

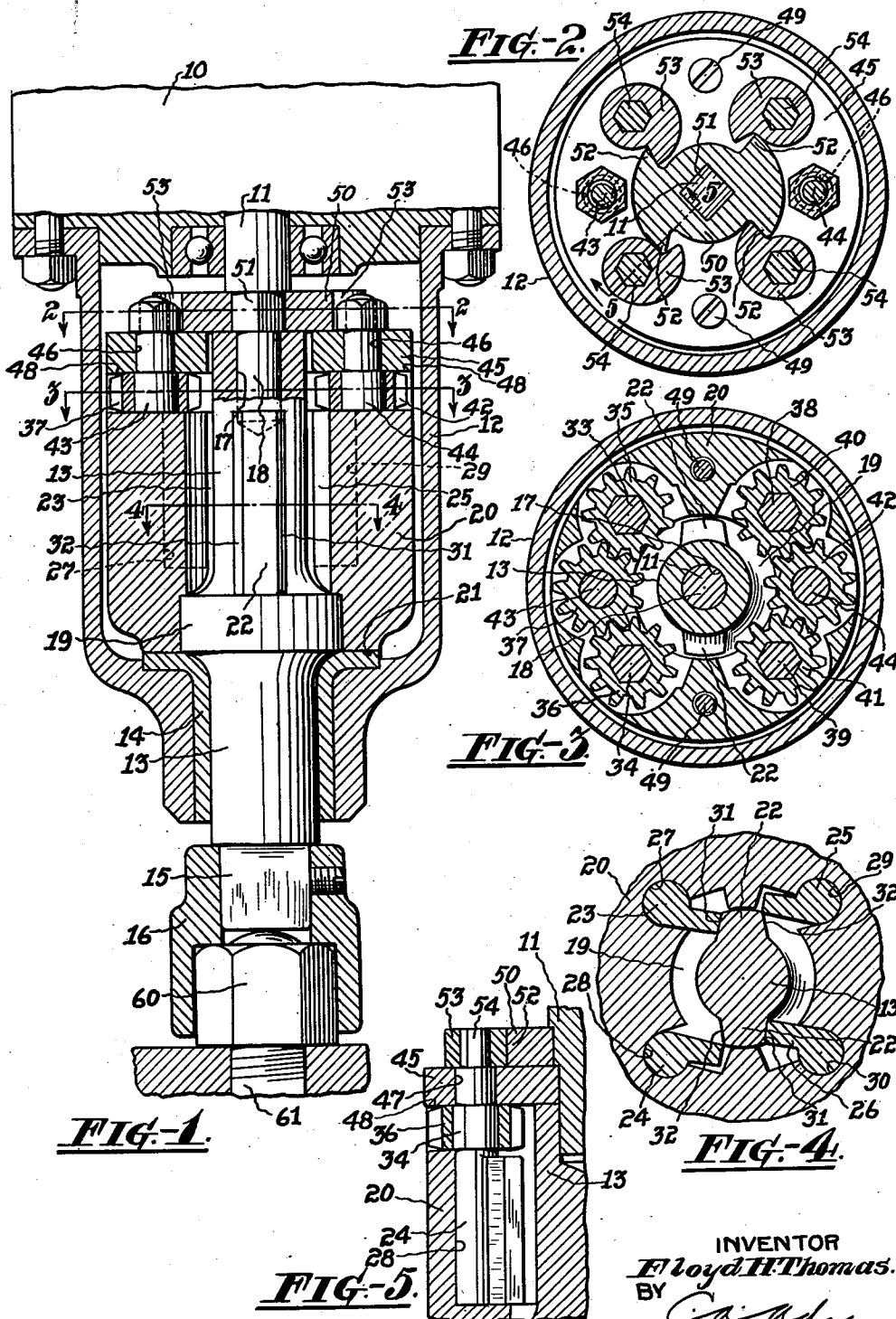
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IMPACT WRENCH

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IMPACT WRENCH

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1

This invention relates to wrenches and particularly to that type of wrench in which hammer blows are delivered when the torque resistance exceeds some predetermined amount.

One of the objects of the invention is to provide a sturdy and reliable wrench of this character.

In tools of this character there is usually provided a spindle with anvil faces which are adapted to be struck by a hammering element. In some types that have been used heretofore there is a tendency for the hammer element to strike a glancing blow which is apt to cause less than the full power of the impact to be delivered to the anvil and furthermore is apt to chip the face of the anvil. It is a further object of this invention to obviate these said defects.

