MULTISPINDLE HAND SCREWING DEVICE OR BRACE

Inventor: August Weisenburger, Sophienstrasse 6, Frankfurt am Main, Germany

Filed: Jan. 4, 1974

Appl. No.: 430,749

Foreign Application Priority Data
Jan. 9, 1973 Germany 2300848

U.S. Cl. 81/52.4 R, 81/57.22
Int. Cl. B25d, B25b 17/00, B25b 23/02
Field of Search 81/52.4 R, 52.4 A, 57.22, 81/57.36

References Cited
UNITED STATES PATENTS
2,069,882 2/1937 Hall 81/52.4
2,781,682 2/1957 Herndon 81/52.4

2,964,152 12/1960 Banner 81/52.4 X

Primary Examiner—James L. Jones, Jr.
Attorney, Agent, or Firm—Schmidt, Johnson, Hovey & Williams

ABSTRACT
A multispindle hand screwing device or brace, in particular for tightening and unscrewing the wheel screw fastenings of motor vehicles, has a drive motor which drives via a transmission unit a plurality of screw spindles provided at their free ends with a screwing implement and with the interposition in each case of a claw or dog coupling which automatically disengages at a predetermined torque. Each screw spindle comprises a universal joint shaft having two joints, and the spindle end provided with the screwing implement is guided parallel in each case by a radially movable slide member which can be moved by a drive unit common to all the slide members.

14 Claims, 5 Drawing Figures
MULTISPINDLE HAND SCREWING DEVICE OR BRACE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a multipindle hand screwing device or brace, in particular for tightening and unscrewing the wheel screw fastenings of motor vehicles.

2. Prior Art

It is known to provide a hand brace having a drive motor which drives via a transmission unit a plurality of screw spindles provided at their free ends with a screwing implement and with the interposition in each case of a claw or dog coupling having automatic disengagement at a predetermined torque.

Such hand braces are used in the assembly of motor vehicles on the assembly line and in motor vehicle workshops, above all where wheel axes have to be frequently changed, for example for changing wheel types or for balancing the wheels.

While in the motor vehicle industry multipindle hand braces have been widely introduced on the assembly line, since the distances apart of the screws or nuts to be simultaneously gripped are equal. However, in motor vehicle workshops a difficulty arises since different types of vehicle are present each having varying radial distances apart of the screw fastenings. The use of multipindle hand braces is thus usually not worthwhile because for each type of vehicle a different hand brace has to be used. Consequently, in the last-mentioned situation there is usually found only single spindle motor-driven hand bracess. This means that each individual screw fastening has to be separately unscrewed or tightened up so that it is necessary to consume a considerable amount of time.

SUMMARY

According to the invention there is provided a multipindle hand screwing device or brace, in particular for tightening and unscrewing the wheel screw fastenings of motor vehicles, having a drive motor which drives via a transmission unit a plurality of screw spindles provided at their free ends with a screwing implement and with the interposition in each case of a claw or dog coupling which automatically disengages at a predetermined torque, each screw spindle comprising a universal joint shaft having two joints, and the spindle end provided with the screwing implement being guided parallel in each case by a radially movable slide member which can be moved by a drive unit common to all the slide members.

By adjusting the common central drive unit the spindle ends provided with the screwing implements are displaced radially together, so that there is provided a rapid adjustment facility to allow for different radial distances apart of the screw fastenings to be unscrewed or to be tightened up. The weight of the hand brace is increased by this adjusting device only to an insignificant extent.

Advantageously each slide member is provided with a rack which meshes with a central pinion common to all the slide members.

In this way a common drive for all the slide members is obtained with very simple means. A particularly space-saving construction may be attained by distributing the individual slide members consecutively along the axial length of the pinion.

For the purposes of adjustment the central pinion may be connected to a crown wheel which meshes with a bevel pinion which can be turned by a handwheel arranged on the exterior of the transmission housing of the brace. This embodiment is, on the one hand, very economical as regards space and, on the other hand, owing to the high step-down ratio between the bevel pinion and the crown wheel provides a very sensitive and readily effective adjustment. The handwheel can be lockable. Advantageously each slide member has an elongated slot one of whose edges carries the rack.

The slide members may be guided near the end face of the transmission unit housing and have arms which at their free ends carry guide bushes for the spindle ends. In this way there is obtained, on the one hand, secure guidance of the slide members and, on the other hand, a high degree of radial adjustability of the screw spindles, without the screw spindles having to be angled in the joints to too great an extent. Advantageously each slide member has two adjacent arms which are connected to the respective guide bush for the spindle end and leave between one another space for the free passage of the screw spindle. In this way the swivelling movement of the screw spindles remains unaffected by the radially moved arms and slide members.

