blind hole terminating short of the head, the head hollow moulded, by virtue of a blind hole open at least at one end, the hollow in the head containing a metallic mass and closed by at least one plug, the head having a removably attached striking face component at least at one end of the head.

2. A process of manufacturing a hammer which comprises the steps of injection die casting an exclusively polymeric integral handle and head by closing a mould into which a core to form a hollow moulded handle having a blind hole terminating short of the head is inserted and into which a core for hollow moulding the head by a blind hole open at at least one end of the head is inserted, followed by the steps of ejecting the integrally moulded hammer from the mould and thereafter inserting a metallic mass in the hollow in the head and closing it with a plug and then attaching a striking face component to at least one end of the head.

3. A hammer as claimed in claim 1, in which a guide slot running axially in the head is provided for purposes of

facilitating cutting the striking face component(s) for purposes of removal of the striking face component and its replacement.

4. A hammer as claimed in claim 1 or claim 3, in which the head is provided with vent holes to allow for alternate escape and ingress of air.

5. A hammer as claimed in claim 1,3 or 4, in which a steel washer is interposed between an end of the head and the polymeric striking face.

6. A hammer as claimed in claim 1,3,4 or 5 in which provision is made for a metallic mass to be inserted into the hollow at the head end of the handle.

7. A hammer as claimed in claim 1,3,4,5 or 6 in which the striking face component is provided with an inwardly directed projecting part which keys into a matching recess in an end of the head.

8. A hammer as claimed in any one of claims 1 and 3 to 7 which comprises an interiorly located lock groove in the periphery of the plug and a matching lock groove in a corresponding position in the interior surfaces of the hollow in the head.

9. A hammer as claimed in any one of claims 1 and 3 to 8, in which for removal of

a striking face component at least one feature is selected from a slot provided on an inner cylndrical surface of the striking face component leading up to the edge of that surface adapted so that when the component is clicked into position the end of the slot is revealed, into which the blade of a screwdriver can be inserted to lever off the component when required and a longitudinally extending groove marked in the head as a guide for cutting the striking face component to ease removal.

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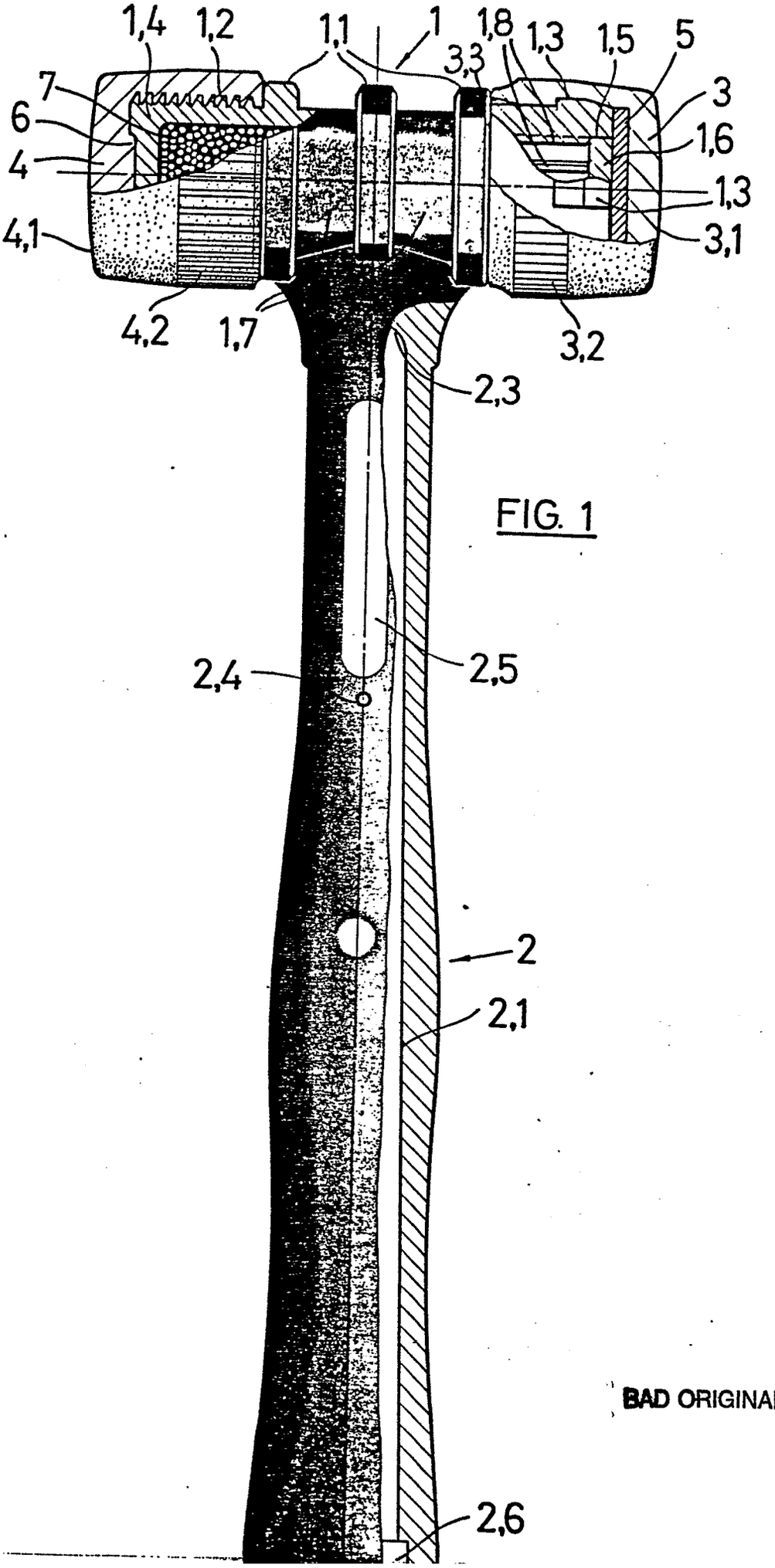

