May 3, 1932. E. G. HYSING 1,856,336

STRIKING TOOL

Filed Jan. 7, 1929

Fig. 1.

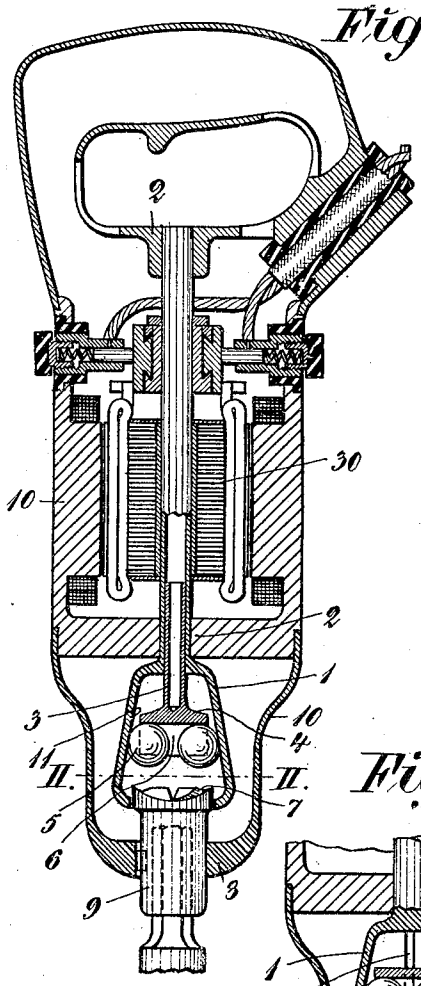


Fig. 3.

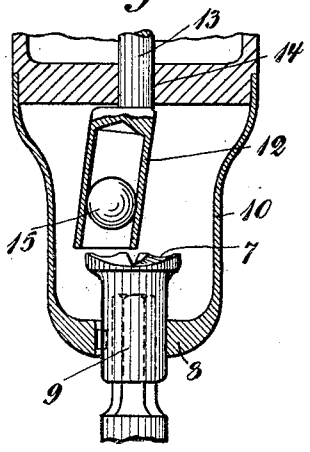


Fig. 6.

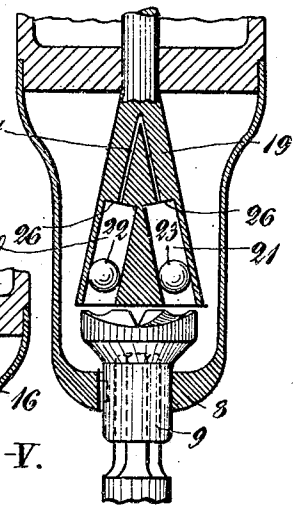


Fig. 4.

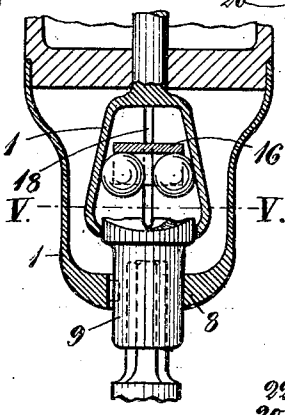


Fig. 2.

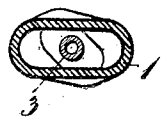


Fig. 7.

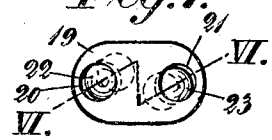
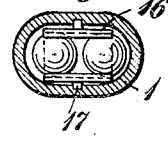


Fig. 5.



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UNITED STATES PATENT OFFICE

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STRIKING TOOL

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The present invention relates to an arrangement in striking tools of the kind, which consists partly of a suitable power rotated striking body, mounted to slide axially and provided with one or more oblique striking faces, which cooperate with corresponding oblique faces located on an anvil and give the striking body a recoil movement, and partly of device cooperating with the striking body by which the latter is caused to move towards the anvil following its recoil movement.

The invention is essentially characterized by the fact, that the striking body consists of or is provided with one or more balls, the faces of which form the oblique striking faces of the striking body.