Preferably at least one of the slide members is provided at its end with a pointer or scale for indicating the radial setting of the screw spindles. A predetermined radial spacing can thus be rapidly set without there being necessary separate measurement of the distance or adaptation to the predetermined spacing of the screw fastenings. For example, it is possible for there to be directly indicated on the scale the type of motor vehicle to whose wheel nut spacing the slide member is to be adjusted.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows, by way of example, a multipindle hand screwing device or brace, for the most part in section, indicating the individual slide members consecutively along the axial length of the pinion.

FIG. 2 shows a partial view in the direction “A” in FIG. 1, the screwing implements being set to the largest possible diameter;

FIG. 3 shows a similar partial view according to FIG. 2, the screwing implements being set to the smallest possible diameter,

FIG. 4 shows a section along the line IV—IV in FIG. 1, a number of parts being omitted; and

FIG. 5 shows a section along the line V—V in FIG. 4, a number of parts being omitted.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, a hand brace, shown for the most part in section in FIG. 1, comprises essentially a drive motor 1, a transmission unit 2, the adjusting device 3 and the screw spindles 4. In this embodiment the hand brace has five screw spindles 4. The drive motor 1, for example the motor of a manually operated drilling machine, is flange-mounted on the housing 5 of the transmission unit 2 and supports on a drive shaft 6 a drive gear wheel 7 which is in drive connection with one of five planet pinions 10 by way of gear wheels 8 (shown in chain-lines in FIG. 1) mounted on an intermediate shaft 9. The planet pinions 10 are mounted on
shafts 11 in the housing 5 and mesh with a common central gear wheel 12 which is arranged freely rotatably on the central drive shaft 6. The central gear wheel 12 is connected with an additional flywheel mass 13.

The planet pinions 10 are bell-shaped and are each connected so as to be incapable of rotation relative to a central square pin 14 on which there is arranged an upper coupling half 15 which is capable of sliding axially on the pin but which is positively driven thereby. The upper coupling half 15 is in engagement by way of prismatic claws or dogs which have inclined flanks, with similarly shaped claws of a lower coupling half 16. The gaps between the claws are in each case considerably larger than the width of the claws.

Each lower coupling half 16 is mounted in an end plate 17 of the transmission housing and engages around a ball joint 18 which has lateral grooves 19 into each of which there projects a round peg 20 located in the lower coupling half 16.

The ball joint 18 forms one end of a shaft connecting piece 21 of the screw spindle 4. The ball joint 18 is pushed into the lower coupling half 16 by a spring 22 which by way of a plate 23 engages on a cup-shaped convex recess in the transmission housing. The shaft connecting piece 21 is radially pivotable, as indicated in FIG. 1. At its other end the shaft connecting piece 21 carries a universal joint 24 to which the free end 25 of the screw spindle 4 is attached, which free end carries a screwing implement 26, for example a socket with a hexagon cross-section.

A plurality of slide members 28 are guided radially for movement in an annular housing portion 27 attached to the end plate 17 of the transmission 2. Each slide member 28 has an elongated slot 29, one of whose longitudinal edges takes the form of a rack 30 which meshes with a central pinion 31.

The pinion 31 is located on a shaft 32 mounted on the end wall of the transmission 2 or is integral with a shaft 32. The shaft 32 is rigidly connected to a crown-wheel 33 meshing with a bevel pinion 34. The bevel pinion 34 is connected to a handwheel 36 via a radially outward directed shaft 35, which handwheel is protected by a guard 37 welded to the housing portion 27.

As evident in particular from FIG. 5, each slide member 28 carries at one end two parallel arms 38 which at their free ends are connected to a guide bush 39 for the free end of the screw spindle 4. The distance apart of the two arms 38 of each slide member 28 is such that there is room between the arms for the screw spindle 4. FIGS. 2 and 3 show that the end of each slide member 28 is bifurcated so as to create space for the screw spindle 4.

At least one of the slide members 28 is bent over at its end facing away from the arms 38 and is connected to a graduated plate 39 (FIGS. 4 and 5) which is guided in a part of the annular housing 27 carrying the guard 37. A pointer 40 is provided on the housing and in accordance with which the scale 39 can be adjusted.

The handwheel 36 is provided on its end face with teeth 41 into which there engages a pawl 43 which can be operated by hand against the force of a spring 42. The handwheel 36 may thereby be locked in position when no adjustment is to be carried out (FIG. 4).

The motor 1 drives the planet pinions 10 constantly via the transmission unit 2. For reversing the direction of rotation, the motor 1 has to be switched off and then switched on again in converse direction. The upper coupling halves 15 driven by the planet pinions 10 are pressed by a compression spring 10a constantly towards the lower coupling halves 16, which are mounted freely rotatably per se, and impart drive to the lower coupling halves.