Other objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

In the drawing which illustrates a preferred embodiment of the invention and in which similar reference characters refer to similar parts,

Figure 1 is a longitudinal section through the impacting portion of a wrench constructed in accordance with the invention, only a portion of the driving motor being indicated,

Figure 2 is a cross-section through the wrench taken along the line 2—2 of Figure 1 looking in the direction of the arrows;

Figure 3 is a cross-section along the line 3—3 of Figure 1 looking in the direction of the arrows;

Figure 4 is a section through the spindle and hammer elements of the wrench taken along the line 4—4 of Figure 1 looking in the direction of the arrows, and

Figure 5 is a section through a part of the spindle and hammer elements taken along the line 5—5 of Figure 2 looking in the direction of the arrows.

Referring to the drawings there is illustrated a wrench of the impacting type including a motor portion 10 of which only a part is shown having a drive shaft 11 extending forwardly into the hammer casing 12. Within the hammer casing is provided a spindle 13 suitably journaled in a bearing shell 14 at the forward end of the housing and provided with a square end 15 adapted to receive a suitable socket wrench 16. A rearward portion of the spindle 13 is provided with a bore 17 cooperating with the reduced end portion 18 of the drive shaft 11 to maintain alignment of the spindles. Longitudinal movement of the spindle 13 within the housing 12 is restricted

2

by a collar 19 formed integrally with the spindle 13.

Spindle 13 is adapted to be driven by the drive shaft 11 of motor 10 through the medium of a hammer element 20 encircling the spindle 13 and guided at its forward end by the collar 19. An end face 21 is provided to bear against the bearing member 14. The hammer element 20 is of considerable mass with respect to the spindle 13 and is adapted to be driven at high speed by the shaft 11.

Suitable means for clutching the hammer 20 to the spindle 13 is provided including anvil portions 22 formed on spindle 13 and dogs 23, 24, 25 and 26 rotatably mounted in bores 27, 28, 29 and 30, respectively, formed longitudinally in the interior of the hammer 20 and parallel to the axis of spindle 13. The dogs 23, 24, 25 and 26 are in the form of pawls which are adapted to engage the faces 31 of the anvils 22 upon rotation in a clockwise direction (Figure 4) and the faces 32 of anvils 22 upon rotation of the hammer in a counterclockwise direction.

The dogs are interconnected in pairs so as to rotate in their respective bores in the same direction. Thus the dogs 23 and 24 are provided at their ends with hexagonal ends 33 and 34, respectively, upon which are mounted spur gears 35 and 36, respectively, and an interconnecting gear 37 meshing with gears 35 and 36 is provided. Likewise upon hexagonal ends 38 and 39 are mounted gears 40 and 41, respectively, for interconnecting dogs 25 and 26 respectively, through the medium of a gear 42.

Gears 37 and 42 are rotatably mounted on studs 43 and 44 respectively, projecting from the upper end of the hammer 20. A plate 45 is provided as a means to hold the gears 35, 36, 37, 40, 41 and 42 in place. The plate 45 is provided with apertures 46 through which the studs 43 and 44 pass and bores 47 acting as bearings for the dogs 23, 24, 25 and 26. The plate 45 lies on the inner face 48 of the hammer element 20 and is fastened thereto by screws 49.

Driving connection between the shaft 11 and the hammer element 20 consists of a dog 50 mounted on a squared portion 51 of shaft 11 and provided with hook-like projections 52 adapted to engage cams 53 mounted on the hexagonal extremities 54 of the dogs 23, 24, 25, and 26. The cams 53 on the dogs 23 and 24 are opposed to each other as are the corresponding hook-like projections 52 of the dog 50. Likewise the cams 53 on dogs 25 and 26 are opposed to each other to engage the opposed projections 52 of the dog

50. Thus assuming that the hammer element 20 is relatively stationary, rotation of the shaft 11 in a counter-clockwise direction rotates the dogs 24 and 25 to disengage the anvil faces 32 while the dogs 23 and 26 are moved into the path of the anvil faces 31. Rotation of the shaft 11 in a clockwise direction produces the opposite effect—that is to say, dogs 24 and 25 are moved into the path of the anvil faces 32 and dogs 26 and 27 are moved out of the path of the anvil faces 31. However, as the hammer 20 rotates with respect to the spindle 13 the forward dog is moved back into the path of the approaching anvil face by the action of the anvil 22 engaging the trailing dog which, through the medium of the interconnection gears 37 and 42, causes the leading dogs to move inwardly into the path of the approaching anvil face.