FIG. 1

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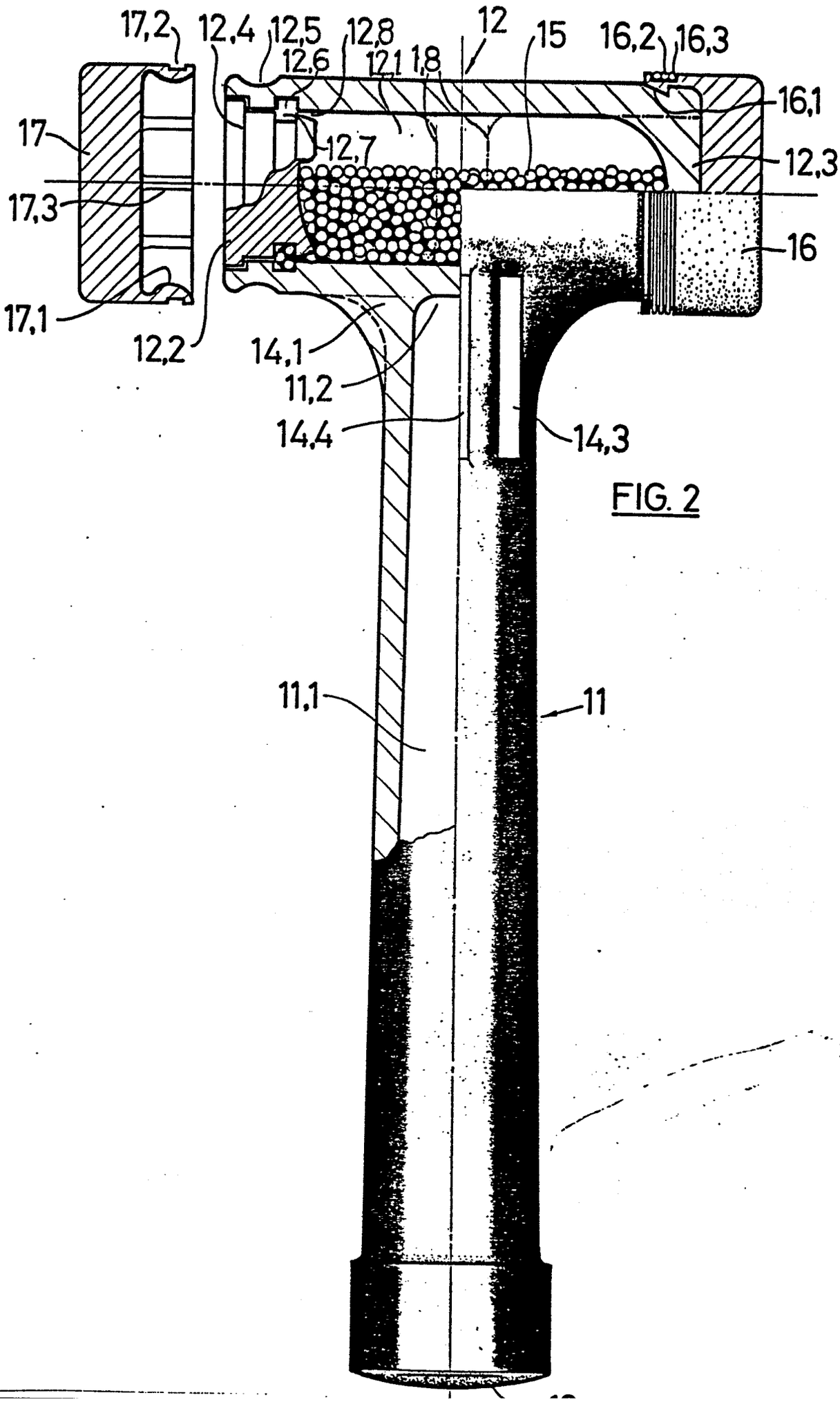

FIG. 2

European Patent Office

EUROPEAN SEARCH REPORT

0204533
Application number

EP 86 30 4159

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl 4)
X	FR-A-2 088 164 (FORGES DE MONTECHEROUX) * Whole document *	1,2,6-8	B 25 D 1/02
Y	DE-A-3 403 483 (BLOMQVIST) * Whole document *	1,2,5,6	
Y	US-A-3 444 908 (ROTH) * Whole document *	1,2,5,6	
A	US-A-2 451 217 (HEINRICH) * Figure 1 *	4	
A	CH-A- 584 093 (KNÜSLI) * Figure 1 *	1,2,5-8	TECHNICAL FIELDS SEARCHED (Int. Cl.4) B 25 D
A	CH-A- 441 159 (GUBSER) * Whole document *	1,2,8	
A	DE-A-2 047 710 (WOLANY)		
A	GB-A-1 291 845 (ASQUITH et al.)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11-08-1986	BENZE W.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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