If the torque transmitted to one of the screw spindles 4 exceeds a predetermined value, for example, because a screw has been tightened to a given torque, then the upper coupling half 15 moves upwards against the force of the spring 10a; the claws engage in the next claw gap and thus encounter the next claw flanks abruptly so that an impact or percussion effect occurs. The hand brace operates in these working conditions like a percussion screwing device. When a given torque is reached the lower coupling half 16 is no longer rotated.

The rotary movement is transmitted to each screwing implement 26 via the respective joints 16, 18 and 24.

In order to vary the radial setting of the screwing implement, as illustrated in FIG. 1 in dash lines, the handwheel 36 is turned after releasing the pawl 43. The crownwheel 33 turns the pinion 31 and thus displaces all the slide members 28 simultaneously radially outwards or inwards until the desired index mark is obtained on the scale 39. The index mark can, for example, be the model designation of the motor vehicle whose wheel screw fastenings are to be unscrewed or tightened up. FIGS. 2 and 3 show the slide members 28 in their outermost and innermost positions.

The slide members 28 are guided in a plate 44 in the housing portion 27. This plate has at the same time radial slots 45 in which the connecting pieces 21 of the screw spindles 4 are guided in such a way that their pivotal movement can only take place in a radial direction.

The grooves 19 have a basically concave shape, as shown in FIG. 1, and extend parallel to the axis of the shaft connecting piece 21. The pegs 20 engaging in the grooves are of frusto-conical shape and permit relative pivotal movement of the ball joint 18 in all directions.

The individual slide members 28 are situated one immediately behind the other so that each individual slide member can mesh with the pinion 31 (FIGS. 1 and 5). Moreover, the individual slide members 28 have to be made, for example cranked to varying extents (FIG. 5), so that they can occupy their corresponding position at the pinion 31. Instead of an individual slide member it is also possible for a plurality of slide members 28 to be provided with a scale 39 so that the adjustment to several positions can be read off selectively, for example the two lateral arms of the guard 37 can control such a scale.

The main advantage of the multisindle, motor-driven hand screwing device or brace described above is that it can be used even in the case of screw fastenings having varying radial distances apart. The readjustment may be effected quickly and with low expenditure of energy. Also, in spite of its adjustibility the weight of the hand brace may be kept as low as possible so that it may be moved readily and applied manually.

I claim:

1. A multisindle hand screwing device or brace, in particular for tightening and unscrewing the wheel screw fastenings of motor vehicles, having a drive
motor which drives via a transmission unit a plurality of screw spindles provided at their free ends with a screwing implement and with the interposition in each case of a claw or dog coupling which automatically disengages at a predetermined torque, each screw spindle comprising a universal joint shaft having two joints, and the spindle end provided with the screwing implement being guided parallel in each case by a radially movable slide member which can be moved by a drive unit common to all the slide members.

2. A hand brace according to claim 1, wherein each slide member is provided with a rack which meshes with a central pinion common to all the slide members.

3. A hand brace according to claim 2, wherein the individual slide members are distributed consecutively along the axial length of the pinion.

4. A hand brace according to claim 2 wherein, for the purposes of adjustment, the central pinion is connected to a crown wheel which meshes with a bevel pinion which can be turned by a handwheel arranged on the exterior of the transmission housing of the brace.

5. A hand brace according to claim 4, wherein the handwheel can be locked in position.

6. A hand brace according to claim 2, wherein each slide member has an elongated slot one of those edges carries the rack.

7. A hand brace according to claim 1, wherein the slide members are guided near the end face of the transmission housing and have arms which at their free ends carry guide bushes for the spindle ends.

8. A hand brace according to claim 7, wherein each slide member has two adjacent arms which are connected to the respective guide bush for the spindle end and leave between one another space for the free passage of the screw spindle.

9. A hand brace according to claim 1, wherein at least one of the slide members is provided at its end with a pointer or scale for indicating the radial setting of the screw spindles.

10. A hand brace according to claim 1, wherein one claw coupling half is mounted in the transmission housing and takes the form of part of a spindle joint.

11. A hand brace according to claim 10, wherein in each case the other claw coupling half is spring-loaded for axial movement and for rotation is positively driven by a gear wheel which in each case forms a planet pinion of the transmission unit and meshes with a central gear wheel mounted for free rotation.

12. A hand brace according to claim 11, wherein the central gear wheel is provided with a flywheel mass.

13. A hand brace according to claim 11, wherein the planet pinions are provided with a flywheel mass.

14. A hand brace according to claim 11, wherein the central gear wheel is arranged for free rotation on a shaft of the drive motor, the shaft projecting into the transmission housing and being connected with a drive gear wheel which is in driving connection with one of the planet pinions via gear wheels on an intermediate shaft.

* * * * *