Other characteristic features of the invention will be more clearly set forth hereinafter. In the annexed drawings:

Fig. 1 shows a longitudinal section of a striking tool constructed according to this invention, and Fig. 2 is a section on the line II—II in Fig. 1. Fig. 3 shows a longitudinal section of the lower part of a striking tool, according to another embodiment, and Fig. 4 illustrates a third embodiment, also in longitudinal section. Fig. 5 is a section on the line V—V in Fig. 4. Fig. 6 is a fragmentary section on the line VI—VI of Fig. 7 of a fourth embodiment and Fig. 7 is an end view of a detail in Fig. 6.

Referring to the embodiment according to Fig. 1, 1 is a sleeve mounted to turn in the bearing 2 of the frame 10. This sleeve 1 may be rotated by means of an electric motor 30 or the like. A shaft 3 is arranged to turn and slide in said sleeve. The front part of this shaft 3 is given the shape of a holder 4 for a pair of balls 5, which balls are arranged in this holder in such a way, that they are forced to follow the rotation as well as in the reciprocating movement of said holder. Besides they are free to move in a radial direction. For this purpose the holder 4 is provided with a recess 6 of a width corresponding about to the diameter of the balls. Said recess is so constructed that a portion of the circumference of the balls 5 extends forwards from the holder to allow the balls to make contact with a pair of oblique faces 7, located on the anvil 9 sliding in the frame bearing 8. As obvious from Figs. 1 and 2, the sleeve 1 has its front end enlarged and of a cross section almost oval, so that its interior width corresponds about to the width of the holder 4. Besides, the open front portion of the sleeve or that portion adjacent the anvil 9 is relatively wide and two opposite sides 11 thereof are inclined in rearwardly converging relation as clearly shown in Fig. 1. The sleeve is also spiral shaped as suggested in Fig. 2.

The arrangement works in the following manner.

Assume that the parts occupy the position according to Fig. 1. In this position the holder 4 together with the balls 5 are moving in the direction towards the anvil 9, in order to deliver a blow thereon. The rotary movement of the sleeve 1 is transmitted to the balls 5 and, thus, also the shaft 3 and the holder 4 are forced to rotate. During rotation the balls 5 will, in the striking moment, contact the oblique faces 7 on the anvil and the recoil movement of the balls is thus effected, bringing with them the holder 4 and the shaft 3. At this recoil movement the balls 5 are simultaneously guided by the inclined sides 11 of the sleeve 1, and forced to move in a direction towards the axis of rotation of the holder, overcoming the centrifugal force, generated by the balls rotating about the shaft 3. When their recoil movement is stopped, the balls return to the front position, shown in Fig. 1, moving along the inclined walls 11 of the sleeve and again meets the anvil.

It is not intended that the holder 4 shall strike against the sleeve 1 at the end of the upward movement of the balls 5 and the holder 4.

The upward movement of the balls 5 and the holder 4 ceases before the holder 4 touches the inner end of the sleeve 1.

This stopping of the balls 5 and the holder 4 is effected by the fact that the motive energy of the balls and the holder is required for bringing the balls 5 radially towards the axis of rotation of the shaft 3. This, namely, will require energy although this energy will

gradually decrease the nearer the balls 5 will come to this axis of rotation, assuming a constant speed of rotation.

The cooperation of the balls 5 and the oblique wall at the rejection of the balls in the direction away from the anvil 9 may, as to the mode of operation, be compared with a brake, the force of which gradually decreases according as the axial speed of movement of the balls will decrease, so as in effect to provide means in the nature of an energy storing device. In all events by bringing the balls in the direction towards the axis of rotation there will be given a possibility of bringing the balls forward in the direction towards the anvil at a great speed by the influence of the centrifugal force.

The spiral shape of the sleeve is not necessary but a suitable choice of the spiral shape for the sleeve in relation to the oblique faces 7, it will be possible to obtain a movement between the balls 5 and the sleeve 1, entirely free from shocks.

It is not necessary to use two balls but, for instance, 3 or 4 balls may be used in an arrangement according to Figs. 1 and 2, without departing from the principle of the invention in any way.

It is also possible to use only one ball, in which case the construction may be simplified, the holder 4 being dispensed with, if desired. An arrangement carried out in this way is shown in Fig. 3.

The sleeve 12 has in this case a cylindrical cross section, but has an oblique position in relation to the axis of the power rotated shaft 13 by means of which the sleeve is rotatably mounted in the bearing 14. The interior diameter of the sleeve corresponds to the diameter of the ball 15. The ball 15 cooperates in the same manner as in the embodiment according to Fig. 1, with oblique striking faces 7 on the anvil 9, mounted to slide in the bearing 8.