I may illustrate the operation of the device as applied to the tightening of a nut 60 upon a bolt 61. Assuming that the socket wrench 16 has been placed on the nut 60, and the driving motor has been started so that the shaft 11 turns in a clockwise direction (Figures 2, 3, 4), the shaft, through the dog 50 and cams 53, rotates the hammer element 20 and the dogs 23, 24, 25 and 26 as a unit to turn the spindle 13 against slight resistance. When the resistance of nut 60 to turning becomes substantial, spindle 13 will stop rotation of the hammer element 20 whereupon the pressure of the hook-like projections 52 against the cams 53 tends to rotate the dogs 23 and 26 to disengage the faces 31 of the spindle 13, permitting rotation of the driving motor and the hammer element 20 without resistance and at a resulting high speed. However, simultaneous with the disengagement of dogs 23 and 26, dogs 24 and 25 will have been rotated inwardly so that they will be engaged upon rotation of hammer 20 by the anvils 22. Upon such engagement the dogs 23 and 26 are again moved back inwardly so that their ends will strike against the faces 31 with a blow at high velocity and resulting in hammering of the spindle 13 to drive the nut 60. This impacting is repeated as long as the driving motor is maintained in operation.

Upon reversing of the driving motor the dogs 24 and 25 will impact the faces 32 to drive the spindle 13 in a counter-clockwise direction and pawls 26 and 27 act as the means for restoring dogs 25 and 24, respectively, to the impacting positions.

Thus by the above construction are accomplished among others the object above referred to.

I claim:

1. An impact wrench and the like comprising a driving motor, a tool receiving spindle provided with anvil faces, a rotatable hammer element, a driving dog pivotally mounted on said hammer element adapted to transmit the rotational energy of said hammer to said anvil faces, a second dog separately mounted on said hammer element, inter-connecting means between said dogs to move one of said dogs into the path of said anvil faces and the other dog out of said path simultaneously, the means to transmit driving force from said motor to said dogs and tending to hold one of said dogs out of the path of said anvil faces.

2. An impact wrench and the like comprising a driving motor, a tool receiving spindle provided with anvil faces, a rotatable hammer ele-

ment, a pair of dogs each separately mounted on said hammer element on an axis parallel to the axis of said spindle and adapted to transmit the rotational energy of said hammer to said anvil faces, means on the dogs for transmitting rotary motion thereto, inter-connecting means between the first said means to move one of said dogs into the path of said anvil faces and the other dog out of said path simultaneously, and means to transmit driving force from said motor to said dogs and tending to hold one of said dogs out of the path of said anvil faces.

3. An impact wrench and the like comprising a driving motor, a tool receiving spindle provided with anvil faces, a rotatable hammer element, a pair of dogs each pivotally mounted on said hammer element adapted to transmit the rotational energy of said hammer to said anvil faces, gears on said dogs, an inter-connecting gear between first said gears to move one of said dogs into the path of said anvil faces and the other dog out of said path simultaneously, and means to transmit driving force from said motor to said dogs and tending to hold one of said dogs out of the path of said anvil faces including arms on said dogs projecting inwardly toward the spindle and an element rotatable by said driving motor to engage said arms.

4. An impact wrench and the like comprising a driving motor, a tool receiving spindle provided with anvil faces, a rotatable hammer element, a pair of dogs each pivotally mounted on said hammer element on axis parallel to the axis of said spindle and adapted to transmit the rotational energy of said hammer to said anvil faces, a gear train inter-connecting said dogs to move one of said dogs into the path of said anvil faces and the other dog out of said path simultaneously, and means to transmit driving force from said motor to said dogs and tending to hold one of said dogs out of the path of said anvil faces including arms on said dogs projecting inwardly toward the spindle and an element rotatable by said driving motor to engage said arms.

5. An impact wrench and the like comprising a driving motor, a tool receiving spindle provided with anvil faces, a rotatable hammer element, a pair of dogs each pivotally mounted on said hammer element adapted to transmit the rotational energy of said hammer to said anvil faces, inter-connecting means between said dogs to move one of said dogs into the path of said anvil faces and the other dog out of said path simultaneously, and means to transmit driving force from said motor to said dogs and constantly tending to hold one of said dogs out of the path of said anvil faces, the other dog coming into contact with the spindle immediately prior to the first dog striking said faces and being actuated by said spindle to move the first dog into the path of the anvil faces.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,174,314	De Mooy	Sept. 26, 1939
2,285,639	Amtsberg	June 9, 1942
2,343,596	Van Sittert et al.	Mar. 7, 1944
2,408,228	Richards	Sept. 24, 1946