The arrangement works in the following manner:

When the ball 15 has arrived at its outermost position, the blow against the anvil 9 is delivered, after which the ball recoils guided by the oblique sleeve 12. At this recoil movement, energy is stored as previously, since the ball 15 is forced, on account of the oblique position of the sleeve 12, to approach towards the axis of rotation of the shaft 13, against the influence of the centrifugal force. The ball 15 will thus be stopped and then moved forwards towards the anvil under the influence of centrifugal force.

Also in this case, the sleeve may be given a spiral shape or be placed in a corresponding oblique position, so as to allow a shockless movement of the ball 15 in the sleeve.

Figs. 4 and 5 show another embodiment, which is much like that one shown in Figs. 1 and 2. However, the holder for the balls in the embodiment according to Figs. 4 and 5 has no shaft mounted to slide in the sleeve 1. Instead of it the holder 16 is provided with a pair of projecting guiding flanges 17, running in corresponding grooves 18 in the sleeve 1. In the drawings the sleeve 1 is straight and not spiral shaped as in the embodiment according to Fig. 1. The sleeve according to Figs. 4 and 5, however, may if desired be given a spiral shape.

In this case the grooves 18 will also have a corresponding twist or turn.

The embodiment according to Figs. 6 and 7 shows a sleeve or body 19, provided with two cylindrical guides 20, 21 for the balls 22 and 23. The working manner of the arrangement is similar to that one shown in Fig. 3 and from Fig. 7 it is obvious that the guides 20, 21 are disposed obliquely to the axis of rotation so as to obtain an energy storing in the way, explained above in connection with the other embodiments.

Having now particularly described the nature of my invention and the manner of its operation, what I claim is:—

1. A striking tool including an anvil having at least one oblique impact surface, a striking member rotatably and reciprocably mounted with respect to the anvil and provided with at least one striking face in the form of a ball for coacting with the impact surface in the anvil for effecting a recoil movement of the member, the axis of rotation of said striking member substantially coinciding with the axis of the anvil, and a guiding and rotating device cooperating with the ball to cause the latter to deliver blows upon the anvil.

2. A striking tool as claimed in claim 1, wherein a plurality of balls are provided and a common holder for the balls.

3. A striking tool as claimed in claim 1 wherein a plurality of balls are provided, a common holder in which the balls are arranged, the holder being slidably mounted in the guiding and rotating device.

4. A striking tool as claimed in claim 1 wherein a plurality of balls are provided and the rotating device includes inclined guides arranged in such a way that the balls during a recoil movement are moved contrary to the direction of the centrifugal force acting upon the balls.

5. A striking tool as claimed in claim 1 wherein a plurality of the balls are provided, a common holder rotatably and slidably mounted in said rotating and guiding device.

6. A striking tool as claimed in claim 1 wherein a plurality of balls are provided, a holder for the balls, the rotating and guiding device being spiral in relation to the axis of rotation and cooperating with the balls, substantially as and for the purposes set forth.

7. A striking tool in accordance with claim 1 wherein the striking body and energy storing device include a plurality of balls, a holder therefor, said rotating and guiding device being in the form of a sleeve for slidably receiving the holder, the sleeve being substantially oval-shaped in cross section so as to allow the balls to move only radially and axially therein, substantially as and for the purpose set forth.

8. In a striking or hammering tool, a striking member, an anvil engageable by the striking member, said striking member being mounted for rotary and reciprocating movement, the axis of rotation of said striking member substantially coinciding with the axis of the anvil, a ball forming the striking face of the striking member and acting in response to centrifugal force developed incident to rotation of the striking member to effect the striking movement, and means acting in response to the impact of the ball upon the anvil to effect a recoil movement of the striking member.

9. In a striking or hammering tool, a striking member, an anvil engageable by the striking member, said striking member including a rotary guiding part, the axis of rotation of said striking member substantially coinciding with the axis of the anvil, and a reciprocating part mounted in the rotary guiding part so as to partake in the rotary movement, said reciprocating part including a holder, and a plurality of radially movable balls forming the striking face of the striking member and which act in response to centrifugal force developed incident to rotation of the guiding part to effect striking movement of the striking member, the impact face of the anvil being provided with means cooperating with the balls and the guiding part to effect a recoil movement of the holder.

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